Nutrition in Agriculture No. 4

# Data Needs for Assessing the Nutritional Effects of Agricultural and Rural Development Projects

## A Paper for Project Planners

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

NUTRITION IN AGRICULTURE

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*No. 4*
*Data Needs for Assessing the Nutritional Effects of Agricultural and Rural Development Projects: A Paper for Project Planners*

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# DATA NEEDS FOR ASSESSING THE NUTRITIONAL EFFECTS
# OF
# AGRICULTURAL AND RURAL DEVELOPMENT PROJECTS

A Paper for Project Planners

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FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS
Rome
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# PREFACE

Project planners would agree that, when decisions have to be taken on the design of agricultural and rural development projects, the underlying base of information is nearly always inadequate. The exact impact of the proposed investment or policies can rarely be predicted with accuracy and therefore judgement, based on experience, is used very widely.

The impact of an agricultural project on food consumption levels and, secondarily, on nutritional status, is one of the most important effects that we would wish to be able to forecast. However, the completed research to date gives us only a few clues for predicting such impacts. Additional information pertinent to the project locality is nearly always needed. This information involves, ideally, an identification of those malnourished, by characteristics of age, sex, geographical location, income levels and other socio-economic factors and an identification of the causes of their malnutrition.

The onus always exists to collect additional information in order to ensure greater confidence about the predicted effects of projects. But information collection has its own costs; it is time-consuming, whereas in the project itself decisions come up which cannot be delayed. Methods of data collection attuned to the needs of projects are not well developed. Surveys to collect data are often conducted by members of the academic community who are more interested in precision and methodology (and future publication) than willing to improvise for the benefit of the project authorities and to meet abrupt deadlines.

Clearly a middle course approach to information collection is required. This paper is a contribution to the cause. Drawing largely on FAO experience, it outlines principles for deciding on what data are essential, balancing the need to know with the time costs involved. This, the fourth number in the series Nutrition in Agriculture, should be read in conjunction with the FAO manual *Integrating Nutrition into Agricultural and Rural Development Projects*, which is No. 1 in the series.

The paper was originally commissioned by FAO for the United Nations Administrative Co-ordinating Committee (ACC), Sub-Committee on Nutrition (SCN). It was presented at the ACC-SCN Workshop on Nutrition in Agricultural and Rural Development Projects, which was held at Castelgandolfo, Italy in February 1983.

As with all previous publications in the series, we invite constructive comment from our readers, especially from those responsible for the design and implementation of agricultural and rural development projects.

P. Lunven
Officer-in-Charge

Food Policy and Nutrition Division

SUMMARY

Recommendations are made on methods and data needs for assessing the nutritional effects of agricultural and rural development projects, mainly in the planning stage. These are based as far as possible on the limited experience available, from known effects of completed projects, and from field tests of *ex ante* assessment methods. The methods need to be appropriate for eventual wide application in project planning, which imposes restrictions on the resources demanded and time available. The aim is to present the "minimum" methods that will lead to useful conclusions for project design.

The logic is first to outline the important decisions, relative to nutrition, on project design. Then the questions that need to be answered to provide information for these decisions are specified; hence the minimum data outputs to answer these questions. The possible sources of data, and appropriate analysis methods for field work, are suggested.

The underlying theory is that the major effect of agricultural and rural development projects on nutrition is through the income generated for malnourished households. A major concern is that malnourished households should participate in the project, hence targetting is an important issue. Then the question of whether increased income will lead to improved nutrition needs to be examined. Although this is the usual case, when income sources change it is possible that nutrition does not improve with increased income. Effects on nutrition through increasing food supply are important for large projects, but are not emphasized here: they are generally of less significance than direct effects, and require extensive resources of data and analysis for estimation.

The planning decisions for individual projects concern targetting, design of activities, decisions on indirect effects, and on trade-offs. Targetting decisions concern who is to participate in the project, and how many of the malnourished may be included. Decisions on design of activities concern, first, whether these activities will benefit the nutrition of those participating and whether participants want these activities. The basis of the proposed method is comparison of nutritional conditions of those who have already adopted or begun to adopt changes to be brought about by the project, with those who have not, utilizing the cross-sectional data which is all that is likely to be commonly available. When income sources change, for example through cropping pattern, effects of such changes must be investigated. If income sources do not change, evidence should be sought on the possibility that currently higher income groups have better nutritional status. Changes in vulnerability (for example, if average yields increase, but variability also increases) need to be assessed, more usually from enquiry than hard data. Sanitation effects are most likely when project activities concern irrigation or resettlement, and may require investigation. Identification of additional components requires information similar to that for other aspects of project assessment. The data requirements for assessing indirect effect, for example through food supply, however, are much more complex. Some indications of their importance may be obtained from available data. However, if such effects are likely to be important and affect project design, then no short-cut method appears to be available; extensive data analysis to trace these effects and to calculate trade-offs could be needed, although these go beyond the scope of "minimum" data. These methods are discussed briefly in an appendix.

Management decisions require data on, first, the process of project implementation; and second, on the trend in nutritional outcome indicators. The latter can be achieved by repeating the type of baseline data collection needed for planning; alternatively, it may be possible to gain the necessary information through contacts of project staff with participants. Evaluation of the net effect or impact of projects is needed in order to guide the design of future projects. This requires more rigorous evaluation design, although management data may be useful in this context. If such impact evaluations are needed, their design should be considered from an early stage.

Five sources of data are considered: information on project design and relevant policies; use of existing information; rapid appraisal; "indicator" surveys; data for project management and evaluation. Information on project design and related policies comes from those responsible for identification and feasibility studies. At the same time, the relation of the project to over-all policies of the government concerned, in particular in relation to food policy, needs to be determined. Existing information may give some of the data outputs required for planning decisions. These data may be specific to the project, or otherwise. There is an important distinction between data collected by sample survey, and those available through administrative sources. Sample surveys give integrated data sets which permit investigation of association with possible causal factors. On the other hand, administrative data, and census data, allow a greater degree of disaggregation. Administrative data usually give variables only by area, which is useful in geographical targetting but not in further analysis. Household budget survey data may be useful when available. Rapid appraisal methods are widely used, and are important for early assessments. They may be able to produce recommendations on project design that are as sound as those based on statistics, but they are often less convincing, and run a greater risk of being wrong. At present it seems important to continue to use and refine such techniques, and to increasingly draw on people with experience of rapid appraisals for these purposes. Nonetheless, existing data and rapid appraisal usually need to be supplemented by a minimum amount of "hard" data. The small-scale indicator surveys tested by FAO are a useful means of getting a minimum amount of such hard data. These surveys collect outcome indicators of nutritional conditions, with a variety of resource or classifying variables. The surveys may be carried out specifically for nutritional purposes, but if possible should be done by including nutrition measurements in other surveys. Such surveys give the required minimum numerical outputs for making planning decisions. Project management and evaluation data should usually be collected as part of an established monitoring and evaluation system within the project. Again, they can be used to assess the adequacy of nutritional changes during project implementation, and with suitable attention to design and analysis,may give estimates of net effects, hence effects per cost.

The analysis required for producing the essential outputs from these data depends mainly on tabulation. For data derived from administrative sources, this is the only widely appropriate method. For sample survey data, experience shows that most of the information may be obtained by judicious tabulation, since the degree of association between classifying variables is seldom high. Nonetheless, provision should be made for more detailed analysis, even if not in the time frame required for project planning. Evidently the strategy for analysis depends on the analytical capacity available, which should usually be within the country concerned. The analysis should be planned early so that the data outputs needed to support the important decisions are known in advance.

CONTENTS

## INTRODUCTION: THE PURPOSE OF THIS PAPER

This paper makes recommendations on practical methods, in particular data requirements, for assessing the nutritional effects of agricultural and rural development projects. These methods and data needs refer mainly to the planning stage of such projects. These needs are closely related to those for surveillance and evaluation during and after project implementation, and these procedures will also be referred to.

The recommendations are based as far as possible on published experience, which is referred to in the text. They relate to a limited number of the most important issues that arise in practice. Such literature as is available recounts, first, the known effects on nutrition of such projects; and, second, field experience of assessments during project planning (FAO, 1983). Judgements are made on the level at which to pitch the proposals, so that the detail and sophistication required are compatible with the financial and political constraints of project design.

Nutrition is a specific aspect of basic needs, level of living, or however the necessities of human welfare may be described. Nutritional status summarizes many important aspects of living conditions. If the children (for malnutrition particularly affects the young) in a community are thriving, this says something positive about the community. If the children are sick, malnourished and dying, there is something radically wrong. The same applies though it may be less easily observed for the older members of the community: hunger is the most basic of deprivations. Nutrition may thus be regarded in two senses: first, treating adequate food consumption and nutritional status as specific objectives; second, planning for nutritional objectives as part of an effort to reach the broader objectives of alleviating poverty. Thus this perspective may help to provide a means of giving a practical poverty orientation to planning development projects.

The intended audience for this paper is the practitioners contributing to the design of specific projects. As such, it aims to form part of the documentation available on the subject; on the assumption that this documentation (e.g. from ACC-SCN 1978; FAO 1979, FAO 1983; Pinstrup-Andersen 1981), is known and available it will not be separately reviewed.

The structure of the paper follows the order of the questions listed below.

(a) Why do we need to assess nutritional effects of agricultural and rural development projects: what are the crucial decisions involved? (Section 1)

(b) If these are the decisions involved, what specific questions need to be answered? (Section 2)

(c) What are then the minimum data outputs that would give satisfactory answers to these questions? (Section 3)

(d) How can the necessary data be obtained within the usual constraints of project formulation, and management? (Section 4)

(e) Which analytical methods may be utilized for producing the required output from these data? (Section 5)

Throughout the paper a major issue is defining what is meant by "minimum data needs". This is impossible to achieve in precise yet general terms, because each project circumstance is unique. An important criterion is the "minimum" necessary to reach convincing recommendations on project design, especially if this is also to include criteria of certainty, and advocacy. The general position taken is that some numerical information is usually necessary for these conditions to be compared, and that the minimum numerical data are indicators of nutritional conditions for different population groups. The comparisons are needed for targetting, and for estimating associations with causal factors of malnutrition to guide project design. However, it is important to note at this stage that no rigid definition of "minimum" is feasible. The concentration here on a mixture of qualitative and numerical data represents an attempt to give some guidance when specific issues of project planning are addressed. As much as anything, the paper aims to help establish lines of enquiry, and to provide one basis for learning from these in practice.

## Section 1

## IMPORTANT DECISIONS FOR PROJECT DESIGN

(Why do we need to assess nutritional effects of agricultural and rural development projects?)

These decisions on project design concern allocation of resources to different areas and population groups, and to different project activities. The concern here is the information needed to introduce nutritional considerations into such decision-making. First, the underlying theory and the decisions themselves need to be examined.

### 1.1 UNDERLYING THEORY

The resources available for improving levels of living and nutrition in rural areas are to a large extent from development projects, particularly in the poorest countries. However, if these projects automatically led to improved nutrition, no special effort would be needed to assess these effects. There are reasons both from indirect evidence and from limited direct experience to suppose that the benefit to nutrition is not automatic. Both failure of including the needy in development projects, and negative effects on the nutrition of participants, have been blamed for lack of a positive effect of agricultural development on nutrition. Thus Hernandez *et al.* (1974), in assessing a long-term agricultural development project in Mexico, concluded that the poor were excluded and hence their nutrition failed to improve. Dewey (1980) concluded that "change brought about by agricultural development ... often benefit only upper income families, while the majority of rural peasants continue living in an impoverished state ..." (see also review in Dewey 1981a). Dewey also considered, in at least one project studied, that families that did participate in agricultural development suffered dietary deterioration and an associated decline in nutritional status of preschool children (Dewey 1981b).

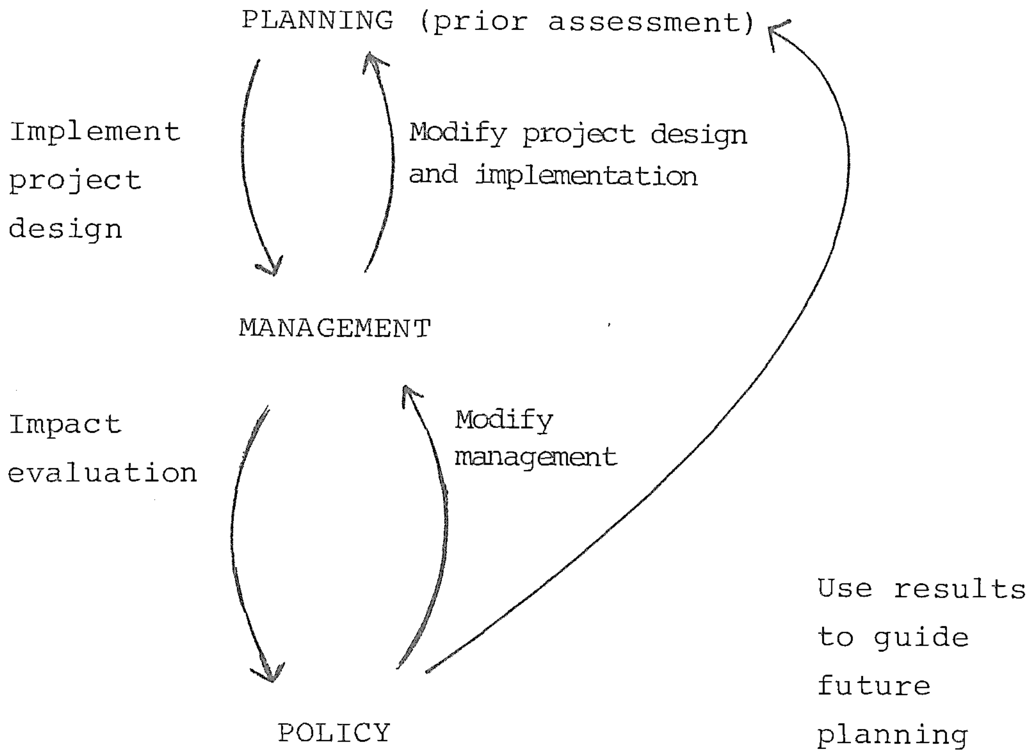
Fleuret and Fleuret (1980) have also extensively reviewed this literature recently, concluding that "...development efforts that focus narrowly on production without considering distribution and consumption unfortunately tend to alter access to resources of all kinds in ways that can have a deleterious impact on nutritional status among the rural poor ..."

If positive effects on nutrition cannot be assumed to occur without deliberate planning for them, ways of assessing *ex ante*, or forecasting, nutritional effects are needed in order to try to influence project designs such that any potential for improving nutrition is realized; and certainly to prevent possible negative effects. This implies that alternative project designs need to be assessed and the results used to help make rational decisions on design, balancing nutritional with other expected outcomes, notably economic. In brief, the objective is to influence project design so that (a) resources are distributed towards the malnourished and (b) these resources are used in such a way that food consumption and nutrition improve for the malnourished.

However, we only need to assess nutritional effects at all when the conclusions can contribute to decisions on project design, implementation or other actions. If in practice they do not, the effort is wasted. This in effect requires a policy commitment to take account of recommendations from this assessment. Our experience to date has been largely that the recommendations on project design can be made with the methods at hand -- imperfect though they may be -- but that planning decisions have not often been based on these. Both the policy and a practical means of carrying it out are needed. The constraint has been more in implementing recommendations than in making them. This paper refers to methods for reaching recommendations, but these will evidently be of no use if they do not lead to decisions.

There are various decisions that need different information support, and require varying degrees of confidence in the information. These decisions can be classified as: planning decisions for individual projects; decisions during implementation; and policy decisions on replication of projects, guidance of a series of projects, etc. In general, the relation between planning, management and policy is conceived of as shown in figure 1. The prior assessment contributes to planning the project design; the ongoing evaluation for management purposes in effect checks the implementation of the plan and reassesses it in the light of actual events and estimated adequacy of the outcome; these assessments, plus other evaluation methods, contribute to estimating the effectiveness of the project *post facto*, the conclusions being used to guide the planning of further projects. Evidently, this concept applies to objectives beyond nutrition.

Figure 1. Relations between planning, management and policy decisions (based on nutritional assessment)




An outline of the decisions involved is given in figure 2, and considered in more detail below. These decisions dictate the information needs. The conventional current practices for this decision-making (e.g. the "project cycle", project management practices, among others) are taken as the background -- realizing that these crucially need to be improved by, for instance, greater popular participation, and more flexible project design and management.

The decision framework proposed in 1978 (ACC-SCN 1978), FAO 1979) remains conceptually valid and has the merit of having been tested. Moreover we can now specify certain of the questions more closely. As discussed later, it is substantially in line with other proposed methods for project assessment. Briefly, the over-all theory follow on page 7.

Figure 2. Important decisions relating to nutrition for project design

Planning decisions

Targetting:

* Who is to participate in the project?
* How many of the malnourished can be included?

Design of activities:

* What activities (components) are included? Targetted to whom?
* What is the expenditure per head?
* What are the likely effects of these activities on nutrition of participants? Hence are modifications to these activities indicated? Are additional activities needed?
* What are the trade-offs involved?

Indirect effects:

* Are effects on food consumption of non-project participants intended to be important? If so, how are those balanced with effects on participants?

Management decisions

* Are goods and services being delivered as planned to the target groups?
* Is the trend in nutritional indicators adequate for the target groups?

Policy decisions (from evaluations)

* Was the improvement in nutrition as planned?
* Was this outcome due to project activities? Which activities?
* What factors interfered with impact?
* Is nutritional impact expected if the project is replicated under similar conditions? Different conditions? How should future designs be modified?

(a) The main effect on nutrition of agricultural and rural development projects is through increasing the real income of malnourished households.

(b) A major concern is that malnourished households participate in the project and hence derive increased real income from the project; an important reason why projects do not have a positive effect on nutrition is simply that the needy do not gain the benefits -- typically the larger farmer benefits, but the smaller landholder and the landless do not.

(c) Virtually all agricultural and rural development projects aim to increase the real income of participants.

(d) In many circumstances increased real income leads to improved nutrition; therefore the first question is whether the needy derive income, then the question of whether income in fact improves nutrition should be examined.

(e) The main circumstances in which income does not lead to improved nutrition is when the income source changes; most negative effects of agricultural development can be related to this (see for example references quoted above). More specifically this effect is when (i) subsistence consumption substantially decreases and is not compensated by increased food purchases; (ii) related to this, the crops grown change; (iii) distribution within the household, the timing of income, etc., changes; (iv) vulnerability increases, e.g. average yields increase, but so does variability; (v) the sanitary environment of the household deteriorates (usually but not always related to changing income source).

The main omission from this theory is the supply effect, which would act through prices unless there were physical food shortages. Only for very large projects is this effect likely to be important, and these effects are not considered in detail here. (This emphasis on income effects is also made by Pinstrup-Andersen 1981). The econometric methods that would be needed to assess supply effects may also be used in assessing demand effects, but they are not strictly necessary: if income sources change, such projection will not usually be possible; if income sources do not change, the calculation will show that increased income gives increased food consumption, which is assumed in the methods discussed here.

This theory is based on the view that poverty, and specifically inadequate real income, is the most important general cause of malnutrition. There may be a need for understanding more specific causes of malnutrition, in order that recommendations on project design may provide an efficient orientation to these specific causes. One major cause which is constantly taken account of is the maldistribution of resources, hence the emphasis on targetting decisions. Research into causality should be focused on those causes of malnutrition that are open to change by the project. For example, landlessness may be a cause of malnutrition; this implies clearly the landless need to benefit, but it may not be realistic to recommend land reform as a project activity. On the other hand, a shift from staple food to export crops may be causing malnutrition, and this is feasibly affected by an agricultural development project.

There is also a distinction between a concern for causality and the ability to prove it. The best that can usually be achieved is, first, to show an association between a variable representing a possible cause (e.g. proportion of export crops to staple food crops) and malnutrition, and to try to take account of obvious confounding (e.g. environmental sanitation); and second to gain some understanding, usually by more informal techniques (see section 4) of what is going on. This may give plausible inferences on causality. The underlying assumption -- which the data proposed here should be used to check on -- is that inadequate real income (affecting certain groups particularly due to inequitable distribution) and poor sanitation are sufficiently common causes of malnutrition that they should be first investigated.

Flow diagrams have often been used to represent causality of malnutrition, and to indicate ways in which project activities can cause changes in malnutrition. These are sufficiently familiar not to require extensive discussion here. A typical representation, here adapted from that used widely in the context of nutritional surveillance (WHO 1976), is shown in figure 3. (This is very similar in concept to that used on page 16 of Pinstrup-Andersen 1981, and to the one shown on page 58 of ACC-SCN 1978.) Such diagrams summarize the theory behind this paper, and can be useful in elucidating ways in which individual projects are actually designed to improve nutrition.

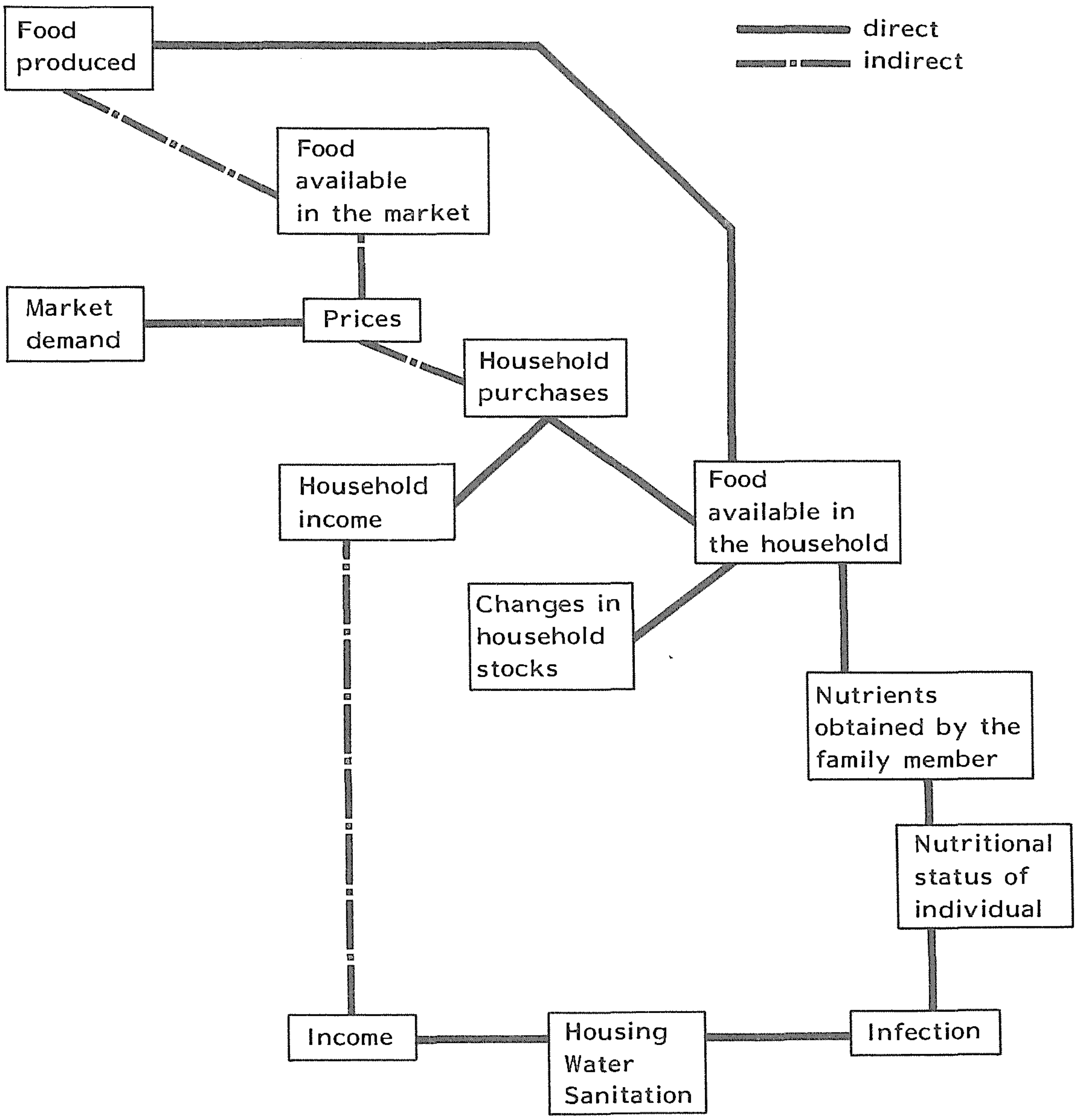
## 1.2 PLANNING DECISIONS FOR INDIVIDUAL PROJECT DESIGNS

The decisions on project design that stem from this theory have been outlined in figure 2 and are set out below. The decisions are only real when there is flexibility in project formulation to accommodate them. These decisions require information, and this information and its required certainty determine minimum data needs.

### Targetting decisions

These decisions in resource allocations are straightforward in principle, although they are more complex when a project consists of a number of different components. They involve decisions on who is to participate in (derived goods and services from) the project. These decisions are made by location and accessibility; by assets (e.g. landholding, collateral for loans); by occupation (e.g. farmers, pastoralists). The information required to set priorities for targetting flows directly from the type of data collection and analysis recommended here. The decisions also involve estimates of trade-offs between targetting certain groups as opposed to others. Calculations of trade-offs have to be pursued in much the same way

Figure 3. Factors determining nutritional status; direct and indirect project effects; priority factors for project assessment




Source: FAO, Nutrition in Agriculture No. 1, adapted from WHO, *Methodology of Nutritional Surveillance*, WHO Technical Report Series No. 593.

as the sensitivity analyses that are common at least in the design of investment projects.

Decisions on design of activities (i.e. on project components)

A substantial proportion of the expenditure in agricultural and rural development projects is usually aimed at increasing production. The decisions in practice overlap with targetting decisions (e.g. a credit-scheme requiring a minimum landholding for eligibility has targetting implications), but here we consider decisions over and above those that affect targetting. In agricultural projects, often the most relevant decisions concern the cropping pattern; while others concern the technology to be adopted, which has implications for employment levels. Many other production-related design decisions flow from these -- on marketing and storage, for example. Activities promoting production of livestock, fishing and forestry involve generally analogous decisions; however agriculture will be used as the example here. Infrastructure development -- roads, water control, etc. -- can be included in this categrory, often being decided in practice in relation to promoting production and marketing.

A second concern is to identify, and decide whether to include, activities aimed more directly at improving welfare -- education, health services, water supply and sanitation, etc. These activities often have direct potential for improving nutrition. Decisions on whether to include such components, and to whom to target them, should depend partly on considerations of their likely effects on nutrition. This requires information on likely causal associations between, for example, contaminated water and nutritional status; and preferably some assessment of the likely relative effects on nutrition, per cost, of different options. For example, it might be more cost-effective to improve water supply than toilet facilities, and this question may need to be investigated -- here the outcome of interest could be gastroenteritis and child mortality rather than or as well as nutritional status; how to compare these outcomes is a further difficult question.

Decisions on indirect effects

The methods and data needs discussed here do not generally provide for assessment of indirect effects on non-participants; either potentially positive effects through food output or income trickle-down, or negative effects through for example price changes. The relevance of these possible decisions is briefly discussed below.

(a) Through food output. Decisions on possible effects through food output are relevant (i) when the project is of a size that a significant increase in marketed food is planned (or when the project is one of a series with the same planned outcome); and (ii) when shortage of food on the market is limiting consumption or there is an anticipated effect on the price of marketed food. Both of the conditions (i) and (ii) must apply. Even if expanding the food supply is a major objective, there are still important decisions on who produces which refer back to the previous discussions. Estimating the effects on food consumption through supply and price is feasible in principle using estimates of price elasticities, if future prices can be estimated. The data required for these calculations are usually derived from extensive household budget surveys, and would not be usually available in the context of a single project.

The two main ways in which indirect nutrition effects will occur through food output are: if there is intermittent physical shortage of food on the market, or if food prices are stabilized or reduced. If these effects are likely, decisions will be needed on: whether to maximize output at the possible expense of income distribution (e.g. to produce food by intensive modern methods); whether not to maximize income to producers by not promoting higher-value (e.g. non-food crops). Examples of both these decisions come to mind. Modern sector agriculture has been supported in some African countries with the objective of maintaining food supplies (primarily to urban areas) implicitly rejecting the alternative of supporting the traditional farmer, and thus forfeiting the opportunity to benefit the majority of the rural poor. Elsewhere food production by the rural farmer has been promoted, but with poor producer prices, whereas his income and food consumption might have benefited more if he used part of his resources to grow higher value cash crops. In general, these decisions again concern who is to benefit in nutritional terms from the project.

These are difficult issues of food policy. They are important for very large-scale projects, or for the policies guiding a number of smaller-scale projects. There is not much experience of deciding on these issues. The decisions relevant to potential participants are nonetheless always important. For most of this paper, we assume that the answers to questions (i) and (ii) above are "no"; i.e. the output effect for non-project-participants is not the main issue. In the appendix, the question of assessing output effects is examined further.

(b) Through income trickle-down. This refers to other secondary effects through the income benefits being passed on through trading, hire of labor, etc. The position taken is similar to that for food output effects: they may be important in certain large-scale projects or for a series of smaller-scale projects; the direct effects are always important, and likely to be more important than these secondary effects. It is unlikely that planning decisions based on expected direct effects should be over-ridden by possible trickle-down effects. However, decisions need to be made early on as to whether these need to be analyzed in detail; if so, the data needs or methods discussed here will need to be expanded. If not, the simpler methods and data needs discussed here then apply.

Decisions on trade-offs

We are not yet at a stage that trade-offs between the nutrition benefits and economic returns of alternative project designs can be assessed quantitatively. Indeed, it is unlikely that the data are going to be commonly available for this. It is tempting to try to arrive at a number summarizing nutritional benefits, which would then allow these trade-offs to be calculated. Such a number would have to be produced from kilocalorie (kcal) consumption estimates, and it is unclear that such estimates would give more than a spurious impression of quantification, because of uncertainties in relations between income and consumption, baseline kcal intakes, etc. (In theory, estimates could be made from the income planned to accrue to different groups, converting this to projected kcal consumption increases, and setting this against estimated kcal deficits by group of household: the number of deficit kcals provided could for instance lead to a quantification of nutritional effect).

In the present context, the estimates of trade-offs would have to be more qualitative, based on assessments along the lines "highly beneficial to nutrition -- reaching X% of malnourished with significant benefits"; "moderately beneficial.."; "neutral .."; etc. Ideally these benefits could be lined up against economic returns and other objectives, and a rational choice made between alternative possibilities. Again there is no experience of this. The methods discussed here will give a basis for ranking nutritional benefits by projects: we now need practical evidence for how such a ranking can be used in deciding on the balance of benefits in actual project formulation.

## 1.3 MANAGEMENT DECISIONS

During project implementation, management decisions can in principle be made which affect the nutritional outcome of the project. These decisions require information, in part linked to that used for planning decisions, but also covering implementation of the plan and its targetting. These management decisions could involve:

(a) Checking that the planned goods and services are being delivered in certain required quantities to the designated target groups, and if necessary tightening up on management procedures;

(b) Periodically assessing whether the nutritional conditions are improving in line with objectives; if not, then further measures may need to be considered.

Procedures for evaluation for management purposes have been laid out, with reference to agricultural and rural development projects in general, by Casley and Lury (1981a). Ongoing evaluation of the adequacy of nutritional outcome of a project is discussed by Mason *et al.* (1982).

The specific questions involved and the data needed to answer them are discussed in subsequent sections.

## 1.4 POLICY DECISIONS

Policy decisions should be based on evaluation of nutritional effects, generally *post facto*, or in the later stages of implementation. The decisions concern (a) continuation and/or replication of projects; and (b) setting of priorities for other projects. These decisions can stem from evaluations of nutritional outcomes achieved. They require more certainty on the causal relations between project activities and nutritional outcome. They must assess associations between project activities and nutrition, and take account of possible alternative explanations for apparent effects (confounding). The relations between evaluation design, confidence in conclusions, and requirements for different decisions (management, policy) is discussed in Mason *et al.* (1982): the relevant table is reproduced in table 1.

These policy decisions are directly related to the planning decisions discussed above. They differ in that they would usually be based on a wider range of data than for single projects -- including evaluations of projects impacts, in-depth studies, detailed research on causality, among others. In relation to the design of individual projects, however, they concern similar questions of target groups, cropping policy, technology etc. The main concern here is how to use planning and management procedures and their associated data to contribute to these policy decisions; this is taken up in later sections.

Table 1. Appropriate data collection and analysis for different decisions

Confidence level increases →

Difficulty increases ↓

| Data and analysis needs | Decisions | (1) Management | (2) Continue funding | (3) Replication in similar conditions | (4) Replication in different conditions | (5) Basic research, causality |
|---|---|---|---|---|---|---|
| (a) | Process data and outcome for participants only | + | + | + | + | + |
| (b) | *Ad hoc* survey | (+) | (+) | + | + | (+) |
| (c) | Advanced statistical analysis | | + | + | + | + |
| (d) | Some kind of control group(s) | | | + | + | + |
| (e) | Before/after data | | | | (+) | + |
| (f) | Highly standardized measurements | | | | (+) | + |
| (g) | Randomized intervention | | | | (+) | + |
| (h) | Double-blind trials | | | | | +? |

Note: + Means occasionally

Source: Mason *et al.*, "Principles for evaluation of on-going programs", CNSP Working Paper Series No. 5, Cornell University, 1982

## Section 2

## SPECIFIC QUESTIONS

(If these are the decisions, what specific questions need to be answered?)

The intermediate step between specifying the decisions that need information and the minimum data needed to provide for informed decision-making is to give details of the questions that need to be answered from these data.

A general summary of commonly relevant questions is given below. Again, the requirements for planning are given in more detail than those for management and policy.

### 2.1 FOR PROJECT PLANNING DECISIONS

(a) Targetting

(i) How are potential participants defined? (e.g. by geography farming system, occupation, resources among others)

(ii) What is the relative nutritional need of these groups?

(iii) What are the proportions of the total needy by group?

(iv) Which groups of potential participants can be targetted, and hence which design brings about the optimum participation of the malnourished?

(b) Design of activities for direct effects

(i) Assuming that the project will increase the income of project participants, is it expected that increased income will lead to improved nutrition?

(ii) Will income sources change?

(iii) If the source of income for participants changes (e.g. change in crops, technology, resettlement) is there evidence that the nutrition of those who have already experienced this change is improved?

(iv) If source of income for participants does not change (e.g. by intensifying production of existing crops) are those with currently higher production (hence income) in fact better-off nutritionally?

(v) Is the sanitation and health environment expected to change?

(vi) Are there population groups with poor nutrition that cannot be participants for whom additional activities would be justified?

(vii) Are there specific problems open to nutritional interventions?

(c) Indirect effects

The two main questions addressed on indirect effects concern (a) whether physical food shortages will be alleviated, and (b) whether food produced will have an effect on prices. These are discussed in detail in section 3.

## 2.2 FOR MANAGEMENT DECISIONS

(i) Are goods and services being delivered to the intended target groups in quantities and qualities as planned?

(ii) Is the trend in nutritional outcome adequate?

## 2.3 FOR POLICY DECISIONS

Can improvements in nutrition be plausibly ascribed to project activities? To which activities? What is the effect per unit cost?

## Section 3

## MINIMUM DATA OUTPUTS REQUIRED

(If these are the questions, what information is needed to answer them?)

The questions put forward above could be answered by qualitative or quantitative methods, or with a combination of these. This depends on the confidence required in making recommendations; the availability of existing data and their suitability for planning; and the possibilities of collecting and analyzing further data. A minimum amount of numerical data is usually needed. Figures are generally required to reach recommendations with any confidence and to present them with the necessary conviction. How far "minimum" data needs go is a matter of judgement, varying under different project planning situations. However, experience to date (e.g. the case studies reported in FAO 1983) suggests that conclusions from initial assessment alone using limited existing data and qualitative appraisal have not been sufficiently focused to lead to satisfactory recommendations. A certain amount of specific quantitative data is therefore needed with the current state-of-the-art. Minimum data needs therefore go as far as obtaining some numerical information on nutritional conditions, but not as far as attempting to make projections of changes in food consumption based on production - income - expenditure - consumption (flow) data. This restriction is primarily for the practical reason that getting flow data, and analyzing them is generally not feasible within the usual constraints of project planning, nor is it absolutely necessary. Use of numerical data does not preclude substantial reliance on more qualitative information, obtained by a number of possible methods, which are included in the discussion in the next section. The data outputs are discussed below under the same headings as section 2.

The minimum data output required is a set of indicators of nutritional conditions disaggregated by variables defining groups; e.g. location, occupation, farming system. This procedure evidently derives from ideas on functional classification (e.g. by Joy 1973, Joy and Payne/FAO 1975). We have a number of examples of such data outputs. Their usefulness partly depends on whether there are in practice significant differences between such groups; we now know that there are indeed several-fold differences in, for example, prevalences of preschool child malnutrition when disaggregated in this way.

There are different opinions on indicators of nutritional conditions. We favour, mainly for practical reasons, use of a series of indicators of status (which may be acting as proxies for the nutritional outcome objective). The choice of indicators depends on availability and possibility of collection. These indicators include:

(a) Nutritional status of children (i.e. stunting and/or wasting in preschool children; birthweights);

(b) Infant and child mortality indicators, if possible;

(c) Housing and possessions (to measure wealth and environment); and

(d) Sanitation (water supply and toilet facilities).

The main alternatives or additions to this set of indicators are food consumption or food expenditure. The case for including these variables is examined later. The indicators suggested are, it is important to note, closely related to the quality of life indicators for evaluation of agricultural and rural development projects proposed by the World Bank (Casley and Lury 1981a, p.45), which are: nutritional status of children; school enrollment by age; expenditure on shelter improvements and contents; distance or time to potable water; and use of clinics.

They are similar to those suggested previously and tested by FAO (FAO 1982, 1983;) and in the context of nutritional surveillance (Mason and Habicht 1981). The restricted list of nutritional status indicators was proposed by Beaton and Bengoa (1976), in line with the more comprehensive suggestions in WHO (1976).

Two examples can illustrate the use of such an indicator series. In table 2, nutrition and related indicators by area in Costa Rica are shown: this was used to set geographical priorities for a large-scale social welfare program. In table 3, the indicator series from a project assessment is shown. This leads to the suggestion that a fairly standardized format for such outputs could be adopted, as shown in table 4. Such tables can quite often be constructed from existing data. This type of data output was found to be useful in the project assessments reported in FAO (1983). In all cases such group comparisons were important for making recommendations on targetting, generally by classifying by geographical variables

Table 2. Social profile of the 10 cantones in Costa Rica with highest and lowest levels of height retardation in children attending first grade of primary school; Height Census of 1979 and Population and Housing Census of 1973

| CANTON | Height retardation | Illiteracy | Poor dwelling | Dwellings without latrines | Dwellings without running water |
|---|---|---|---|---|---|
| | Percentages | | | | |
| High height-retardation | | | | | |
| Coto Brus | 24.6 (1045) | 17.9 | 20.2 | 39.2 | 78.2 |
| Los Chiles | 23.1 ( 485) | 34.8 | 15.8 | 53.3 | 88.8 |
| Buenos Aires | 23.0 ( 824) | 23.4 | 29.2 | 51.6 | 84.2 |
| Aserri | 22.8 ( 758) | 12.6 | 17.4 | 15.8 | 11.8 |
| Pocosi | 22.1 (1137) | 14.7 | 15.3 | 18.9 | 61.8 |
| Turrubares | 21.7 ( 184) | 30.1 | 17.4 | 37.4 | 45.0 |
| Guatuso | 21.6 ( 259) | 28.6 | 16.1 | 44.0 | 87.2 |
| Guacimo | 21.3 ( 286) | 17.5 | 14.9 | 21.3 | 54.7 |
| Tarruzu | 21.2 ( 212) | 15.7 | 18.4 | 18.0 | 17.8 |
| Golfito | 21.0 ( 891) | 16.7 | 11.8 | 23.9 | 38.0 |
| Low height-retardation | | | | | |
| Tibas | 7.0 ( 884) | 3.7 | 10.2 | 0.7 | 1.0 |
| Moravia | 6.9 ( 435) | 3.1 | 7.8 | 1.9 | 5.4 |
| Alfaro Ruiz | 6.8 ( 133) | 6.8 | 5.8 | 2.4 | 12.2 |
| Montes de Oca | 6.4 ( 466) | 3.0 | 8.2 | 0.8 | 1.7 |
| Barva | 6.4 ( 282) | 6.2 | 11.2 | 1.8 | 1.8 |
| Central San Jose | 6.3 (4193) | 3.5 | 10.4 | 0.4 | 0.9 |
| Atenas | 5.7 ( 297) | 10.5 | 15.3 | 7.4 | 14.8 |
| Goicochea | 5.3 (1183) | 3.7 | 9.2 | 0.7 | 1.5 |
| Palmares | 4.9 ( 268) | 6.2 | 8.4 | 7.1 | 8.0 |
| Belen | 4.4 ( 203) | 5.3 | 5.9 | 3.6 | 1.9 |

Note:

In parentheses the number of cases of children evaluated by canton in Height Census of 1979.

Source:

Valverde, V. *et al.*, Bol. Inf. SIN 2(10): 4-10 (1980)

Table 3. Example of indicator series pertaining to Dept. Du Nord, Haiti, in 1979: results by distance from town (administrative centre)

| | Time to town in minutes | | | | |
|---|---|---|---|---|---|
| | 0-50 | 50-100 | 100-200 | 200 | Total |
| Number of households in sample | 41 | 72 | 106 | 42 | 261 |
| Number of children in sample | 67 | 120 | 174 | 69 | 430 |
| Population % in group | 15.7 | 27.6 | 40.6 | 15.7 | 100 |
| Number of households in group | 3,140 | 5,520 | 8,130 | 3,140 | 20,000 |
| Nutrition: %< 90% height/age | 34.3 | 35.0 | 54.0 | 62.3 | 47.0 |
| %< 80% weight/age | 32.8 | 49.2 | 57.5 | 53.6 | 50.7 |
| % total malnourished in group | 10.2 | 26.8 | 46.1 | 16.6 | 100 |
| Mortality: % children born & died | 13.4 | 13.1 | 17.2 | 22.5 | 16.5 |
| Morbidity: % sick last week | 44.8 | 50.8 | 57.5 | 63.8 | 54.7 |
| Wealth: % unimproved housing | 19.5 | 26.4 | 35.8 | 33.3 | 30.3 |

Source: FAO, 1983

Table 4. Example of format for presenting an indicator series

| Indicators | Group 1,2 ..n | Total |
|---|---|---|
| Total population group | | |
| % population in group | | |
| Nutrition | | |
| % children <80% weight/age | | |
| % children <90% height/age | | |
| % children <80% weight/height | | |
| No. children (or households with children) <90% height/age in group | | |
| % total stunted children in this group | | |
| Health | | |
| % children with diarrhoea | | |
| % children with fever | | |
| % children born and died (per year) | | |
| Calculated total child deaths/year | | |
| % total child deaths in this group | | |
| Socio-economic/environmental | | |
| % households with unimproved housing | | |
| % households with no toilet | | |
| % households with unprotected water | | |

Source: Mason *et al.* 1982, p. III-104

(e.g. administrative area, distance). Associations of nutrition with other variables, such as cropping pattern or water supply, can be identified by intergroup comparisons, and in several of the case studies these associations led to conclusions on design of project activities. An example is in the Palawan assessment (FAO, 1983).

A series of indicators is used to give a diagnostic picture of the conditions of different groups of people. Use of one indicator alone, e.g. nutritional status, is less convincing; moreover, a series of indicators is more specific in identifying a particular problem. A group of people with a high prevalence of child malnutrition, a high child mortality rate, poor housing, and so on, is clearly in trouble. A case can be made more effectively with a series of indicators than only with, say, child malnutrition. This applies when the indicators generally agree, when they confirm each other. This is usually so in our experience (table 2 and 3 are fairly typical). When the indicators do not agree, some specific problem is being shown up: for example, if malnutrition is high but housing good. A case such as this occurred in Costa Rica, where income and related indicators for one population group (workers on banana plantations) showed these people to be relatively well-off but the child malnutrition rate was also high; the reasons were found to be high food prices and contaminated water (Tristan 1980).

The main additional candidates for inclusion in an indicator series are indicators of food consumption which is an obvious direct way of expressing nutritional objectives. Food consumption is easier to handle quantitatively in theory and it would be useful if changes in food consumption could be reliably predicted from income changes. The latter are frequently estimated in the usual course of planning development projects (e.g. to lead to economic return calculations). The drawback in the present context is the cost and difficulty of collecting reliable food consumption data. Twenty-four-hour dietary recall (on quantities of food prepared) is probably the only feasible technique widely applicable, but in some circumstances it is difficult to get reliable results. Recall of expenditure may be more accurate, and apply when subsistence consumption can be neglected. This source of data is worth using when readily obtainable from existing household budget surveys (ensuring that these include quantities of food as well as values) or from budget surveys to be carried out in the course of project planning.

Another problem in integrating food consumption estimates is the variation in household and individual consumption day to day and season to season. In overcoming this both repeated interviews within a short period and repetition of this several times per year are required. These uncertainties mean, first, that absolute comparisons with nutritional requirements (assuming that these can be reliably estimated) are dubious -- it is difficult to state with confidence that a deficit of x kcals per head per day exists. Second, establishing significant differences between groups requires large sample sizes. For example, in the FAO-assisted survey in Palawan, maybe half the resources for interviewing and initial analysis went into 24-hour recall of food consumption; apparent differences in mean intakes between groups were found, but only for one group were these significant on statistical testing. This one difference was indeed useful, for it supported otherwise hard-to-interpret results; but it probably was not worth the resources. Larger sample size for status indicators, and additional qualitative follow-up, would probably have yielded more information.

It is true that calories are a major objective of interest. If status indicators can be shown to be a reasonable proxy for calorie consumption, the problem is partly solved. We therefore need data showing the comparative efficiency of defining target groups by either criteria. Published data on this are lacking, although the expected correlation between food consumption at household level and child nutritional status seems to exist in the rather few cases in which it has been studied. The relative efficiencies of targetting implied from one data set containing food consumption and nutritional status variables has been calculated as shown in table 5(a). A similar comparison between income and nutritional status is shown in table 5(b). Priorities for targetting would be similar at the level of the group using food consumption, expenditure income, or nutritional status, at least in these data sets; the overlap is less good at the household level, but the group level is the more important. These data indicate that nutritional status may be a useful proxy for food consumption, income and expenditure for targetting purposes. Further analyses along these lines are badly needed.

In conclusion, status indicators of nutritional conditions are essential as part of a minimum data set, both for establishing priorities between different population groups, and for gaining insights into likely effects of project activities on nutrition. However, research should be undertaken into use of food expenditure and consumption indicators -- whether based on total diet or staples only -- in a limited number of assessments.

## 3.1 TARGETTING

Targetting priorities may be set through comparisons of nutritional conditions among different groups of potential participants. The definition of these groups is dictated by project design criteria. They will typically be by location, by occupation, (for farmers) by farming system (crop, landholding, technology etc.), and so on. Once such data are available, alternative targetting strategies may be assessed through cross-tabulation of the planned targetting against numbers of malnourished, as shown in table 6. (Further details are given in

Table 5. Comparison of targetting efficiency by nutritional status and food consumption

(a) Ranking of occupation groups by nutritional status and food consumption indicators

| Occupation group | % children < 75% weight/age | % households < 1500 kcals/head/day |
|---|---|---|
| 1 | 23.6 | 26.5 |
| 2 | 20.0 | 22.4 |
| 3 | 25.5 | 36.1 |
| 4 | 23.2 | 34.8 |
| 5 | 17.9 | 38.6 |
| 6 | 24.0 | 61.3 |
| 7 | 25.8 | 36.4 |
| 8 | 24.0 | 24.1 |
| 9 | 23.5 | 41.0 |
| mean | 23.9 | 35.4 |

An example of targetting by nutritional status using the above data

| | | Groups with % < 1500 kcals: > mean | < mean |
|---|---|---|---|
| Groups with % children < 75% weight/age | > mean | 3 | 1 |
| | < mean | 2 | 3 |

Note: One false positive obtained (top right-hand cell); two low consumption groups missed (lower left-hand cell).

Source: Calculated from NNC/NACIAD/FAO, 1980, annex III, table 7.

(b) Ranking of groups (by resources) by stunting and total income

| Group | % with weight/age < 80% | Mean annual household income ($US) |
|---|---|---|
| 1 | 45.5 | 125 |
| 2 | 52.2 | 316 |
| 3 | 28.6 | 598 |
| 4 | 60.6 | 111 |
| 5 | 61.1 | 217 |
| 6 | 44.3 | 524 |

An example using the above data

| | | Income: < $300 | > $300 | |
|---|---|---|---|---|
| % weight/age < 80% | > 50% | 2 | 1 | 3 |
| | < 50% | 1 | 2 | 3 |
| | | 3 | 3 | 6 |

Source: Data on which these calculations are based originated from Haiti. Calculated from data from Haiti Survey (FAO, 1983)

Table 6. "Focusing" and "Coverage" comparison of target groups and the needy

| | | Needy? (e.g. malnourished) YES | NO |
|---|---|---|---|
| Targetted? | YES | a | b |
| | NO | c | d |

"Planned Focusing" 1/ Proportion of total targetted that are needy = $\frac{a}{a + b}$

"Planned Coverage" 2/ Proportion of total needy that are targetted = $\frac{a}{a + c}$

Notes: In epidemiological terms, 1/ focusing is equivalent to positive predictive value; 2/ coverage is equivalent to sensitivity.

Source: Mason *et al.*, "Principles for Evaluation of Ongoing Programs", CNSP Working Paper Series No. 5, Cornell University; table I.8(A).

Mason *et al.* 1982, chapter IV.) This requires division of households into needy or not needy, and targetted or non-targetted. They allow calculation of indicators of coverage (proportion of total needy targetted) and focusing (proportion of total targetted that are needy); in a poverty-orientated project, the prevalence of needy in the population as a whole. These simplifications are reasonable for direct interventions, but become complicated for multicomponent projects. Nonetheless, they provide a logical way of assessing targetting, for planning and (see further in this paper) for monitoring and evaluation. They have not (as far as we know) yet been tried in this context, but they are simple enough to merit testing.

A hypothetical example given in table 7 may help explain the concept further. In this example a population of 1,000 is considered in three groups (these could be subdivisions of the area). Costs are assumed to be the same for the three targetting scenarios (A to C). Targetting of group 3 only (the worst-off in prevalence terms in this case) gives 31% of the needy targetted (design A). Targetting of group 1 (design B) gives 39% of the needy reached: if the 500 households in group 1 can be targetted at the same cost as the 200 in group 3 (e.g. because of remoteness), then targetting of the better-off in this case gives better coverage of the needy, even though more non-needy receive benefits (i.e. focusing towards the malnourished decreases). Thus for fixed costs per area, coverage is the criterion for deciding on targetting. If costs are *per caput* (for example, 200 in group 1 or 200 in group 3 may be targetted at fixed cost; i.e. design C *versus* design A), selection of these from group 1 (assumed randomly) obviously gives the lowest coverage, and is a poor option compared with targetting of group 3: in this case focusing is the correct criterion for assessment. In the example, under neither of these circumstances does it make sense to target group 2, a relatively small group with a relatively low prevalence. When there are differential costs, other scenarios may be calculated.

## 3.2 DESIGN OF ACTIVITIES FOR DIRECT EFFECTS

The objective here is to assess whether nutritional conditions -- for example, as defined by the indicators discussed above -- are likely to improve for those receiving benefits from the project. We assume that project activities will bring goods and/or services to the participants, that will generally increase their income. All else being equal, we know that income is likely to be related to calorie consumption, although this assumption is based almost entirely on cross-sectional data; nonetheless, almost all surveys of calorie consumption with respect to income have shown positive elasticities cross-sectionally.

The approach taken assumes that potential project activities will be first defined by considerations other than nutrition, and hence there is limited (but more than marginal) scope for influencing these. The alternative would be to start from scratch: to ask, what are the causes of malnutrition then to design a project to tackle these. This is not realistic; but even if it were it might make less difference than appears at first. A project whose

Table 7. Hypothetical example of setting targetting priorities

The following data might result from the survey

| | Population | Prevalence of malnutrition (% pop.) | Number of malnourished | Target design A | B | C |
|---|---|---|---|---|---|---|
| Group 1 | 500 | 20 | 100 | - | all | 200 |
| Group 2 | 300 | 25 | 75 | - | - | - |
| Group 3 | 200 | 40 | 80 | all | - | - |

<u>Design A</u>

| Targetted? | | Numbers malnourished: Yes | No | | |
|---|---|---|---|---|---|
| | Yes | 80 | 120 | 200 | (Group 3) |
| | No | 175 | 625 | 800 | (Groups 1 and 2) |
| | | 255 | 745 | 1,000 | |

Proportion of total malnourished that are targetted = coverage
= 80/255 = 31%

Proportion of total targetted that are malnourished = focusing
= 80/200 = 40%

<u>Design B</u>

| Targetted? | | Numbers malnourished: Yes | No | | |
|---|---|---|---|---|---|
| | Yes | 100 | 400 | 500 | (Group 1) |
| | No | 155 | 345 | 500 | (Groups 2 and 3) |
| | | 255 | 745 | 1,000 | |

Coverage = 100/255 = 39%

Focusing = 100/500 = 20%

<u>Design C</u> (If 200 people only can participate, compare Design A with 200 from Group 1)

| Targetted? | | Numbers malnourished: Yes | No | | |
|---|---|---|---|---|---|
| | Yes | 40 | 160 | 200 | (from Group 1) |
| | No | 215 | 585 | 800 | (rest of Group 1 + Groups 2 and 3) |
| | | 255 | 745 | 1,000 | |

Coverage = 40/255 = 16%

Focusing = 40/200 = 20%

primary objective was improving nutrition in the long-run would tackly poverty, aim to increase real income, and probably end up much the same as a poverty-orientated rural development program. Here we are taking a short-cut: to give the initial benefit-of-doubt that rural development is likely to improve levels of living, hence nutrition, of those that participate: and then to examine these assumptions. This means we start out by saying "When will income not improve nutrition?", rather than "How can development (which conventially includes increasing income as a major measure of success) improve nutrition?" Evidently, if we get the methods right, these will reduce to the same thing. Finally, this also comes down to making similar assumptions to a more quantitative approach using income-consumption relationships. If these are found to be positive, income benefits will mean nutritional benefits -- albeit attempts might be made to quantify these; if they are not, then the reasons still need examination as in the present approach.

A combination of possibilities, with conclusions on likely nutritional effects for participants, has been laid out in FAO 1978, and is reproduced here in table 8a.

The next question (see 2.1) -- will income sources change? -- needs information from the project design itself. Is a shift in cropping pattern intended? How will technology change -- e.g. increased use of irrigation? Is resettlement part of the plan? Will labor patterns alter? If the income source will change, the next section is relevant; if not, then the subsequent section is. In either case, the basis of the proposed method is to try to compare nutritional conditions between those who have already adopted, or begun to adopt, the change with those who have not; often this has to be based on cross-sectional data. (This is vulnerable to confounding by self-selection and other factors, which need to be taken account of as far as possible in analysis.)

One way of envisaging the relations between income, income source and food consumption, is shown in table 8b and figure 4 (these are equivalent, and are based on hypothetical figures for purposes of illustration). The figures show that within income source categories -- urban wages, estate wages etc. kcal consumption rises with increasing income. As mentioned above, there is extensive evidence that this is true. However, between income categories (meaning here cash power kind), kcal consumption may differ with income source. For example, the poor food crop farmer may have a high kcal consumption at a given low income than the export crop farmer; or the estate worker may face higher food prices than the urban wage-earner, thus having lower consumption at equivalent income. Thus, when income is to be raised within income source categories, i.e. source of income does not change, it is likely that food consumption rises. In the illustration, the farmer at A moving to C will benefit nutritionally. The concern is then whether the income source changes. If it changes without

Table 8a. Possible combinations of changes in factors directly affecting nutritional status and conclusions

| Bought food | Subsistence food | Sanitary environment | Conclude |
|---|---|---|---|
| 1. Income ↑ | Same or ↑ | Same | positive |
| 2. Income ↑ | ↓ | Same | CARE |
| 3. Income ↑ | Same | ↓ | negative |
| 4. Income same | ↑ | Same | positive |
| 5. Income same | ↑ | ↓ | negative |
| 6. Income same | ↓ | Same | negative |
| 7. Income ↓ | ↑ | Same | CARE |

(If answer is CARE or Don't know, 2nd stage analysis may be indicated)

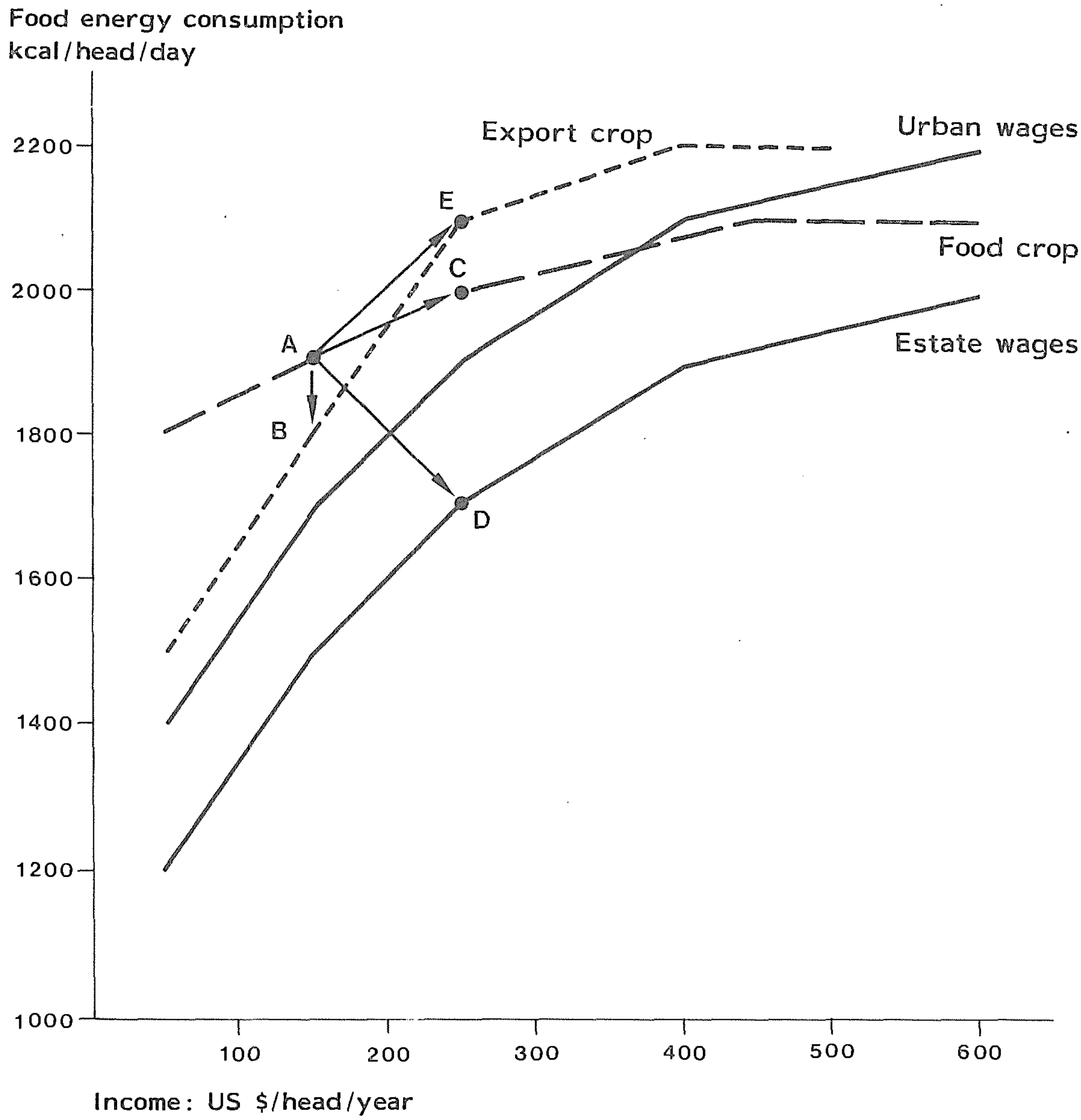
Source: FAO, Guidelines for the Introduction of Nutritional Considerations into Development Projects, Rome 1978

Table 8b. Illustration of relation of kilocalorie intakes (kcal/head/day in cells) with income from different sources

| Income $ per caput/year | Income source: Urban wages | Estate wages | Food crop farming | Export crop farming |
|---|---|---|---|---|
| < 100 | 1400 | 1200 | 1800 | 1500 |
| 100 - 200 | 1700 | 1500 | A 1900 | 1800 B |
| 200 - 300 | 1900 | D 1700 | C 2000 | 2100 E |
| 300 - 500 | 2100 | 1900 | 2100 | 2200 |
| > 500 | 2200 | 2000 | 2100 | 2200 |

Notes: Results are hypothetical, for illustration: kcal requirements are usually about 2,000 to 2,200 kcal/head/day.
For explanation of arrows between cells A, B, C, D, E, see text.

Figure 4. Illustration of relation of kilocalorie (kcal) with income from different sources




Notes: This is equivalent to table 8b. Data are hypothetical. See text for explanation of symbols.

an increase in income, e.g. A to B, the consumption may decline (here, illustrating a shift from food to export crops). If the income source changes with an increase in income, the amount of increase is obviously important, and may be enough to increase consumption (e.g. A to E) or may not be (e.g. A to D).

## If income sources change

This includes decreased dependence on subsistence consumption, and covers possibilities in the framework in table 8a and 8b. Some sociological reasons for such effects are reviewed in Dewey (1981b). Here, we need to compare nutritional indicators for those who have begun to adopt the change with those who have not. Obvious factors such as landholding area may need to be taken into account for when the shift is from one cropping pattern to another or with new technologies.

The data outputs for such comparisons may be similar to those for targetting: indicators by group, the groups now being defined by, for example, the old and new cropping pattern, are required. Experiences of such effects are mixed. One obvious concern is the "cash-cropping effect" -- which in fact has itself mainly been investigated by cross-sectional comparisons (Dewey 1981b; Rabeneck and Latham 1982). Varied effects may be found; see table 9. In 9(a), a positive effect of cash crops is indicated; in 9(b), a possible negative effect of improved varieties is shown; in 9(c), no effect of crops controlling for other factors was found.

If the possible changes, such as shift in cropping pattern, have not occurred at all in the project area, evidently similar information will be needed from elsewhere. The principles are similar, and possible data sources are discussed in a later selection.

Similar comparisons may be made for other shifts in income sources; through resettlement, employment opportunities and similar cross-group comparisons.

## If income sources do not change

This refers to the case when income increases from the same source. Examples are when agricultural yields are increased without substantially changing the cropping mix; and when wages increase. This is a safer bet in terms of nutrition. Factors such as child care could be important -- increased employment of women outside the home might have detrimental effects on weaning practices, breastfeeding and other such factors. The minimum data need again is to check whether there is evidence that increased income is not associated with improved nutrition. As before, comparison of groups or examining association of income or its proxies with nutrition is called for. Two possible proxies for income and/or wealth present themselves: landholding area, and indicators of wealth such as housing. Generally when controlling for variables

Table 9. Example of nutritional and related indicators by cropping pattern

(a) Comparison of farmers growing high-value, non-food crop with staple

| | % < 80% weight/age | Child mortality indicator | % poor housing | n |
|---|---|---|---|---|
| Non-food | 19.2 | 0 | 61 | 26 |
| Staple | 36.5 | 6 | 63 | 308 |

(b) Comparison of farmers growing improved cereal variety with traditional variety

| | % < 90% height/age | n |
|---|---|---|
| Improved | 26.5 | 83 |
| Traditional | 15.4 | 78 |

(c) Comparison of farmers growing cereals, root crops and coffee

| | % < 90% height/age | Child mortality indicator | % poor housing | n |
|---|---|---|---|---|
| Cereals | 43.8 | 16.4 | 32.0 | 80 |
| Root crops | 46.2 | 14.8 | 38.6 | 143 |
| Coffee | 48.5 | 19.0 | 21.0 | 62 |

Sources: (a) Garcia *et al.*, 1982.
(b) Rafferty *et al.*, 1982.
(c) From data used in Mason 1980

such as cropping pattern, landholding has usually been shown to have the expected positive relation with nutrition. Similarly housing indicators (construction, number of rooms etc.) generally have significant positive associations with anthropometry. When these expected associations are not found there is reason to be concerned that improved income will not improve nutrition, and the social reasons for this will require additional investigation.

## Changes in vulnerability

A more difficult question concerns: even if under prevailing circumstances food consumption and nutrition are expected to improve, is future vulnerability to deterioration risked? Circumstances in which this is an issue could be: (a) if average crop yields increase is variability also increased? Varieties which are higher-yielding but less drought-resistant than the traditional ones could be one example; (b) if there is a shift to presently higher value crops, are these more vulnerable to future price fluctuations? Coffee in East Africa, coconuts or rubber in South-east Asia, may provide examples here; (c) alternatively again, will a shift away from food crops open the community to a less reliable (even if on average advantageous) food supply?

Resolving these issues relies on judgement more than data. For example: are new varieties more drought-vulnerable? Is drought a recurrent problem? What safeguards can be made? Is the farmer adopting new varieties going to be wiped out one year in five? What is the world outlook for export crop prices? Are national food shortages risked? Questions such as these need to be addressed in assessing changes of vulnerability, but their answers are more likely to come from informed discussion that from data collection and analysis.

## Effects on sanitation

This concern is primarily when the following are intended project activities:

(a) Irrigation: are water-borne diseases endemic and likely to be spread by irrigation? Schistosomiasis and malaria are two obvious examples. Information is needed on the prevalence of such diseases, their transmission, and hence the likely risks of their spread.

(b) Resettlement: is adequate provision to be made for toilet facilities and water supply for new settlements? This is fairly obvious, but may need information on minimum services associated with reasonable sanitation elsewhere (flush toilets and piped water may not be worth the cost; pit latrines and protected wells might suffice).

## Identification of additional components

Experience is being accumulated on identification of components additional to those planned for primarily non-nutritional reasons. These typically include education, health services, environmental sanitation and nutritional interventions. They usually would be of relatively low cost compared to the over-all expenditure of a rural development project (say 5% or less). The information needs for this identification may be different: assuming it is also covered elsewhere only limited space will be devoted to this, but some considerations are given below.

A first circumstance is where some (limited) project funds are available specifically for improving nutrition. Here, it may be possible to identify specific causes of malnutrition in the project area, for which the cost of intervention on a fairly wide scale is reasonable. For example, in Palawan a substantial association of water supply with malnutrition was found, apparently more important than sanitation (see table 10). These results were again obtained by analysis of the type of cross-sectional data discussed earlier. The results suggested that a water-supply intervention should be considered. Often, however, no such specific intervention proposes itself: how to justify an intervention within the project area when it is needed everywhere is a difficult question to answer. Why, for example, institute supplementary feeding for project participants when many others who do not even have the benefits of a rural development project need it? One reasonable answer could be: when project developments give new potential for improving nutrition which could be realized with additional activities; for example, if infrastructure brings improved access to remote areas, providing the means for, say, health services to reach these areas, or for referral. The information required for this involves, first, knowledge of who is malnourished which can be obtained from the sort of data discussed so far. Defining the specific opportunities for intervention depends both on local knowledge obtained qualitatively, and on investigating associations between possible factors for intervention and nutritional outcome. Certain of these factors, e.g. sanitation, would be included in the data discussed; others might require additional data, for example on weaning practices, which may be quite readily included among data to be collected.

The second circumstances in which additional activities may be needed is when there are certain malnourished groups who cannot be brought into the project, e.g. the landless. This should not apply in principle to rural development, but may to agricultural development projects. The situation here is analogous to designing a conventional nutrition intervention project, generally aimed at a relatively short-term intervention, and not usually able to affect poverty fundamentally. Again, an understanding of possible causal factors which are open to intervention are needed. This information can come from a combination of statistical evidence and more informal understanding of causality (not necessarily from the project area), much as discussed in the previous paragraph.

Table 10. Examples of associations of water supply and toilet facilities with malnutrition

(a) Mean weight/age by water and toilet facilities

| Toilet | Water supply river/spring | Water supply piped/well | Total |
|---|---|---|---|
| Pit/none | 79.1 | 83.7 | 82.8 |
| n | 55 | 221 | 276 |
| Closed pit, antipolo, flush | 83.1 | 86.4 | 86.1 |
| n | 35 | 338 | 373 |
| Total | 80.7 | 85.3 | 84.7 |
| n | 90 | 559 | 649 |

(b) Percentage of households with mean weight/age $<$ 80% by water and toilet facilities

| Toilet | Water supply river/spring | Water supply piped/well | Total |
|---|---|---|---|
| Pit/none | 56.4 | 38.0 | 47.4 |
| n | 55 | 221 | 276 |
| Closed pit, antipolo, flush | 51.4 | 33.7 | 35.4 |
| n | 35 | 338 | 373 |
| Total | 54.4 | 35.4 | 38.1 |
| n | 90 | 559 | 649 |
| percentage of total sample | 14 | 86 | 100 |

Note: $X^2 = 6.857$

$p < 0.01$

Source: Garcia *et al.*, 1982

## 3.3 INDIRECT EFFECTS -- THROUGH FOOD OUTPUT

The questions here are the following.

(a) Is physical shortage of food on the market restricting consumption (in the project area or elsewhere, seasonally or periodically), and will marketed food produced by the project significantly prevent this?

(b) Will the volume of increased food be such as to have a downward effect on food prices, or will it, for example, substititute for food imports, without reducing or stabilizing prices, and hence not influence consumption levels)? Alternatively will the output provide a cheaper source of calories (e.g. increasing cassava consumption when rice is the usual staple)?

(a) Preventing physical food shortage. The general answer to (a) may be available, first, from historical records of food production and price fluctuation, and government measures taken (e.g. rationing, food distribution schemes). Second, enquiries can be made concerning previous seasonal shortages of marketed food and fluctuations in food prices in potentially affected areas. Quantifying the extent of the problem is much more difficult. One possibility is likely to be from previous studies, if they exist, of seasonal changes in food consumption and/or nutritional status. Health service records may be useful here.

It is crucial for this purpose to distinguish whether such seasonal or intermittent problems are actually due to shortage of marketed food, and/or high food prices caused by shortage, or to inadequate income to buy the available food. For example, in Indonesia where severe inadequacies of food consumption occur periodically in certain areas ("food crises"), this has been clearly identified as due to failure of income, usually due to drought, and not of supply (D. Dapice, personal communication). The government grain marketing agency (BULOG) succeeds in maintaining supplies and controlling prices, even when crops fail locally. Similarly, in certain of the severe droughts in recent years in Africa (e.g. Ethiopia in 1971-1973), grain was available at relatively normal prices in the market while starving refugees were being fed in camps. Of course, none of this decries the importance of producing the food needed. But by no means always are periodic crises due to physical shortages of food.

The information needed to decide on this issue is more likely to come from an objective sifting of the available evidence and opinions than from any data collection exercise. Interviews should ask pertinent questions such as: "When previously people suffered from inadequate food, was this because there was no food to purchase in the market or because there was no money to buy the food?" If the constraint is primarily income, the issues revert to direct effects. If it is food availability, see below.

(b) <u>Will there be an effect on food prices</u>? In the context of minimum data, we can only go as far as deciding if further analysis is needed. If it is, more thorough studies will be required. However, this decision is important, and can be looked into in a "minimum" context. Two types of information are needed from those responsible for the project design, and for food policy, as follows.

(i) If a possible indirect food consumption effect were likely, would this affect project design? For example, might it be decided to produce more staple food by more intensive methods than otherwise for this reason? (In this case, fewer benefits may go to the small and traditional farmer, and this trade-off will need to be assessed; see appendix ). Evidently the decision is only difficult when going for indirect effects reduces the direct effects (e.g. acts against income distribution in the project area).

(ii) If more food were produced, would there be an effect on food prices? In many cases this is as much a policy question as one requiring analysis, because at least staple foods are often controlled by law or by intervention in the market. Evidently it mainly applies when the project will make a significant contribution to the overall food supply -- nationally if marketing is efficient; locally if local price rises occur in response to supply. If prices are effectively controlled, those responsible for setting food prices should be asked the following question: if domestic food supplies increase (by some estimated tonnage) will consumer prices be held down? Secondly, finding out what happened in previous years with good or bad harvests can provide some guidance. It may be possible to inquire (of local officials, farmers, etc.): the last time there was a bumper harvest, did consumer food prices decrease? The converse is also relevant; the last time there was a bad harvest did consumer food prices increase?

If this information suggests that indirect effects via food supply are likely to be inportant, and that these will affect project design, there would appear to be no short-cut method to calculate the trade-offs between indirect effects to the non-project-participant consumer, and direct (income) benefits to be project participants. An effort should be made to estimate the balance between (i) increase in kcal consumption (preferably in relation to kcal deficit) for the former and (ii) the consumption foregone by the latter. The parameters needed will include: increase in marketed food; supply-price relations; price-consumption relations (for non-participant consumers); income-consumption relations (for particpant producers). This goes far beyond a "minimum" data base, and is beyond the scope of this paper (and the author's expertise -- but see appendix).

## 3.4 MANAGEMENT

The first question requiring information for project management concerns project implementation: are goods and services being delivered to the intended target groups in quantities and qualities as planned? Without a satisfactory answer to this question it is pointless to try to estimate project effects on nutrition. Unless the project is being implemented at least reasonably satisfactorily, no effect on nutrition could be expected anyway. The success of (a) delivery to the target groups, and (b) delivery to the needy, can be assessed by an extension of the "2 x 2" table given in table 6. This can be used to derive indicators of "delivery" and "leakage", as shown in table 11. The theory is described in detail elsewhere (Mason *et al.* 1982).

The second question is as follows: are the nutritional outcome indicators adequate in showing trends? Use of indicators requires a standard of adequacy, and has been discussed elsewhere (as above). Note that this use represents the "minimum" level of evaluation. It is not an attempt to ascribe nutritional outcome to the project, but only assess whether the nutrition of participants (or target groups) is improving adequately. Evaluation of net outcome, i.e. that outcome likely to be due to the project, is referred to under "policy" below. Periodic

Table 11. Deriving indicators of program delivery and targetting

| | | Targetted? YES | Targetted? NO | | Evaluation (During Program) |
|---|---|---|---|---|---|
| Recipient? | YES | a | b | Program data | |
| | NO | c | d | | Survey data (directly) |

| | | | |
|---|---|---|---|
| "Leakage" | Proportion of total recipients who are targetted | = | $\frac{a}{a + b}$ |
| | Proportion of total recipients not targetted | = | $\frac{b}{a + b}$ |
| "Delivery" | Proportion of total targetted not recipients | = | $\frac{c}{a + c}$ |
| | Proportion of total targetted who are recipients | = | $\frac{a}{a + c}$ |

Source: Mason *et al.*, "Principles for evaluation of ongoing programs", CNSP Working Paper Series No. 5, Cornell University; table I.8(B).

repeated collection of outcome indicators, by group, exactly as for planning, would provide the necessary information. Inclusion of indicators of participation in the project would provide data which, with more extensive analysis, would lead to evaluation of the likely effect of the project activities on nutritional outcome. This is reasonably familiar in the context of evaluating nutrition programs (e.g. see Gwatkin *et al.* 1980); but there is little or no direct experience of evaluating agricultural and rural development programs with respect to nutrition in this way, and efforts are now needed to obtain this experience. Another means of monitoring nutritional outcome would be to use data derived from administrative sources, as described in section 4.

## 3.5 POLICY - FROM EVALUATIONS

The information required from project evaluations in order to guide the design of other projects concerns the effect on nutrition, preferably in relation of cost, of different activities, allowing for changes that otherwise would have occurred. In other words, estimates of the net effect (or impact) are needed. (In evaluation terminology, we need to allow for possible confounding). For example, a reduction in the prevalence of malnutrition among project participants may be observed; this could be due to general economic improvement; it could be that the participants in fact select themselves, and these are the more progressive farmers who would anyway have improved; and so on.

The decision should be made early on, preferably in the planning stage, that an evaluation of the net effect is intended. Such an evaluation requires attention (a) to design, some form of comparison being needed; (b) to variables: alternative explanations (e.g. socio-economic status) for observed changes must be later taken into account by analysis; and (c) indicators of project participation will again be needed. There are many useful texts on evaluation design in general (e.g. Cook and Campbell 1979), and in the context of rural development (Imboden 1980; Casley and Lury 1981a), and details are beyond the present scope.

The main points being made here are that the information needed for planning may be very useful, with certain additions, for evaluation purposes; and that this decision should be taken early on to get a workable evaluation design, and to insure that the necessary baseline data are collected.

## Section 4

## SOURCES OF DATA

(If these are the data outputs needed,
how do we get the data?)

The steps in the procedure for obtaining the necessary data outputs may be defined as follow (FAO 1982; Lunven and Sabry 1981):

(a) Desk review;

(b) Initial assessment;

(c) In-depth studies;

(d) Evaluation during project implementation.

The data needed for (b) and (c) are similar, in that if all the data from an in-depth study were available to begin with, the initial assessment would be all that is needed. The procedures outlined here are therefore not structured in steps because the value of data sources is different in each situation. Generally speaking, subsections 4.1 to 4.3 may be included in an initial assessment; all the methods, but particularly those of 4.2 and 4.4 may be included in an in-depth study.

Data sources are classified as follows, according to type or application:

4.1 Information on project design and relevant policies;

4.2 Use of existing information;

4.3 Rapid appraisal;

4.4 Indicator surveys;

4.5 Data for project management and evaluation.

## 4.1 INFORMATION ON PROJECT DESIGN AND RELATED POLICIES

Data on project design should be obtained from those responsible for identification and feasibility studies. The information concerns potential participants of the project; its economic objectives; how much flexibility there is in the project design; calculations of income and production changes; and so on.

Information on the place of the project in the over-all food policies of government is needed. Examples of relevant issues are: (a) whether increased food production is a high-priority objective (so that it over-rides within-project considerations); (b) whether increased food supply is intended to alleviate shortages, and/or to lower food prices.

Such information must be gained by posing relevant questions to those involved; it is unlikely that studies to gain observational data will be undertaken for the purposes of project planning.

## 4.2 USE OF EXISTING INFORMATION

Some of the data outputs required for planning decisions may be obtainable from existing data. To recapitulate, the main need is to compare nutritional conditions (a) between different potential target groups and (b) between those who have already experienced changes intended to be effected by project activities, and those who have not. It should be said that existing data have seldom provided all the necessary information. Nevertheless, judicious tabulation of existing data, whether project-specific or otherwise, may give certain useful answers.

There is an important distinction between data collected by sample survey, and those that are available through administrative sources or possibly from censuses. Sample surveys give integrated data (see below); however, for precise targetting it is useful to investigate administrative sources that are widely spread. For example, clinics and schools exist in many communities, and data available from these can give a possible degree of targetting which is not available from disaggregated sample survey data.

An important characteristic of useful existing data is that they should be integrated. That is, they may be analyzed by relevant groupings -- including household characteristics such as occupation -- and/or association between potential causal factors and nutritional outcome may be examined. Available information usually gives variables only by area. This is useful for geographical targetting, but does not allow further analysis in most cases. It does not allow analysis of nutrition by factors such as cropping pattern. The only case to date where such analyses have been possible because of the availability of a sufficiently large integrated data set has been in Kenya (FAO 1983; Rafferty *et al.* 1982). Unless such integrated data sets are available, further analyses seldom provide the needed information. If there are existing studies showing nutritional status by relevant grouping, and associations between variables, these may also be valuable. If not, combinations of existing outputs may sometimes give similar, if less powerful inferences, for example through combination of several tables of indicators.

The main potential for use of existing data is in combinations by area. Potential sources are usually administrative and include:

(a) Outcome data

(i) clinic records of prevalence of malnutriton

(ii) vital registration, for mortality rates

(iii) school entrant data (e.g. height)

(iv) birthweights

(v) household budget surveys (discussed below)

(b) Classifying data (from administrative sources or by limited enquiry)

(i) main crops grown

(ii) access to services (e.g. number of health posts)

(iii) accessibility (distance of administrative center; road density; etc.)

(c) Census data (for classifying and as additional outcome indicators, e.g. the following:)

(i) quality of housing

(ii) water supplies

(iii) literacy rates

These data may be compiled both by area, and sometimes by classifications such as ecological zone. The example given in table 2, from Costa Rica, was generated by this method. The criteria for using such data depend on matching data availability with needs. Evidently if such data are readily available they should be included in the 'minimum' data set. As the cost of retrieving and analysing data from existing sources rises, a point will be reached when this becomes unjustified -- and this is a matter of judgement in different project circumstances.

One common source of integrated data needs special mention: use of household budget survey data. When these data can be used to give estimates of food consumption by group, it may be possible to reanalyze them for project planning purposes. A useful example, from a food consumption survey, is the study done with FAO assistance in Puno, Peru (FAO 1983). Household budget survey data on calorie consumption may indicate relative priorities by group, but the inherent variability in the data coupled with usually small sample sizes severely limits the possible disaggregation. However, if a household budget survey has been recently carried out in the area, particularly when quantities of food purchased and/or consumed have been recorded (as well as expenditure on food), then serious consideration should be given to further analysis of these data. The usefulness of this evidently depends on the sample size, and the extent to which the classifying variables of interest are included.

## 4.3 RAPID APPRAISAL (NON-QUANTITATIVE DESCRIPTIVE DATA)

Methods of acquiring information intermediate between use of existing data and conducting of a new survey are actually used frequently, but have hardly been formalized into a methodology. A recent effort was made to bring together some of the techniques under the heading of "Rapid Rural Appraisal" (IDS 1981). Most people involved in project design rely substantially on "eyeballing", while trying to avoid the major biases and pitfalls (well laid out in the documents on Rapid Rural Appraisal). A major pitfall for nutrition is the same as that for poverty assessment: the extremes are the least visible. There is also a substantial body of experience that has hardly been tapped for these purposes from anthropology and rural sociology; although it should be noted that detailed anthropological work (e.g. participant observation) may take substantial time and resources. All these ways of gaining information have in common more emphasis on understanding the mechanisms at work than on producing numerical data. Often, they may in fact be able to produce recommendations on project design that are as sound as those based on statistics; they may have the drawback however that they are less convincing, and they may run a greater risk of being wrong. For example, in one FAO case study there was a conviction, before carrying out a survey, that traditional farmers practicing shifting cultivation had worse nutrition than others, and that providing them with the means to modernize would be helpful. However, anthropometric and other indicators from survey work showed that this group were, if anything better off than more settled farmers which they were to be encouraged to become. It is likely that a combination of anthropological or sociological insights with a minimal numerical data base would provide the best mix for minimum data requirements.

The purposes of such anthropological or sociological studies in this context are: (a) to define issues in project design, and to provide preliminary answers (much as in the initial assessments as presently conceived); (b) to help in survey design, if carrying out a survey is decided upon; (c) to provide an understanding of social, cultural and political causes of poverty and malnutrition (an understanding which is often not obtainable from statistical evidence alone); and thus of likely household responses to changes to be brought about by project activites. Some investment in these studies is therefore very often going to be needed.

There is not enough experience yet to justify firm conclusions about the value of rapid appraisal, sociological studies, "disciplined eyeballing" etc., in the present context. We do know that the initial assessments in the case studies carried out by FAO produced conclusions generally supported by subsequent in-depth studies -- they provided preliminary recommendations, and represented good value-for-money. They were not very specific, however: factors likely to be associated with malnutrition were identified, hence implying priority for certain groups and commenting on likely effects of project activities on nutrition; but the relative importance of these factors was not open to assessment. For instance, in one study, about 10 factors were suggested, of which only two in fact turned out to be significantly associated with nutritional status (Mason 1980). Refinements of these techniques should be continued, increasingly with the assistance of those with experience of rapid appraisals for these purposes.

The field techniques for rapid appraisal -- or at least those aspects referred to as "taking soundings" -- have been usefully reviewed by Pacey (1982). They depend substantially on observation and interview (with selected rural families, with key informants such as health workers, among other sources; see Pacey 1982, but include use of existing data much as discussed in the previous subsection. It is difficult to estimate the resources needed, which depend on the importance attached to the answers; but a few weeks field work in rural areas by one or more experienced individuals would be usual.

## 4.4 INDICATOR SURVEYS

With the present state of knowledge, some quantitative outputs are needed in providing even the minimum of data for project planning. Quantitative outputs require measurement and analysis of these measurements. If the measurements have not already been made, on a sufficiently large sample of the population which itself is defined, quantitative outputs depend on new data collection. It is suggested that existing data and rapid appraisal usually need to be supplemented with a minimum amount of "hard" data. This subsection discusses how to get this information, and the expression "indicator surveys" is used for the techniques involved.

Methods for obtaining outcome indicators of nutritional status and level of living by relevant group are becoming better known. There is however no general description of the methodology available, although examples exist from the FAO rapid surveys (FAO 1983) and other similar surveys. A brief description of this particular methodology is given here. It is likely to be as extensive as any widely adopted approach to *ex ante* project assessment is; it falls well short of a full-blown study, but can provide enough certainty within reasonable resource needs to often be the best option.

If a sample survey of households in the project area is carried out for other planning purposes, it may be feasible to include a nutrition module within such a survey. This reduces costs substantially, and the broad survey may provide much of the classifying data needed. The discussion below applies to both a single-purpose survey and a broad survey which includes nutrition measurements.

As very rough rules of thumb, such indicator surveys require about six months from planning through field work to basic data outputs. They may cost around US$50,000. When they are part of other surveys, the cost may be drastically reduced. There is a need to develop a survey package (including sample questionnaires, equipment, training manuals and analytical capacity) which can be rapidly put in the field. Judging from recent experience, such surveys should have the following features. Most of these are conventional, and are described elsewhere (e.g. Casley and Lury 1981b). Features specific to nutrition surveys are described below.

A sample including around 1,000 households has proved sufficient (note that this figure need not be a set proportion of the total population of the area). Usually the sample should be selected such that the probability of selection of each household in the area is the same. This avoids the need to apply weights to households in the analysis. Stratification for sampling is thus undesirable; but the penalty is that small groups (say, less than 10 percent of the population) may be inadequately represented. An additional sample of these, over and above the main sample, could be drawn. The sampling should usually be two-stage, selecting villages or equivalent population groupings systematically with a probability of selection proportional to their population; an interval sampling procedure is usual. Within villages, households should be listed and randomly or systematically selected. A self-weighting sample works out to give approximately the same number of households in each village selected in the first stage sampling. Emphasis should be on a maximum number of villages selected, not a maximum number of households interviewed or selected. For example, 10 households in each of 100 villages is possibly an optimum sample; 10 households in each of 50 villages is usually better than a sample of 40 households in each of 25 villages.

The questionnaire should be set up with three sections: area characteristics, household characteristics and outcome indicators. (These are discussed in section 3.) The area (or village) questionnaire may be administered separately. Area and household characteristics should be chosen for relevance to project design: for example, for an agricultural project crop patterns are crucial, education levels (if not an object of intervention) probably not.

Wherever possible, data should be recorded as continuous variables, to be later categorized if necessary; for example, it is preferable to record distance variables as approximate numbers of kilometers or minutes, rather than as falling within certain ranges. The most demanding variable to collect is landholding, or cultivated area. It may be desirable to collect approximations in local units (e.g. number of "large" and "small" fields), and possibly to measure area (e.g. with compass and range-finder) on a small sample.

The field work for such a survey has generally employed some 10 to 20 enumerators and supervisors, and taken 1 to 2 months in the field. Planning and training has taken a preliminary 1 to 2 months. The checking and basic data analysis have generally taken 2 to 4 months (see also section 5 on analysis). A period of 6 months from start to production of main findings is the indicative time figure for planning purposes.

Particularly when a nutrition module is included in a larger survey, the training of enumerators to weigh and measure the heights of children may be viewed with some trepidation. In fact, training of enumerators for anthropometry has been routinely done (in Kenya) in two to three days; although more extensive training and standardization tests may be desirable, results from at least the Kenya surveys have proved satisfactory. Whether the same enumerators or a different team are used for anthropometry and interview for other outcome indicators depends on local circumstances; both approaches have been used (see Kenya 1979). Beyond this the training of enumerators and field testing of questionnaires is conventional.

For analysis there are essentially three options: hand calculation and tallying; use of a microcomputer; use of a conventional, mainframe computer. A choice needs to be made at the start of the survey, and procedures set up to allow a rapid turnaround of data. Checking the data should in any event begin while the survey is in the field, to allow for return visits to households to check suspect results. Hand calculation and tallying is uncommon at present, although it could still be a viable procedure. Nonetheless, if they can be organized, computer-based analyses have overwhelming advantages.

The use of microcomputers is still far from perfected, although a broad range of experience is being built up. In future, microcomputers are likely to be used for data entry, editing and initial tabulations, in the context of our discussions. The constraints lie more in programs than in equipment. To date, the FAO package remains the only one suitable, although others are being developed. The FAO FARMAP package (FAO 1977) has been adapted to handle anthropometric data. Software compatibility between different equipment is likely to remain a serious problem for some time. Commercial packages are expected to allow simple statistical analyses of nutritional data.

If an efficient computer service exists in the country of the survey, it is likely to provide the best option for analysis of the survey data. Often the difficulty is not the lack of facilities, but the unrealiability of and delays experienced in implementing such jobs as data entry, and cleaning and analysis of data. The impression of the present writer is that only in a few countries can access to adequate computing services (with time-sharing and conventional statistical packages) be guaranteed. The distinctions between microcomputers, minicomputers and mainframes are becoming rapidly blurred, and the balance of advantage in time and cost is constantly shifting. Overlaying these technical considerations are the bureaucratic and political ones of access and availability of suitably trained personnel in the countries concerned. Case-by-case decisions will be needed. Periodically updated guidelines for such decisions would be useful. The analyses required are discussed in section 5.

## 4.5 DATA FOR PROJECT MANAGEMENT AND EVALUATION

Data for program management are mainly obtained through the program itself. The first important question -- are goods and services being delivered to the intended target groups in the quantities and qualities planned? -- requires a combination of administrative data with information defining target groups. Baseline data from the project planning stage should be used for this. This question itself has a direct bearing on likely nutritional effects: if the project is not reaching the intended malnourished, there is little point in investigating further to try to find a nutritional effect. Administrative records on project activities, suitably set-up to include details of participants, are a major source of data. Periodic surveys may be needed where targetting is established by criteria not easily known by project staff -- e.g. landholding areas of farmers contacted by extensionists. Indicators of project delivery can be set-up as an extension of the targetting indicators shown in table 7, as given in table 11.

Assessment of nutritional effects requires measurement of outcome indicators. In the same way as for baseline assessment, these measurements could either be taken from existing sources, or incorporated in the collection of other measurements for purposes of project monitoring, including repeated sample surveys. The choice of data collection method depends substantially on whether a project monitoring and evaluation system exists, and the data collection methods used for this.

The most likely existing sources of anthropometric data in the project area are clinics and schools: such sources should provide relatively crude and long-term measures of change. Nonetheless, if the data are already being collected as is the case in a number of countries, they should be examined for suitability for the purpose at hand. Sampling of records, by time and/or contacts, is likely to be advisable to reduce the volume of data. For other outcome indicators, the same existing sources described earlier should be investigated: vital registration for infant and child mortality rates, local government records and census updates for housing, among others. However, these may neither be available nor sufficiently reliable in the project area.

If a project monitoring and evaluation system exists, either involving interviews by project staff in the course of their duties, or using periodic sample surveys, it may be possible to include periodic nutritional measurements in such exercises. Much the same considerations apply as for using a nutrition module in baseline indicator surveys. The periodicity for nutrition measurements should probably be of the order of every one to two years. By the same token, other useful indicators may be obtained essentially by repeating the procedures used for baseline indicator surveys; these again are only likely to show significant change over a period of time measurable in years.

The primary purposes of this monitoring and evaluation, or surveillance, are to guide management during project implementation. Generally, it will be difficult to ascribe changes in nutrition to project activities, owing for example to lack of comparison groups, and indeed this is not the main purpose. However, use of the data for this purpose may be sought in periodic evaluations. Even without setting up comparison groups, it may be possible to use variations in project delivery that occur, either by design or chance, to draw tentative conclusions on the causal links between project delivery and outcomes. These conclusions require correlational analyses, or tabulation by varying degrees of project delivery. Variables measuring project delivery (e.g. frequency of visits by extensionists, credit received etc.) thus need to be recorded at the same time as outcome variables. Finally, variables measuring possible alternative explanations for observed changes (confounding influences -- e.g. socio-economic status) should be considered. This extension of monitoring and evaluation procedures could allow more detailed analyses, typically not within the usual activities of project management, of net effects or impact of the project on nutrition.

The next extension of this procedure, which should be considered at the earliest stage possible in project planning, is to use the data in drawing conclusions with an increased degree of certainty on the actual nutritional impact of the project. Impact is used in the sense of effects net of changes that might anyway have occurred. It should be noted that the only way of ascribing probabilities to causal links between project activities and outcome is by randomized trials, which are virtually never going to be possible in the sort of project evaluations considered here. However, using the variables discussed previously, plausible inferences may be reached, but doing so still requires careful design from the outset.

The techniques referred to involve setting up some form of comparisons, either with and without program, or before-during-after the program, or a combination of these. The various possible designs have been known as "quasi-experimental" (Cook and Campbell 1979). Two particular such designs have been suggested for agricultural and rural development projects (Casley and Lury 1981a): the non-equivalent group design, and the interrupted time series design. Essentially these attempt to control for likely alternative explanations for presumed project effects by collecting the likely confounding variables and using multiple regression or similar methods to investigate associations between project activities and changes in outcome, controlling for confounding variables. These methods not only guard against unwarranted positive conclusions on project effects, but, equally important, may elucidate effects masked by other changes. For example, in one nutrition and health intervention program, the crude results were apparently negative regarding nutrition, and showed positive only after controlling for socio-economic status (Chernikovsky 1979).

Details of such techniques are beyond the scope of this paper, and they have been discussed elsewhere with respect to nutrition (Mason *et al.* 1982). The main point here is that conclusions on impact crucial to policy decisions on design of future projects can be obtained, if appropriate attention is given to design both concerning from whom data is collected, and which additional variables need to be included (project delivery, potential confounding). This extra effort would be worthwhile in selected cases.

## Section 5

## ANALYTICAL METHODS FOR PRODUCING THE ESSENTIAL OUTPUTS FROM THESE DATA

The methods appropriate for analyzing the available data are dictated by the required outputs. A capability for producing tabulations is the minimum required, and is adequate for most purposes. The required tabulations should have been decided early on, when relevant decisions and questions were identified (sections 1 and 2), and dummy tables should have been drawn up. The analyses begin with the filling in of these tables. The methods need to be simple and valid, and do not require extensive time or highly specialized skills. In general, straightforward tabulations by carefully selected criteria are the preferred format: they are the simplest to generate and the most easily understood, although they may be given more visual impact by presentation as graphs, histograms, "pie charts" etc. In many cases, statistical testing is appropriate, in order to estimate the likelihood that observed differences in the data are not due to chance; here the usual levels of significance (i.e. $p < 0.05$ etc.) may be relaxed if this is stated: for instance a three-to-one probability ($p < 0.25$) that a certain situation exists may be useful information for project planning. However, the common tests themselves are often approximations since the required assumptions of randomness and normality are frequently violated.

Two different types of data may serve to illustrate the appropriate needs. First, there is the collection of available administrative and service-derived data, almost always only available by area: agricultural production estimates, clinic-derived data, often some census results, population estimates etc. Available sample survey data may also be extracted. Second, there are the more integrated data files obtained from sample surveys such as those described in subsection 4.4.

These may be confined to case studies of a few families or villages, or be representative of the area itself. Most examples using numerical information fall within these categories.

The main possibility for administrative and service-derived data is tabulation of relevant indicators by area. Such tabulations are built-up from a variety of sources and are used in creating a broad panorama of the setting, including:

(a) Areas most and least developed (e.g. use of road densities);

(b) Areas of food surplus and deficit (converting production to kg/head/year)may be used: a figure of about 150 to 180 kg/head/year for cereals is a useful estimate of requirements -- however, since trade volumes are virtually never known such estimates are not all that useful and do not indicate food deficiency.

(c) Infant and child mortality rates, literacy and disease prevalences indicating special need -- individually these indicators are seldom reliable, particularly mortality rates, but they may add up to a coherent picture;

(d) Special problems such as endemic diseases, which may sometimes be identified;

(e) Population figures, which may indicate relative importance of different areas -- very often projects may emphasize accessible areas, and such data may emphasize the importance of outreach.

Further analysis is seldom appropriate. Correlations between indicators such as these by area seldom indicate more than is obvious by inspection. Statistical tests as a whole are not usually useful. The priority should be to lay out the indicators as they are available, and to combine these with local knowledge to reach preliminary conclusions.

Integrated data sets from sample surveys give better opportunities for analysis and interpretation. In contrast to administrative data, the possibilities for analysis are so enormous that it is essential to define priorities. (A typical data set of 100 variables for 1,000 households i.e. 100,000 numbers, can be manipulated in a practically infinite number of ways.) Certain features of analysis, after cleaning and editing, peculiar to nutrition-related surveys are summarized below.

Anthropometric variables (usually weight, age and often height of preschool children of 1 to 7 years, say) need transformation. First, weight-for-age, height-for-age and weight-for-height values need to be computed from reference standards.

The most convenient way to do this rapidly is by using simple and quite accurate algorithms to calculate expected weight from known age, expected weight from known height and expected height from known age. (We have used the algorithms given in Kenya 1979.) If anything more than tabulation is to be done (e.g. correlation or regression) child-level variables need to be aggregated to the household level to give mean (and/or minimums) weight-for-age etc. at the household level. Similar aggregations are needed for morbidity variables. Mortality data require calculation also at the household level. All other variables generally apply already at the household level, or at village level. For anthropometric data, it is recommended to use height-for-age and weight-for-height (if height has been measured) and drop weight-for-age. Height-for-age and weight-for-height are usually independent of each other; height-for-age is the most useful for the present purposes.

When a data file is created at household level the tabulations needed are straightforward in principle. Mean values and prevalences below cut-off points (usually 90 percent of standard height-for-age, 80 percent for weight-for-height or weight-for-age) may be readily derived for groups suitably defined. Indicators of mortality and morbidity may also be readily calculated. Indicators for housing and sanitation require local knowledge -- percentages of households with minimum housing conditions (e.g. one room only; straw roof only etc.) may be calculated. It is convenient to have all indicators moving in the same direction for the same meaning; a "high is bad" convention is common. Not only prevalences, but proportions of total affected households in a group should be calculated (see standard format in table 4).

The relatively tricky decisions are definitions of groups to tabulate by: this should be dictated by needs for decision-making. If crop policy is an issue, tabulations should be made by cropping patterns, if outreach, by distance; and so on. By this stage, the questions are well beyong targetting: we are trying to see whether a particular crop is associated with malnutrition for policy reasons also, for example. Cross tabulations (e.g. by distance and crop) soon produce too disaggregated an analysis. Multivariable techniques become appropriate. Another major concern in theory is drawing incorrect conclusions because of associations between classifying variables (for example, if all the inaccessible households grow one crop, the accessible households another, the effects of crop and distance cannot be separated).

Pragmatically, experience so far is that the degree of association among the variables in such a data set is low enough that such confounding is unimportant. The main effects are independent of each other and can be elucidated by tabulation. Analysis of the integrated data sets using, for example, multiple regressions has seldom changed conclusions derived from tabulation. Given that computing possibilities are going to be so limited under "minimum"conditions, there is reasonable assurance that carefully designed tabulations will elicit much of the information needed for decision-making. In the data sets recommended, tabulations by one or two classifying factors (e.g. crop and landholding area; water supply and sanitation) in one to three categories each is recommended.

Evidently the strategy for analysis depends exclusively on the analytical capacity available. Beyond this, capabilities increase to cover correlation, frequently tables (including chi-square), analysis of variance, multiple regression and other techniques. A conventional strategy for analysis would often proceed using all these techniques: correlation and frequency tables to understand the one-on-one relations between the variables; analysis of variance for comparison of means (one-way), controlling for additional variables (n-way) and testing for interactions; regression to investigate effects of variables while holding others constant. These methods have been described for nutritional data analysis by Tabatabai (1982). It should be noted that in using nutritional status as the dependent variable, only minor amounts of the variation are generally explained by the variables used say, (10 per cent); whatever happens, results should be expressed as tabulations.

For minimum methods, the question of checking results for significance nonetheless arises: it is suggested that this be done parsimoniously and be linked closely with conclusions important for recommendations. It is quick and straightforward to do chi-square tests on prevalences: when recommendations depend on the statement that one group has a significantly higher prevalence than another, the confidence in this assertion should be known: but this confidence need not always be the conventional 1-in-20 "bet" ($p < 0.05$). The important thing is to know what the bet is. Finally, an important consideration in many surveys is the "design effect" (Kish 1965) owing to a two-stage sampling process; the sample size is not as large effectively as in a random sample. The factor by which the actual "n" should be deflated to give an "effective n" can be calculated. For these types of surveys (e.g. with 10 to 20 households per cluster) it is often around 2. This effect reduces the confidence in making assertions about the population from which the sample was drawn (evidently assertions about villages selected are not affected).

We have only considered so far the basic analyses needed to draw conclusions and make recommendations in a tight time-frame. Subsequent, more advanced data analyses are useful at least in some cases both for developing methods and for drawing more general conclusions to contribute to the design of other projects. The possibility of allowing data to be transferred to more powerful computing facilities for more lengthy analysis using the array of statistical techniques currently available should be considered from an early stage. The two main technical considerations, not vital for basic analyses, are (a) to have continuous variables in the original data set (e.g. distances, not distance categories) and (b) to worry about transfer of data files from computers originally used for basic analyses to larger ones.

## Appendix

### ASSESSMENT OF NUTRITIONAL EFFECTS THROUGH FOOD SUPPLY

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There is extensive reference in the foregoing text to the complexities of assessing the indirect nutritional effects of agricultural projects through food output, and calculating trade-offs in taking these into account. It is concluded that "minimum data" would not usually allow these assessments. However, some outline of the procedures may be useful, as given in this appendix.

To simplify the problem somewhat, estimates are required of changes in food consumption:

(a) From marketed food owing to increased food supply, which includes non-project-participants;

(b) Owing to additional income accruing to project participants.

(a) In the calculation of changes in consumption (e.g. outside project area) through marketed food, it is necessary to estimate the following factors:

(i) the effect of the increase in the commodity produced on the proportion of this output that is marketed; from historical data.

(ii) the effect of increased marketed food output on food prices. This requires a knowledge of the supply-price relationship for the commodity, which would usually be estimated from historical data.

(iii) the relation between the consumer price of the commodity and the level of consumption -- the own-price elasticity of consumption. These elasticities can be estimated from budget survey data, collected over time so that price varies sufficiently. Large data sets are required, the more so when elasticities by income strata are needed ( as they would be for the calculations envisaged here). Baseline estimates of kcal consumption are also needed.

(iv) in addition, the effects on the price and hence consumption of other commodities (cross-price elasticities) would also be desirable in estimating changes in total kcal consumption. Data similar to (iii) are needed.

(v) Effects of foregoing production of other crops could also be taken into account, in analogous ways.

(b) In the calculation of change in food consumption owing to additional income accruing to participants, it is necessary to estimate the amount of additional income to be earned. This would be calculated from estimates of the increase in production to be brought about by the project, and its value. Production and cost functions (or alternatively, profit functions) need to be estimated, from historical data, on prices, factors of production, and outputs; or more commonly from field surveys. The latter should be disaggregated by relevant socio-economic groups. (N.B. The changes in kcal consumption resulting from income changes are estimated from income-consumption elasticities. These are usually derived from cross-sectional consumption/household expenditure data, although time-series data are preferable. Elasticities should be estimated for different income strata. Baseline estimates of kcal consumption are also needed.)

Subsequently, the balance of benefits to participants in the project, and to other consumers within and outside the project area, needs to be calculated. Two opposing scenarios could be envisaged: (a) an extensive development project bringing benefits to many of the rural poor, hence increasing their kcal consumption, but producing only a small increase in surplus food marketed. Here, the income effect on the participants kcal consumption is the main factor to be estimated; (b) an intensive food production project generating little local employment, but substantially increasing the marketed food supply and increasing consumption primarily through price effects for non-participants. The kcals consumed, possibly in relation to kcal deficits, by different groups of consumers would need to be balanced, by the calculations outlined above. Further, decisions would be needed on who the project is aiming to benefit; which go beyond these calculations.

The calculations can be made through the setting up of a quantitative model of food supply, consumption, income flow etc., for different population groups. There is experience of such studies, both at micro-level (e.g. McCarthy and Taylor 1980; Gotsch *et al.* 1975) and at macro-level (e.g. Pyatt and Thorbecke 1976). The methodology could be applied to project analysis, given adequate resources and time; however, the time involved would often preclude their use for *ex ante* assessment. In any event, their use is likely to be more appropriate for a limited number of research studies than for wide application to project planning.

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