

FOOD AVAILABILITY AND CONSUMPTION INDICATORS

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The views and interpretations expressed in this report are those of the authors and should not be attributed to the Agency for International Development.

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## FOREWORD

The Agency for International Development (A.I.D.), Bureau for Program and Policy Coordination, Center for Development Information and Evaluation (PPC/CDIE), in cooperation with the Bureau for Science and Technology and three regional bureaus, organized a workshop on indicators for measuring changes in income, food consumption and food availability, and the natural resource base. The purpose of the workshop was to identify and discuss a set of simple, practical indicators that can be used by overseas Missions and A.I.D./Washington for monitoring the impact of agricultural and rural development assistance.

The workshop was held on June 20-22, 1988 in Virginia and was attended by 60 development specialists, including A.I.D. staff, consultants, and outside experts. "Food Availability and Consumption Indicators" is one of the four background papers written by experts and presented at the workshop. The titles of the others are "Impact Indicators: General Issues and Concerns," "Indicators of Household Income for Use in the Evaluation of Agricultural Development Project," and "Indicators for Assessing Changes in Natural Resources in Developing Countries."

A report by Krishna Kumar, entitled "Indicators for Measuring Change in Income, Food Availability and Consumption, and the Natural Resource Base," presents the main findings and conclusions of the workshop. Of related interest, CDIE has issued Methodologies for Assessing the Impact of Agricultural Development Projects, A.I.D. Program Design and Evaluation Methodology Report No. 11.

I am confident that these publications will be of great help not only to A.I.D. staff and contractors but also to host governments and institutions struggling to develop effective and efficient monitoring and evaluation systems for development activities.

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## GLOSSARY

Biochemical indicators, as determined by blood tests and tests of other bodily fluids, show the impact of food consumption and other factors (as discussed in the paper) on the individual. However, this method does not provide estimates of the calorie intake of an individual, which is the most general indicator of food consumption based on nutrition measures. Biochemical indicators do give a more exact estimate of some aspects of the nutritional status of an individual than do anthropometric indicators and are especially useful in cases in which vitamin and mineral deficiencies are the main nutritional problems.

Food availability is defined by FAO as food production, plus food stocks at the beginning of the period, plus food imports, minus food exports, minus food stocks at the end of the period. The formula calculates the ~disappearance~ of food within the country and assumes that all food that has ~disappeared~ is food consumed. Sometimes food availability figures are adjusted for storage losses and waste. Food availability can be defined at any level of aggregation.

Expenditures on food purchases are the amount of money spent on food during a certain time period. The definition can also include estimates of the cost of home-produced food consumed during the period, gifts of food, or bartered food, all based on market prices. Sometimes the definition is restricted to the amount of food purchased and actually consumed during the relevant period; in such cases, food stocks, before and after the period in question, need to be determined. Food purchases during this period become an estimate of household food availability.

Food consumption is the amount of food prepared at the household level or the amount of food eaten by individuals. Measuring individual food consumption may require weighing individual food portions, a highly invasive method with possible major effects on food habits, depending on the cultural situation. The usual approach to obtaining estimates of household food consumption is to obtain household estimates of food prepared, a list of the people present at the meal, and possibly an estimate of waste. Other approaches to measuring food consumption are as follows:

-- 7-day recall of food purchases. The person who does the household marketing is asked to provide by memory the quantity of food purchased and the price of purchase.

-- Weighing and measuring. An enumerator is present at each meal and weighs each portion and the related waste for each individual.

The trade-off in choosing one or the other of these methods is between the amount of time required of the enumerator and household (weighing and measuring) and the likelihood of obtaining imprecise answers (7-day-recall method). For a fuller discussion of the pros and cons of each of these methods, see Pekkarinen (1970).

## 1. INTRODUCTION

In February 1987 the U.S. Agency for International Development (A.I.D.) presented a new focus for A.I.D.'s Agriculture, Rural Development, and Nutrition account in the FY 1988 Congressional Presentation: "A.I.D.'s agriculture, rural development, and nutrition program is designed to increase the incomes of the poor majority and to expand the availability and consumption of food--while maintaining and enhancing the natural resource base.~ Efforts to implement and monitor the intent of this statement have created a demand for information on income, food availability and consumption, and natural resources in developing countries. This paper surveys the type of information required for specific indicators.

### 1.1 Why Collect Consumption Data?

Interest in food consumption derives from a desire for a well-nourished population who can move ahead with economic development. Experience in agricultural projects highlights the importance of monitoring the effects of changes in agricultural technology on food consumption and nutrition. Two reasons can be cited as to why these concerns should be addressed. First, consumption goals of farmers may act as constraints to the adoption of technology. Such constraints, which are usually not recognized, include farmers' need to protect family food supplies: conflicting demands for household labor to carry out maintenance activities, such as food processing and preparation and agricultural production; and food-quality preferences. Second, changes in agricultural technology affect the food consumption of both producer and consumer families. Changes in farm management and production technology have not always been beneficial for the food consumption status of producers. Thus, it is important to understand the linkages between production and consumption when choosing development alternatives. Some of the more important linkages include (1) seasonality of production (food availability, malnutrition, human energy expenditure, incidence of disease, and terms of trade for the poor), (2) crop mix and minor crops (subsistence versus cash and nonfood crops), (3) income (regularity, kind, and recipients), (4) the role of women in production, (5) crop-labor requirements, and (6) market prices and their seasonality (Frankenberger 1985).

Thus, attention to food consumption concerns is important both for promoting the adoption of new technology and protecting and promoting access to food for rural populations. Moreover, such concerns are fundamentally tied to the development and transfer of agricultural technology and should be incorporated into the design and implementation of agricultural research and development projects. If one of the major goals of development assistance is to enhance the well-being of project participants, then impact on consumption must be taken into account. Appendix A, which specifically addresses the data collection issues, presents some methods for incorporating food consumption considerations in the

design of agricultural projects.

## 1.2 Conceptual Issues

To address nutrition and food consumption issues in agricultural development requires an understanding of the possible indicators for food consumption. In choosing food consumption indicators there are three major questions to address: What will the indicator be used for? What level of aggregation must it cover? And what definition of food consumption will be most cost-effective?

### 1.2.1 Choice of Indicators

Food consumption indicators are gathered for a specific goal. Whether that goal is to evaluate a project or to develop a strategy for the country largely dictates the choice of indicator. Thus, the end use of the data should drive the choice of the indicator; for example, a food consumption indicator that is sufficient for designing a project may not be appropriate for evaluating the project.

Time and money are generally limited, and they are only marginally interchangeable in data collection and analysis efforts. The more emphasis placed on accuracy (i.e., how close the defined variable is to actual food consumption) or precision (i.e., how well the chosen definition of food consumption is being measured), the more time and money will be necessary. Given that precision is a problem with all data, especially in the developing country context, it is sometimes preferable to choose a less accurate indicator but one for which a more precise estimate can be derived.

In general, indicators can be grouped into one of two types: direct indicators and indirect indicators. Direct indicators of food consumption include those closest to actual food consumption rather than those closest to marketing channel information or medical status. Direct indicators should be quantified and gathered at fairly low levels of aggregation (e.g., the household level). Indirect indicators of food consumption are generally used when direct indicators are either unavailable or too costly (in terms of time and money) to collect. Indirect indicators are the result of alternative definitions or approximations for food consumption, as discussed in Section 2.

### 1.2.2 Levels of Aggregation

The level of aggregation needed is based largely on two factors: the purpose for the data and the level of food consumption data available. For example, if investigators need to monitor food consumption within a project area and plan to compare the data with project costs per household, then household-level food consumption data within the project area are preferable. However, village-level

data may be aggregated to achieve comparability. If the indicators are to be compared with national-level production estimates, then national food consumption indicators are needed.

The choice of the level of aggregation may be based on more than one factor, including geographic division (e.g., region or rural versus urban), income (or expenditure) class, socioeconomic class (e.g., educational level, ownership of durable or nondurable goods), and basic consumer group (e.g., village, household, or individual). Figure 1 illustrates some of the levels of data that can be gathered to describe different aggregations from the national down to the individual level.

The level of aggregation should also be based on identifying the groups who are most at risk of malnutrition or inadequate food consumption. They generally make up the lowest income group, but they could be further disaggregated to a specific type of individual (e.g., pregnant women) or socioeconomic group (e.g., plantation workers).

### 1.3 Definition of Food Consumption

Choosing a definition for food consumption poses problems similar to those inherent in designing survey questions. Any one definition of food consumption is limited by the necessity to minimize sampling error (accuracy), minimize measurement error (precision), and maximize the information obtained. Food consumption can be defined anywhere on the continuum, from food in the market (or field) to food just consumed by an individual. Depending on the situation, food consumption can be defined as food availability, food purchase or expenditures, food eaten, or nutritional status.

Figure 1. Flow Chart Showing Levels of Data on Food Available in Country

However, because the technical methods behind these definitions vary, not all types of food consumption data can be gathered at all levels of aggregation; for example, data on nutritional status using height and weight measures have to be gathered at the individual level. However, most of these measures can be aggregated upward once the necessary data at the lowest level have been gathered. The quantification of the chosen food consumption definition can vary from obtaining exact weights and measures to approximating the food eaten in a household.

Given the conceptual issues regarding food consumption indicators, different strategies for measuring food consumption can be pursued. The next section focuses on some alternate direct and indirect indicators of food consumption.

## 2. DIRECT INDICATORS OF FOOD CONSUMPTION

As stated earlier, direct indicators are measures of food purchases and food consumed. Some of the more familiar methods are presented below and summarized in Table 1.

### 2 1 Expenditure Data or Budget Surveys (macro)

Direct indicators of food consumption at the macro level depend on the existence of national-level expenditure data, budget, or consumption surveys,<sup>1</sup> which are costly and timeconsuming to perform. We therefore do not advocate performing such surveys if data are not already available.<sup>2</sup> Instead we suggest analyzing existing survey data, in particular disaggregating the data to provide income-level data. Unfortunately, these surveys are available at most every 10 years. For some countries, only one survey may be available.

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<sup>1</sup>A book produced and periodically updated by the Food and Agriculture Organization lists all currently available food expenditure or budget surveys. The Economic Research Service of the U.S. Department of Agriculture (USDA) has recently done a similar, but more detailed, listing for Africa.

<sup>2</sup>An alternative is to investigate some short-cut methods to the national consumption survey, as described in recent papers by Bonnard (1988), Senauer (1987), and Zalla (1988).

Table 1. Common Indicators for Measuring Food Consumption

Data on food expenditures can be converted to quantities of food consumed by using the price per unit information available in the surveys. Given that food is a composite of several different items, aggregation is limited by a choice of common denominators, which can generally be determined by limiting consideration to food grain consumption or by converting all food items to their calorie content.

In this context a two-tiered approach is useful: present food grain consumption in kilograms per capita per year and, if possible, convert food consumption to calories per capita per year. These indicators should be derived at different income levels (e.g., lowest third, middle third, and highest third) given the high variability of food consumption with income.

The food consumption estimates derived from these surveys are the most direct indicators of changes in food consumption for the nation as a whole. These estimates can also be used to compare food consumption levels across countries. More detailed analysis of the food consumption data can provide policymakers with information on the likely impact of different agricultural development programs on food consumption by different income or geographical groups. Table 2 provides an example of household food consumption survey data. The data were analyzed by Iowa State University for USAID/Jakarta to explore the food consumption impact of agricultural policies in Indonesia (Iowa State University 1987).

## 2.2 Minimal Data Sets for Assessment of Food Consumption (macro)

At the regional level, food expenditure or detailed consumption data are less likely to be available. However, collection of minimal food consumption data are easier within a region. A shorter survey can be performed in several ways: by limiting the number of food items on the survey (e.g., only asking about the 10 food items that make up 90 percent of the target population's diet), aggregating items by food groups, cutting down on the level of precision desired (e.g., getting measures by cups instead of tablespoons), and asking for frequency of consumption of a food item rather than the quantity of food consumed. All of these methods attempt to hasten the process of gathering data and are all valid, depending on the circumstances.

We recommend a shortened 24-hour-recall survey of household consumption. Enumerators collect data on household staple consumption (grains, breads, roots, and tubers), presented as calories per capita, and count the frequency of other food items consumed in the household during the past 24 hours. They also collect socioeconomic data on household members, including data

Table 2. Sample Household Survey Data Showing weekly Per Capita Food Consumption for Indonesian Households, by Location and Expenditure Group (kilograms)

on their resources. Since income data would not be available, data from surveys of other relevant socioeconomic groups (e.g., landless laborers and tenant farmers) should also be included.

These types of data are especially useful for tracking the impact of localized agricultural development programs. By performing these quick surveys on a seasonal basis every few years, changes in food consumption related to changes in agricultural production should become visible. The method needs to be fine-tuned to the particular project objectives and the culture of the people in the area to ensure the relevance of the data collected.

These consumption data are limited in their level of precision and in the lack of expenditure data for estimating incomes and elasticities. A survey instrument collecting these types of data has been tested in Mauritania on the Agricultural Research II project (O'Brien-Place 1988). Table 3 presents some preliminary data from that survey.

### 3. INDIRECT INDICATORS OF FOOD CONSUMPTION

As stated earlier, indirect indicators of food consumption are generally used when direct indicators are either unavailable or too costly (in terms of time or money or both) to collect. They are also used in conjunction with direct indicators to provide a clearer picture of interacting variables. Some of the more familiar indirect methods of assessing food consumption are presented below.

#### 3.1 Food Availability (macro)

Food availability is an estimate of the ~disappearance~ of food within the country or region.<sup>3</sup> The assumption is that all the food produced or imported and not stored or exported is consumed.<sup>4</sup> The Food and Agriculture Organization (FAO) prepares national food availability estimates on virtually every country (FAO 1987). Other agencies, such as USDA and A.I.D.,

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<sup>3</sup>The most useful works in this area are unpublished; see the articles by Villere (1981), Chavez, Hankin, and Hueneman (1981), and Young (1981). For a good review of the methods see Sanjur (1982, 217 ff) or Quandt and Ritenbaugh (1986, Section 1).

<sup>4</sup>FAO assumes a 10-percent loss rate at the household level.

Table 3. Food Consumption for eight Villages in Mauritania

also prepare food availability estimates when they derive food aid needs. We suggest the use of the FAO estimates because they provide data, usually given as calories per capita per day, on the largest number of countries. Any biases in these estimates would, we hope, be consistent across countries, thus allowing for cross-country comparisons. The FAO estimates are also useful for tracking a country's food security situation over the years and estimating food-aid needs. The limitation of FAO estimates is that they are, for the most part, really tracking production and imports. Actual distribution of food between regions, income classes, or within families is ignored. Therefore, these availability estimates on a per capita basis must be higher than recommended requirements to allow for maldistribution. Table 4 presents some representative FAO data on food availabilities.

A second set of estimates on food availability is usually provided by the country's ministry of agriculture. These estimates, particularly if they are regional, should also be used.

Regional estimates are useful for providing more detail on the distribution of food within the country, possibly indicating regions needing food aid. However, no food availability estimates can actually warn of possible famines. As shown in the study by Mabbs-Zeno (1987), famines are generally the result of a lack of resources to purchase food, not a lack of food available. This is why the actual food consumption estimates described above are so crucial to any real understanding of the food situation in a country.

### 3.2 Market Availabilities and Prices

Another level of information on food consumption can be derived by observing market prices, especially for the major staples (or food grains). In general governments regularly gather data on prices. However, if they are not being gathered already, a simple market survey of prices and stocks can be run every 4 to 6 months in each of the major regions of the country with very little effort (Holtzman 1986). Such market surveys can also collect information on informal price structures.

If prices are collected on a regular basis, their movement over seasons and years will give some indication of increases and decreases in food availabilities. An even simpler check is a listing of food items available in the market at different seasons.

Table 4. Food Availabilities in Selected Countries in Calories Per  
Capita Per Day

### 3.3 Household Food Availability (micro)

For households the question of food availability becomes a question of food access, which complicates the definition of this indicator and thus the data collection effort. Whether households are producers of food, consumers of food, or both can help determine which data are necessary. Assessing food availability for households that are both producers and consumers requires estimates of production, storage, and other sources (see Sections 3.3.1-3.3.3). For these producer/consumer households an informal estimate of food availability could be derived by using the same formula that FAO uses for countries (production + storage - sales + purchases). However, the amount and quality of data required for this formula may not be worth the effort. In this case, approximate indicators can be derived.

Household food availability indicators are useful mostly for project design, monitoring, and evaluation because they provide micro-level information. However, most of these indicators cannot be easily aggregated quantitatively other than by percentages (e.g., 35 percent of households sold an animal just prior to harvest to obtain food). Except for indicators (such as production estimates) for which data may already be available, most of the data will have to be collected. The most efficient method for initially collecting this information is a reconnaissance effort backed by a secondary data search. Appendix B provides categories of data that may be needed for this type of dietary assessment. The list of categories is meant to be used as a "menu" from which researchers can choose. The justification given for each type of data provides some information on why researchers may want to collect a particular kind of data.

#### 3 3 1 Household Production Estimates

In most cases household production data are already being gathered by the ministry of agriculture or the development project personnel. Production estimates can be gathered specifically for estimating food availabilities, using the same technique (e.g., estimates of yield just prior to harvest and farm sales data) agricultural production projects have used. Production data can be included in the formula for estimating food availability or related directly to the size of the household (kilograms produced per person) and using the information as an approximate indicator.

#### 3.3.2 Household Storage Estimates

Estimates of food in storage at the household level can be more difficult to obtain than production estimates. This is due to the reluctance of some people to discuss food in storage (cultural beliefs) or their inability to estimate how much food is in storage (more than one location and type of food). Perhaps a more useful approach to direct questions about food in storage (and production)

is to ask questions such as, ~Given the amount of your last harvest, how long will your household be able to eat from it?~ A second possibility is to concentrate on amounts of food in storage only at critical times of the year, such as just prior to harvest (Frankenberger 1985). Here the relevant question might be, "Do you have any grain in storage?" If yes, ~How long will it last?~ When asked how long the harvested grain would last in Mauritania, female heads of households were very quick at estimating the number of months, indicating they already had thought through the situation. Estimates ranged from 6 months to 2 weeks (O'Brien-Place 1988).

### 3.3.3 Estimating Other Household Resources

Household access to food is determined by how much a household produces (sometimes none), plus how much a household can obtain from other resources. An alternative to using direct production estimates is to use land area per household member as an indicator of resources. The agricultural project would usually already have such data available. This indicator, however, lacks information on the productivity of the land, as well as differences in age-gender composition of households, which can affect the food consumption requirements of households. An improvement on this ratio is the subsistence potential ratio (SPR), which ~in its simplest sense...is simply the ratio of the household's ability to feed itself to its need to feed itself" (Whelan 1983). The data needed for calculating this ratio are size of farm, expected yield, and age and gender composition of the household. The SPR compares the amount of food (calculated in calories per capita) that a household can produce over a year with the calories per capita requirements of the entire household for the year. It is intended to estimate household resources while avoiding the problems of gathering income data (Frankenberger 1985). It can also serve as a proxy for income and emphasizes the relationship between production and consumption. The SPR may also correlate with the primary food source of the household, which may be important insofar as knowledge of the source (along with the amount) of food can indicate those households that may be at risk nutritionally. For example, households that rely heavily on the market face different food-related risks than do households that rely heavily on home-produced food. The SPR can be refined, depending on the availability of data, to include resources other than land, for example, wages, liquid assets (livestock, jewelry), and coping strategies.

Estimating wage income can be a difficult process because households may be unwilling or unable to disclose the necessary information. In general, whether a family member is employed and the type of employment is probably sufficient information for ranking the food situation of a household. In other words, the actual amount earned may not be as significant as whether the person has been able to find work.

Liquid assets can be estimated by questioning or by observation, neither of which is very reliable given the reluctance of households to discuss such matters. An indirect approach is to ask household members whether an animal or piece of jewelry has been sold within the last month in order to obtain food (grain). This approach has been tested in Mauritania and is still under analysis, but appears to be quite promising (O'Brien-Place 1988). Here again, estimates of existence or nonexistence of resources at a critical period, such as just prior to harvest, may be more significant than estimates of actual amounts of resources. The household that still has livestock or jewelry just before harvest is obviously better off than one that does not (Frankenberger 1985).

#### 3.3.4 Household Coping Strategies

Coping strategies refer to methods households use to acquire food when the more conventional methods of production and purchase are unavailable. These strategies include social methods (e.g., borrowing from relatives or neighbors) and physical methods (e.g., gathering wild food items) and can be elicited through the use of rapid reconnaissance methods developed by anthropologists (Frankenberger, Perquin, and H' Malla 1986). A chart of these strategies can be derived relating these indicators to the severity of the food problem (Watts quoted in Gow 1987; Mabbs-Zeno 1987) (see Figure 2). Such information could be very useful in quickly estimating the extent of food aid needs in an area. Only data on these indicators would be needed to classify households during food shortages. Depending on how finely the stages are defined, this method could be used to classify households according to their food situation in normal, as well as famine, periods.

Figure 2. Reversibility of Coping Strategies by Famine Victims

R		
E	More	Using famine foods
V		Borrowing from kin
E		Using stored goods
R		Migrating for wage work
S		Selling livestock
I		Borrowing from money lenders
B		Pledging land
I		Permanent migration
L		Selling household assets
I		Selling land
T	Less	Migrating for aid
Y		
	Earlier	Later

Source: Mabbs-Zeno (1987, 8).

### 3.4 Nutritional Status

Nutritional status is a sensitive measure of overall quality of life for populations at risk of malnutrition (Harrison 1987). Understanding food consumption patterns may provide insights into potential pathways for measuring nutritional impacts (Harrison 1987). In the past agricultural projects gave less attention to direct measures of nutritional status, primarily because nutrition was perceived as the proper concern of the health sector, and such measures for assessing nutritional status were believed to be too costly, complex, and difficult to handle (Harrison 1987). However, these concerns can be addressed by careful selection of measures and methods for assessing the nutritional status of a target population.

Nutritional status defined by anthropometric (i.e., weight and height) measures can show the impact of food consumption and other factors on nutritional status. Anthropometric indicators provide a more exact definition of the nutritional situation, but less exact information on food consumption effects because nutritional status is a result of several factors in addition to food consumption. Other factors affecting nutritional status include health status (e.g., diseases that are present), sanitation, and level of activity of the individual.

Anthropometric measures most commonly consist of data on weights, heights, and age of children, usually children under 5 years of age. Some of these data are available through the ministry

of health if growth monitoring is a part of the maternal and child health system in the country. A second source is a national nutritional survey if one has been done for the country.

Anthropometric data are usually presented as weight/height, weight/age, and height/age ratios. The weight/height data do not depend on knowledge of age (which is in some situations the most unreliable variable to measure); they describe nutritional status and the presence of acute malnutrition. The weight/age data indicate whether the child is presently well nourished for his or her age. The height/age data indicate whether the child has been well nourished for his or her age over recent years. However, without further information, the usefulness of such data is limited. Researchers may not know whether the nutritional status is due to food availability, food habits, sanitation, disease, or access to resources. Despite this shortcoming, these measures can be used to indicate overall changes in the well-being of the target population and to compare data on food consumption between countries. In monitoring changes in nutritional status, the growth pattern of children is what is important. Table 5 provides an illustration of data gathered in a rapid survey of four Mauritanian villages (Cassidy 1988).

When anthropometric data are unavailable, a secondary level of information on nutritional status can be derived from data on infant mortality and child death rates, which are usually presented as ~so many deaths per 1,000 infants or children.n These data are usually available from the ministry of health and are gathered every 10 years by the World Health Organization (WHO). A recent volume from the United Nations (1987) presents these data in graph format.

The infant mortality rates and birth weights may be good indicators of maternal nutritional status, and the child death rate is a good indicator of children's nutritional status. Information on the cause of death, if available, is also indicative of the level of malnutrition, particularly if death is attributable to measles or other "minor~ infectious diseases. The child versus infant mortality rates can also reflect weaning ages.

All of the nutritional indicators mentioned above are limited to describing overall nutritional status, based largely on calorie (and protein) intakes. To measure specific nutrient deficiencies nutrient deficiency indicators are needed. The most likely nutrient deficiencies to be addressed through general development and food consumption efforts would be

Table 5. Distribution of Normal and Abnormal Growth for Children in Four Villages in Mauritania

Growth Pattern	Doubel	Ganki	Seyenne	Solou	All	%
Normal	17	31	27	21	96	64.4
Normal with past history of hunger	8	3	2	6	19	12.8
Recent or continuing weight loss	3	5	13	6	27	18.1
Chronic growth failure	<u>1</u>	<u>1</u>	<u>1</u>	<u>4</u>	<u>7</u>	<u>4.7</u>
Total	29	40	43	37	149	100.0

Note: This table simultaneously compares height/age (H/A), weight/age (W/A), and weight/height (W/H).

Normal = H/A, W/A, and W/H values all normal, where normal is defined as greater than -2 standard deviation of median.

Normal with past history of hunger = W/H normal, W/A either low or normal, and H/A low, where low is defined as less than -2 standard deviation.

Recent or continuing weight loss (recent or prolonged hunger) = W/A and H/A low or normal, but W/H low.

Chronological growth failure (stunting) = W/H, H/A, and W/A all low.

Source: Cassidy (1988, Table 17).

vitamin A, iron, and iodine deficiencies, which really require biochemical nutritional data in order to determine precisely their presence or absence. Since such data can be gathered only through intrusive techniques, it is better not to collect them but to use them only when already available. However, certain other indicators can be used to measure nutritional status, such as the presence of night blindness in children indicating a lack of vitamin A and the number of people suffering from goiter or cretinism as a result of iodine deficiency. In general, we do not suggest the use of indicators at the level of specific vitamins until food consumption indicators are better understood and utilized.<sup>5</sup>

#### 4. CONCLUSIONS

Food consumption indicators can be obtained through several approaches. The methods and strategies for collecting the data vary from time-consuming, detailed approaches to rapid data collection methods involving rough approximations. The choice of indicators depends first on their intended use and second on such constraints as time limitations.

Food consumption data can be used in the design of agricultural projects to choose a target population or to choose the appropriate agricultural interventions (Tripp 1984). Food consumption indicators can also be used to monitor and evaluate project efforts.

National or regional food and agricultural planning relies on food consumption data for knowledge of the nutritional and food consumption status of the population and for forecasting future food consumption needs. These planning efforts are an intricate part of government decisions on policy. Government policies on everything from foreign exchange rates to fertilizer subsidies have an eventual impact on food consumption. Food consumption data can be used to estimate the effects of present and proposed policies.

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<sup>5</sup>Work is also being done on devising a dietary indicator for measuring vitamin A deficiency based on a frequency count of specific vegetables eaten by households (Barbara Underwood, National Eye Institute).

## APPENDIX A

### FOOD CONSUMPTION CONSIDERATIONS IN THE DESIGN OF AGRICULTURAL PROJECTS

Including food consumption considerations in an agricultural project requires extra time and personnel. The chart that follows outlines how this can be done. The left column highlights the usual questions asked during the process of designing an agricultural development project. The right column illustrates the type of additional personnel, questions, and issues that need to be addressed, depending on the specific agricultural project, when food consumption con-siderations are included in project design.

Beginning with the problem of appropriate personnel needed on the design team, the chart leads the user from defining project area food consumption/nutrition problems, to collecting and analyzing data, to developing goal and purpose statements for the project's Logical Framework. The final section suggests ways to integrate food consumption concerns into traditional project activities. Each section shows which additional activities, data sources, questions, or methods are necessary for making a project sensitive to the food consumption half of the economic equation. The particular design of the chart assists project managers to ask questions that address the project's food consumption effect.

Project designers should use the chart as a point of departure in their work. The chart can be used as a guideline at the design, implementation, and evaluation phase of projects to ensure that the project is achieving its food consumption objective. Implementors and evaluators can utilize the chart as a framework for determining whether a project is achieving food consumption objectives by charting food consumption changes over the life of the project. During implementation the chart may highlight problem areas in need of new strategic approaches. Country- and area-specific issues require consideration in each project instance. Staff can utilize the chart as a checklist during project implementation and evaluation.

Box 1. Agricultural Project Design Requirements

## APPENDIX B

### CATEGORIES OF DATA FOR DIETARY ASSESSMENT

#### DATA JUSTIFICATION

##### I. SECONDARY DATA (see Appendix C)

Preliminary information necessary to provide an informed choice on what other questions to ask, what to emphasize, possible problems, cultural barriers to questioning people, and so on.

##### II. Socioeconomic INFORMATION FOR THE VILLAGE

Background information to provide a social and economic context for the dietary assessment; these data also allow assessment of why certain problems exist and how they might be resolved within the project context.

###### A. Resources

Present resource base allows identification of possible (and impossible) points for interventions.

1. Land
2. Well(s)
3. Community buildings
4. Education
5. Health care
6. Communications
7. Transportation available
8. Agricultural extension available, how often?

###### B. Markets

Markets are the intermediary between production and consumption for the majority of individuals; thus markets function at the heart of food availability, food price, and income (for farmers) issues.

1. Location
2. Facilities
3. Food prices

##### III. SOCIOECONOMIC INFORMATION ON THE HOUSEHOLD

Allows for a look at resource constraints at the household level instead of just at the village level. This in turn means interventions can be targeted to the household as opposed to village level.



A. Members of the Household

Necessary for determining per capita food figures and labor availability.

1. Age
2. Sex
3. Migration patterns in and out of the household

B. Occupations of the Household Members

Covers possible income sources: wage and self-employment

1. On farm
2. Off farm

C. Education

Shows limitations/possibilities for training (e.g., nutrition education: At what level of complexity could education be provided? Could written materials be used?); identifies lack of education as possible basis for nutritional problems; and lets evaluators know whether self-surveys by households are possible.

1. Head of household
2. Caretaker of the children
3. Oldest child still at home

D. Resources

Identifies the realm of possible changes given the present resources of the farm household.

1. Size of farm
2. Capital goods such as plows and the like
3. Off-farm income (if estimates are likely to be reliable)
4. Livestock
5. Major possessions such as radios

E. Ethnic and Religious Identity

Can have a large impact on food choices (both production and consumption), holidays, and food sharing systems.

#### IV. HOUSEHOLD FOOD SUPPLY

Necessary for assessing the consumption abilities of the household and for relating them to the production possibilities.

##### A. Food List or Inventory

Knowledge of major food items consumed ensures that no important food item is missed.

Foods eaten by the family: to be presented by food group with the following sections in one table or separate tables, depending on major questions.

##### B. Food Purchases

1. Who purchases food? (Can affect choice of foods and amount of income available for food.)
2. Where do you purchase food? At the roadside market, village market, from neighbors? (Effects of price and quality can be a bottleneck to food availability.)
3. How far do you go to purchase food? (Increases cost; illustrates scarcity, if any.)
4. How do you get there? Is there a cash cost? (Same as no. 3.)
5. Are these trips combined with other necessary trips? (If yes, indicates no additional direct cost in getting food.)
6. Which items do you usually buy? (Amount of reliance on market.)
7. How often do you have to purchase them? (Same as no. 6.)
8. Are these items acquired by barter or money? (To what degree are they tied to cash economy?)

##### C. Home Production

How free of the market are they? Can they subsist mostly on their own production if necessary? And what are their staples for home consumption that need to be maintained?

1. Field crops

Same as C, given above.

- a. Which crops are for household consumption?
- b. Which crops are cash crops?
- c. What are utilization patterns; that is, is the crop sold immediately or is part of the crop stored?
- d. What household labor is used on these crops?

2. Livestock

Level of investment in livestock and whether it can be used to carry the household over the hungry season.

- a. What types of livestock?
- b. How much stock of each animal do you usually have?
- c. How much stock of each animal do you have by the end of the hungry season?
- d. Who cares for the animals?

3. Garden

Is this extra source of food being exploited at present or can it be developed?

- a. What is produced?
- b. Who tends the garden?
- c. Does the garden provide much in the way of basic caloric staples?
- d. What garden produce is sold, shared, or exchanged and with whom?
- e. When the garden is producing, does the household still need to purchase additional vegetables (or other garden items)?
- f. What are the major constraints to gardening?

4. Gathered food

Can indicate possible sources of food that need protection or that need further development.

- a. What kinds?
- b. From where?
- c. How often? Is it seasonal?
- d. By whom?

5. Water and fuelwood

Possible limits to certain types of cooking or food items, thus could be intervention point.

- a. Where located?
- b. Collected by whom?

c. How often?

6. Hunting and fishing

Alternative sources of food that may need to be protected in face of technical changes in production activities.

- a. What?
- b. By whom?
- c. When or how often?
- d. Where?

D. Food Sharing/Exchange

Locates additional food needs or sources of the household.

1. To or from local relatives
  - a. What?
  - b. How often?
2. To or from local nonrelatives
  - a. What?
  - b. How often?
3. To or from relatives in the city
  - a. What?
  - b. How often?

E. Food Donations

Are present programs reaching the needy? How much is needed?

1. From whom (government or nongovernment agencies)?
2. What?
3. For what members) of the family?
4. How often?

F. Storage and Preservation Techniques

Household capabilities in storing and preserving food can show need for possible interventions. Improving household storage and preservation capabilities can get the households over the hungry season.

1. What is stored?
2. Where is it stored?
3. What is the usual amount in storage?
4. Are seeds stored? Are they separated from

- food?
5. Do (or when do) stores run out?
  6. How much is in storage just prior to harvest?
  7. What are the major causes of losses during storage?
  8. What food preservation techniques are commonly practiced and by whom?

## V. TYPES OF FOOD

Provides a simple listing of what foods are important or unimportant and why.

### A. Staples

1. What is (are) the main cereal grains?
  - a. How often are they eaten per day?
  - b. What are the desirable qualities for cereals, for example, glutinous, mealy?
  - c. How much of the staple is necessary per day for the household to be satisfied?
2. What staple would they eat more of if they could afford it? How much of it do they eat now?
3. What would they eat less of if they could afford some other food? How much of this undesirable food do they eat now?

### B. Complements to the Staples

Although the cereal staple is the most important item in the diet in terms of bulk, the food eaten with the staple is also important.

#### 1. Pulses?

Provide vegetable protein

- a. What kinds?
- b. How often are they eaten?

#### 2. Vegetables?

Provide vitamins and minerals, also can act as a buffer source of nutrients during the hungry season.

- a. What kinds?
- b. How often are they eaten?

#### 3. Root crops?

Can provide a backup source of calories to the main

staple (or sometime is the main staple); some root crops (e.g., sweet potatoes) are also an excellent source of vitamins.

- a. What kinds?
- b. How often are they eaten?

4. Livestock?

Provide investment for hungry season.

- a. What types?
- b. How many owned just prior to harvest?
- c. How often are livestock slaughtered?
- d. How often are they milked?

5. Poultry?

Same as livestock.

- a. What kinds?
- b. How often are they eaten?

6. Eggs?

Good source of nutrients, especially for small children because eggs are easily digestible.

- a. What kinds?
- b. How often are they eaten?

7. Fish? Good source of protein.

- a. What kinds?
- b. How often are they eaten?

8. Fats and oils?

High calorie source.

- a. What kinds?
- b. How often are they eaten?

C. Food Preferences

Limits what food items could be used in a successful project or which ones would require education of households in order to gain acceptance.

1. Preferred and generally available.
2. Preferred but not generally available.
3. Disliked even though available.
4. Traditional.
5. Introduced food items.

VI. FOOD PREPARATION

An effective mechanism for confirming the main food items eaten.

A. List of Major Dishes

## B. Preparation Techniques

Provides data for looking further into fuel and water constraints and provides a basis for suggesting technical improvements to food preparers.

1. Who prepares the food and with whose help?
2. When is the food prepared?
3. Time spent
  - a. Preparing?
  - b. Cooking (how many times per day)?
  - c. Gathering fuel wood?
  - d. Getting water?
4. Is food preparation equipment (e.g., pans) available?
5. Where is food prepared?
6. Are cereals milled at home?

## C. Recipes of Major Dishes

1. Ingredients (include water).
2. Time.

## VII. FOOD HABITS

Provide a more complete investigation of habits which may be contributing to present nutrition problems.

### A. Eating Patterns

Timing of meals can indicate a lack (or surplus) of food or time of the food preparer; these patterns can also indicate who might not be getting sufficient food within the household.

1. Time of major meals.
2. Household members who participate in each meal.
3. Who eats with whom?
4. Who eats first?
5. Who eats what?
6. What is the usual content of each meal?
7. How much of the staple do you need to "fill" all the people in the household?
8. Are there days (or other periods of time) when you do not have enough staple?
9. Are there days or times of the year when some meals stop?
10. When you do not have enough at a meal, who eats less?
11. Does anyone eat snacks? If so, what and how often?
12. How are foods served (e.g., one plate for

everyone)?

B. Special Food

Limits food items that can be introduced, but can also point out a food that is "self-targeting" to a nutritionally vulnerable group.

1. Food only eaten by certain groups (e.g., children).
2. Food taboos (e.g., religious, or for pregnant women).
  - a. For which household members?
  - b. When?
3. Foods necessary for rituals or celebration.
4. Other food beliefs.
5. Food classification systems (e.g., hot and cold foods).

VIII. GROUPS NUTRITIONALLY AT RISK

Can provide a preliminary idea of whether there are nutrition or health problems; this survey would need to be followed by a more formal nutrition or health survey.

A. Children

Provides information on feeding practices and illnesses of children that can be the first signs of deeper problems.

1. Are they breast-fed?
  - a. For how long?
  - b. If not, why not?
  - c. If not, what are they given?
2. What are the qualities of breastmilk that distinguish it from milk from animals and from commercial formulas?
3. What are weaning foods? When are they started?
4. What foods should not be given to a child?
5. Who feeds the child?
6. How do you know the child is hungry? Full?
7. Does force feeding of children occur? what age and sex?
8. How often does the child have diarrhea?
9. Are the episodes seasonal?
10. What is the treatment for diarrhea?
11. What food (if any) is given during diarrhea episodes?

B. Mothers

The health of the mother (particularly while pregnant or lactating) directly affects not only her, but her child (children) and possibly the whole family, depending on the food preparation activities.

1. How many children has the mother had?
2. How many are living?
3. What is the spacing between children?
4. Do mothers have any concerns in relation to feeding their children?
5. How do they see child-feeding practices now differing with how their mothers fed them?

IX. SEASONALITY OF CONSUMPTION

One of the major problems for households is the variation in food availability (prices) over the year; these data can point out (along with some of the above information) the severity (or lack of severity) of the potential problems.

- A. What foods are in short supply and in what seasons?
- B. What are the coping strategies of the household? That is, are there substitute foods? Is there additional outside work?

X. HEALTH

These issues can be a contributor to or the overriding cause of malnutrition if food availability is sufficient; to determine the extent of their role, some data should be gathered.

A. Sanitation

1. What is the source of water supply and the variations by seasons?
2. What type of sewage disposal is used?
3. How often and where do people bathe?
4. Is animal waste present? Localized?

B. Disease: Incidence by Family Member

1. Chronic
2. Endemic
3. Seasonal
4. Childhood
5. Other
6. What is perceived as the cause and cure of diseases?

## APPENDIX C

### SECONDARY DATA SOURCES FOR FOOD AND NUTRITION STATUS INDICATORS

There are two types of nutrition (or malnutrition) indicators: direct and indirect. Direct indicators are generally percentages of the population (or population subgroups) suffering from a specific form of malnourishment (e.g., 40 percent of pregnant women are anemic). Indirect indicators can attest to the likelihood of malnourishment and, to an extent, its form (e.g., mortality and morbidity data by disease and age group). The direct indicators provide information on the cause as well as the extent of malnutrition and are thus preferable when available.

Among both types of indicators, there are different levels of specificity. Since nutrition interventions are generally target-oriented, the more specific an indicator, the better. Specificity can apply to whether an indicator is related to one deficiency, or whether it is available by a relevant age (and sometimes sex) grouping.

Indirect indicators are either from food data sources and/or health sources. Direct indicators can be determined from clinical examination (as part of a nutrition survey or during routine health care) or biochemical tests. Since the clinical exam (at least weight and height measurements) is simpler, it is more likely to be available. Clinical signs can be less definitive than biochemical tests.

A list of the indicators, their usefulness, and source is in Table C-1. Nutritional disorders other than those listed exist. However, they are either of much lower prevalence or are less harmful. Table C-2 compares nutritional deficiencies in the world providing an estimate of the prevalence, impact, and possibilities for prevention.

Table C-1: Secondary Data Sources and Uses

Table C-2: Worldwide Prevalence, Fatality, Significance, and Ease of Prevention of the Major Nutritional Disorders

## BIBLIOGRAPHY

Acheson, K.J., et al. 1980. "The Measurement of Food and Energy Intake in Man--An Evaluation of Some techniques." The American Journal of Clinical Nutrition 33:1147-1154.

Anderson, M.A. 1979. "Comparison of Anthropometric Measures of Nutritional Status in Preschool Children in Five Developing Countries." The American Journal of Clinical Nutrition 32:2339-2345.

Bonnard, P. 1988. "A Rapid Appraisal Methodology for Expenditure Surveys: An Evaluation of the Liberia Model." Washington, D.C.: Nutrition economics group, Office of International Cooperation and Development, U.S. Department of Agriculture, March.

Cassidy, C. 1988. "A Survey of Nutritional Status in Children Under Four and Their Mothers in Four Villages in the Regions of Brakna, Guidimaka, and Gorgol, Mauritania." Nouakchott, Mauritania: Mauritania Agricultural Research II Project and USAID/Nouakchott, May.

Chavez, M., J. Hankin, and R. Huenemann. 1981. "Simplified Dietary Assessment in Developing Countries." Report to the Committee on International Nutrition Programs, National Research Council. Unpublished.

Christakis, G., ed. 1972. Nutritional Assessment in Health Programs. Washington, D.C.: American Public Health Association.

Eckroad, J.C. 1981. A Methodology for Diagnosing Causes of Malnutrition at the Community Level--The Cali Approach. Washington, D.C.: Agency for International Development, Office of Nutrition, January.

Evers, S., W.A. McIntosh. 1977. "Social Indicators of Human Nutrition: Measures of Nutritional Status." Social Indicators Research 4:135-205

Food and Agriculture Organization (FAO). 1987. FAO Production Yearbook 1986, Vol. 40. New York: United Nations.

Ferroni, M. 1980. "Large-Sample Monitoring of Household Expenditures and Food Consumption in Partial Subsistence Economies: A Methodological Note." Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, April.

Frankenberger, T. 1985. Adding a Food Consumption Perspective to Farming System Research. Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, June.

Frankenberger, T., B. Perquin, and F.M. H'Malla. 1986. Farming-Systems Research Along the Senegal River Valley: A Food Consumption Survey in Guidimaka, Gorgol, Brakna, and Trarza Regions. Tucson: Mauritania Agricultural Research Project II, College of Agriculture, Office of Arid Lands Studies, University of Arizona, July.

Franzel, S. 1984. "Comparing the Results of an Informal Survey With Those of a Formal Survey: A Case Study of Farming Systems Research/Extension (FSR/E) in Middle Kirinyaga, Kenya." Farming Systems Research Symposium, Manhattan, Kansas.

Gilbert, D., E. Brinneman, and J. McGuire. 1976. "Dietary Assessment: A Comparison of Two Methods." A Report to the Subcommittee on Nutritional Assessment, Agency for International Development, April 29.

Gordon, G. 1979. "Finding Out About Child (0-5 Years) Feeding Practices." Paper presented at "Rapid Rural Appraisal," a conference held at the Institute for Development Studies, University of Sussex, Brighton, United Kingdom, December.

Gow, D. D. 1987. "Sustainable Development of Fragile Lands: The Case of Extensive Livestock Production in Africa." Agricultural Administration and Extension 24:3-32.

Harrison, G. 1987. "Nutritional Status Indicators: Their Use in Farming Systems Research." Farming Systems Symposium, University of Arkansas, October.

Holtzman, J.S. 1986. Rapid Reconnaissance Guidelines for Agricultural Marketing and Food System Research in Developing Countries. International Development Papers, Working Paper No. 30. East Lansing: Michigan State University.

Iowa State University of Science and Technology, Center for Agricultural and Rural Development. 1987. Evaluating Food Policy in Indonesia Using Full Demand Systems. Ames: Iowa State University of Science and Technology, September.

Keig, G., and J.R. McAlpine. (N.d.) "An Environmental Framework for Nutrition Surveys in Papua New Guinea." Land Utilization Branch, Department of Primary Industry, Government of Papua New Guinea. Unpublished.

Larking, F. 1987. "Food Frequency Approach: Comparison With Food Records" Third Conference for Federally Supported Human Nutrition Research Units and Centers, National Institutes of Health, Bethesda, Maryland.

Leonard, J.B. 1983. ~Examples of Single Methods for Consumption Analysis Using Tanzanian Data.~ Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture. Unpublished.

Limbo, A., et al. 1984. "A Comparative Analysis of Some Methods of Evaluating Diets of Preschool Children From Low Income Families." Philippine Journal of Nutrition 27:182-194.

Mabbs-Zeno, C.C. 1987. "Long-Term Impacts of Famine: Enduring Disasters and Opportunities for Progress." Staff Report No. AGES870212. International Economics Division, Economic Research Service, U.S. Department of Agriculture.

McNeill, G. 1985. Foods and Nutrition: A Practical Introduction for Field Workers. Nutrition in Practice I, Part I. London: London School of Hygiene and Tropical Medicine.

Martorell, R. 1982. Nutrition and Health Status Indicators Suggestions for Surveys of the Standard of Living in Developing Countries. Living Standards Measurement Study, No. 13. Washington, D.C.: World Bank.

Mason, J.B., et al. 1982. "Identifying Nutritional Considerations in Project Planning: A Case Study of Assessment Methods." Food Policy (May):109-122.

Nichaman, M., et al. 1981. "Comparison of Weight-for-Height and Arm Circumference as Anthropometric Indicators of Protein-Energy Malnutrition." Center for Disease Control, Atlanta, Georgia. Unpublished.

O'Brien-Place, P.M. 1981. Nutrition in Policy Planning for the Rural Sector. Ithaca, N.Y.: Cornell International Nutrition Monograph Series, No. 8.

O'Brien-Place, P.M. 1987. Evaluating Home Garden Projects. Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, February.

O'Brien-Place, P.M. 1988. "Preliminary Results: A Dry Season Food Consumption Indicator Survey Along the Senegal River Valley in Mauritania." Mauritania Agricultural Research Project II and USAID/Nouakchott, February.

Pacey, A. "Taking Soundings for Development and Health: An Approach to the Information Needs of Rural Development Workers, District Officials and Health Services Staff. World Health Organization, FHE/81.2/Rev. 1.

Pao, E. 1987. "Human Nutrition Information Service (HNIS) Studies of Dietary Intake Methodologies: An Overview." In Third Conference for Federally Supported Human Nutrition Research Units and Center. Bethesda, Maryland: National Institutes of Health, February 24-25.

Payne, P. 1979. "Assessment of Nutrition Problems: Who Do We Look At and What Do We Measure?" Paper presented at "Rapid Rural Appraisal," a conference at the Institute for Development Studies, University of Sussex, Brighton, England, December.

Payne, P. 1985. "The Nature of Malnutrition." In Nutrition and Development, edited by M. Bisas and P. Pinstrip-Anderson, 1-19. New York: Oxford University Press.

Pekkarinen, M. 1970. "Methodology in the Collection of Food Consumption Data." World Review of Nutrition and Dietetics (12):140-171.

Quandt, S., and C. Ritenbaugh. 1986. Training Manual in Nutritional Anthropology. Special Publication of the American Anthropological Association No. 20, Washington, D.C.: American Anthropological Association.

Reutlinger, S., and J. Katona-Apte. 1984. "The Nutritional Impact of Food Aid: Criteria for the Selection of Cost-Effective Foods." Nutrition Today:20-28.

Sanjurjo, D. 1982. Social and Cultural Perspective in Nutrition. Englewood Cliffs, New Jersey: Prentice-Hall.

Schuftan, C. 1979. "Household Purchasing-Power Deficit: A More Operational Indicator to Express Malnutrition." Ecology of Food and Nutrition 8:29-35.

Scrimshaw, N., and R. Lockwood. 1980. "Interpretation of Data on Human Food Availability and Nutrient Consumption." Food and Nutrition Bulletin 2:29-34.

Senauer, B. 1987. "Rapid Appraisal: The Survey Instrument." Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, October.

Simmons, E. 1981. Budget, Expenditure and Consumption Surveys in Developing Countries: What, Who and How. Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, October.

Smith, M., A. Venhaus, and B. Santos. 1985. "Quality of Food Intake Among Rural Families in the Dominican Republic."

Srinivasan, T.N. 1981. "Malnutrition: Some Measurement and Policy Issues." Journal of Development Economics 8:3-19.

Stone, P., T. Frankenberger, and M. Jaghana. 1986. A Rainy Season Food Consumption Survey in Guidimaka, Gorgol, and Brakna Regions Mauritania. Tucson: Mauritania Agricultural Research Project II, College of Agriculture, Office of Arid Lands Studies, University of Arizona, October.

Stone, P., B. Gaye, and T. Frankenberger. "Food Consumption in the Senegal River Valley: A Rainy Season Farming Systems Reconnaissance Survey in the Middle Valley Between Podor and Matam, Senegal." Senegal Agricultural Research Project II, USAID/Dakar, December.

Tripp, R. 1982. "Including Dietary Concerns in on Farm Research: An Example From Imbabura, Ecuador." Economics Program Working Paper, International Center for the Improvement of Maize and Wheat (CIMMYT).

Tripp, R. 1984. "On-Farm Research and Applied Nutrition: Some Suggestions for Collaboration Between National Institutes of Nutrition and Agricultural Research." Food and Nutrition Bulletin 6 (3):49-57.

United Nations, Administrative Committee on Coordination, Subcommittee on Nutrition. 1987. First Report on the World Nutrition Situation. November.

Uzzell, J.D. 1982. "Training Module: Rapid Nutrition Reconnaissance." Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, July.

Vaughan, S., and W. Flinn. 1983. Socioeconomic Factors Associated With Undernourished Children, El Salvador Rural Poor Survey, June 1977-May 1978. Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, July.

Villere, B. 1981. "Simplified Dietary Survey Methodology: A Preliminary Report." Center for Disease Control, Atlanta, Georgia. Unpublished.

Whelan, W. 1983. "Incorporating Nutritional Considerations Into Farming Systems Research." In Proceedings of Kansas State University's 1982 Farming Systems Research Symposium, edited by Cornelia B. Flora. March.

World Health Organization (WHO). 1983. Energy and Protein Requirements. WHO Technical Report Series, No. 522, updated in 1985. Geneva: WHO.

World Health Organization (WHO). 1983. Measuring Change in Nutritional Status. Guidelines for Assessing the Nutritional Impact of Supplementary Feeding Programmes for Vulnerable Groups Geneva- WHO

Young, C. 1981. "Dietary Methodology." Unpublished.

Zalla, T. 1986. "Towards Rapid Appraisal of Consumption and Expenditure Patterns." Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, July.

Zalla, T. 1988. "Sampling Methodologies for More Cost-Effective Collection of Food Consumption and Expenditure Data." Washington, D.C.: Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture, April.