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DATA NEEDS FOR ANALYZING  
THE CONSUMPTION EFFECTS OF  
AGRICULTURAL POLICIES

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## EXECUTIVE SUMMARY

Evidence that government policies can inadvertently affect the health status of individuals in adverse ways has led USAID and USDA to conduct a study of the Consumption Effects of Agricultural Policies (CEAP). Research has been directed at the measurement of consumption changes through the estimation of the relationships which link agricultural policies to their consumption and nutritional outcomes. These estimates are derived from several common sources of data, most importantly: national household income and expenditure surveys, household and individual food consumption surveys, and nutritional status surveys. Other sources, such as food balance sheets and demographic statistics, are primarily useful as secondary or corroborating evidence.

Experience with consumption studies has indicated that policy analysis can be made more useful with both additional types of data and with improvements in the existing sources of data. Household budget and consumption surveys can be improved by ensuring that the household data are sufficiently disaggregated by income and other socioeconomic groups, and that the expenditure data are sufficiently disaggregated by commodity type. To capture seasonal variations, surveys should be conducted over a period of one year. Food quantities and/or food prices are also essential for consumption analysis. In addition, consumption analysis should more strongly emphasize individual dietary intake data, and should more frequently include anthropometric surveys and other indicators of nutritional status.

Three general recommendations are also made. Different types of household surveys should be more easily integrated with one another. Household surveys are more useful when the data generated are comparable over time. Finally, better communication between consumption analysts and data producers is needed to ensure that any essential information is not omitted.

## FOREWARD

This study is part of a continuing effort by USAID to evaluate the relationship between agricultural policy and food consumption. This report is a survey of the various data problems encountered in examining these relationships. It is primarily intended for researchers who are new to food consumption analysis. It is also directed to statistical bureaus around the world in an effort to communicate the data needs for more accurate consumption analysis.

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## INTRODUCTION

In recent years, development planners have focused a significant amount of attention on the nutritional and health consequences of agricultural policies. This concern originated at a time of growing awareness that agricultural policies and projects are a potential cause of the increasing vulnerability of malnourished persons. The increased recognition of the limitations of many explicit nutrition interventions was also important for the development of nutrition planning in the agricultural sector.

Although malnutrition has been shown to be strongly and consistently correlated with real income, the assumption that an increase in income will lead to improvements in nutritional status has now come under greater scrutiny. Fleuret and Fleuret (1980) have reviewed numerous studies which provide evidence of deleterious nutritional impacts following changes in agricultural policies. In order to anticipate and prevent negative outcomes from agricultural policies and projects, and to stimulate improvements in nutritional status, development organizations have begun incorporating nutritional considerations into agricultural planning. The Food and Agricultural Organization (FAO) has developed guidelines for the ex ante and ex post evaluation of nutritional outcomes. The United States Agency for International Development (USAID) has supported the Consumption Effects of Agricultural Policies (CEAP) project. One of the stated goals of the CEAP project is to:

...develop better methods for determining in advance the probable effects that various economic policy choices will have on people's food consumption patterns and nutrient intakes....(USAID, 1981)

One of the obstacles in assessing consumption impacts has been in obtaining the data necessary for analysis. This paper examines the problems of data collection for the CEAP studies. The data needs for CEAP studies are first considered through a framework describing the process of analyzing the consumption effects of agricultural policies. Major sources of data are then examined independently, and their utility for policy analysis is assessed. This is followed by a review of data use in several recent CEAP and non-CEAP studies. This review provides the basis for conclusions regarding future data utilization in determining the consumption effects of agricultural policies.

It should be emphasized that the primary focus of this paper is on the evaluation of data needs for accurate analysis of consumption effects of agricultural policies on low-income households. Primary importance is placed upon data for analyzing the actual or estimated consumption effects, rather than data for analyzing the causes of changes in consumption. Thus, although production and consumption decisions of farm households cannot be assumed to be independent, for the purpose of this paper only the consumption effects are considered. An excellent review of the firm household model is available elsewhere (Roe, 1983).

The goal of this review is to assist planners, researchers, and graduate students who are new to food consumption analysis and who may

be contemplating or undertaking research in this area. This paper is also intended to alert administrators in statistics offices and in agricultural and health ministries to the potential improvements in their data collection such that this information may become more useful in consumption analysis.

## FRAMEWORK FOR ANALYZING THE CONSUMPTION EFFECTS OF AGRICULTURAL POLICIES

### Introduction

Evaluating the consumption effects of agricultural policies entails examining the numerous direct and indirect linkages which occur between the time a policy is implemented and the actual time of food consumption by an individual. The description and quantification of these complex linkages will answer questions necessary for policy making and evaluation.

The primary research objective is to be able to estimate any changes in food consumption and nutritional status of low-income groups which may arise from specific agricultural policies. The ultimate policy objective is the absolute improvement of nutritional status of high-risk populations. Reliable estimates of consumption effects can be used to influence policy design, to assess the costs and benefits of alternative policies, or to compare the expected effects of agricultural policies with those of nutritional interventions.

Differences in methodology will arise depending on whether a particular project or a more widespread policy is being considered. The basic linkages to be examined, however, are essentially the same. These fundamental connections are between food availability and food consumption and between food consumption and nutritional status.

In exploring these linkages, the questions which must be answered relate to: the quantity and variability of food available; the quantity and variability of food consumed, and factors determining the ability to

purchase food; the relationship of individual consumption to household food purchases; the relationship between socioeconomic or cultural factors and individual and household food consumption; and, the degree to which dietary intake by an individual will provide an adequate indicator of nutritional status. Such questions can be explored by following a descriptive and analytical path beginning with an account of the relevant types of agricultural policies. Regional income and price effects will be examined before finally reaching the consumption and nutrition effects at the household and individual levels.

#### From Government Policy to Food Availability

Governments can institute numerous policies which may eventually affect food consumption. In a review of CEAP studies, Robert Evenson presents a typology of five categories of agricultural policies: factor supply (primarily those affecting the prices of agricultural inputs, wages and capital); production technology; product demand (e.g. trade policies and farm prices); factor ownership; and, consumption policies such as price subsidies and food transfer programs (Evenson, 1983).

Most agricultural policies have four types of outcomes. They can affect food availability, income, prices, and the environment. Whether food availability increases or decreases is primarily a function of the type of agricultural policy undertaken. If yields of traditional crops increase as a result of the introduction of improved technology, it is likely that local food availability will also increase. Per Pinstrup-Andersen has concluded, however, that the "...amount of nutrients made available by a given project or policy is usually a poor indicator of

the nutritional effects..." (Pinstrup-Andersen, April 1983). The amount of additional production which is marketed in a given location is also dependent upon the efficiency of the food distribution and storage system. Food availability can also decrease as a result of agricultural policies if, for example, an export cash crop is introduced and displaces production of food for local consumption. It is important to determine the extent of any changes in the seasonal supply of food.

Income and prices can also be expected to change as a result of agricultural policies. Their effects on households will be further discussed below. Analysts must also examine income and price changes, as well as their seasonal fluctuations, at the regional level. The income and price effects of many agricultural policies will be entirely different for rural and urban dwellers.

Environmental impacts of agricultural policies must be monitored, for they can have indirect effects on nutritional status. Negative effects can occur if sanitation levels deteriorate, leading to greater incidence of bacterial infection and consequent reductions in the utilization of nutrients. This is particularly important with regard to children.

#### Consumption and Nutritional Effects

At the household and individual level, the consumption and nutritional effects of agricultural policies depend primarily on how changes in purchasing power are allocated. Pinstrup-Andersen states that "...Household incomes, food prices and food availability determine the extent to which nutritional requirements could be met

by the individual household. (Pinstrup-Andersen, July 1981). It is necessary to determine the relationship between these three variables because, according to the FAO, "Increased food consumption is the most important means of improving malnutrition as indicated by poor nutritional status." (FAO, 1982)

An increase in real income does not necessarily imply a commensurate improvement in the nutritional status of at-risk groups. This linkage is often complicated by other variables. Circumstances in which higher incomes do not improve nutritional status most frequently occur when the source of household income changes (Mason, p. 5). For example, moving from subsistence crops to a cash crop will often increase income; however, the increase in income may not be sufficiently high to pay for foods which must now be purchased, and seasonal variability of consumption may increase. Other factors within the household are also important in determining the actual levels of food consumption. These include: who has control of the family budget, the intra-household distribution of food, the time allocation of women, and various other cultural practices (Pinstrup-Andersen, July 1981).

#### Estimating Relationships

Given the relationship between agricultural policies and food consumption, the parameters to be estimated and their data requirements must next be determined. The parameters required for estimating the consumption effects of agricultural policies depend on the desired depth and practical constraints of an investigation. Rigorous models may involve the joint estimation of producer and consumer demand systems.

The data requirements for such models are substantial. Decisions must be made regarding "the trade-off that exists between conceptual rigor and practical constraints on data collection and use." (Grootaert, p. 2).

Since the combination of types of policies and their outcomes can be extensive, it is recommended to concentrate on outcomes common to most agricultural policies. Income and price changes are the most common outcomes affecting households. The real income change will influence a family's ability to acquire food, food acquisition behavior, and changes in the intra-household distribution of food. Income and price elasticities are normally used to help explain these relationships. It is important to note that these parameters must be specifically targeted toward low-income groups; this includes the majority of people at a high risk of being malnourished, and particularly infants, young children, and pregnant and lactating women. Unfortunately, such analysis is made difficult because, as Pinstrup-Andersen states, "Data scarcity is the principal barrier to direct estimation of such disaggregated parameters." (Pinstrup-Andersen, 1983).

What are the specific data necessary for analyzing these linkages? The choice of indicator depends on the type of policy studied, and among other things, data availability, and, cost and time constraints of data collection (Pinstrup-Andersen, 1983). Data needs also depend on an assessment of how important it is to uncover the "black box" between policy formulation and the health outcomes of a population. A complete investigation of the consumption effects of agricultural policies would examine the following types of data:

1. Indicators of food availability.
2. Household budget surveys, and other indicators of a household's ability to acquire food.
3. Household food consumption surveys.
4. Individual dietary intake and other indicators of intra-household food distribution.
5. Nutritional status indicators such as anthropometry.
6. Health indicators and vital statistics.

The following sections discuss each of these primary sources of data and their applicability to CEAP studies.

## DATA AVAILABILITIES AND USES

### Food Balance Sheets

Perhaps the most widely available data used as indirect indicators of food consumption are the food balance sheets published by the United Nations Food and Agriculture Organization. These estimates of average per capita food availability are derived by subtracting food utilization (excluding that for human consumption) from the aggregate food supply, and dividing by the current population level. Food composition tables are then used to calculate the per capita energy and nutrient content of the food supply.

A major shortcoming of this approach is that these are residual figures and incorporate any and all preceding errors in estimating food supply and disappearance. The margin of error can be substantial since aggregate food supply entails estimating national production, quantities of imports, and changes in stocks. Food utilization must be estimated from export totals, feed, seed, and industrial use, and from losses in storage and transport. Per capita food availability may not necessarily be a good indicator of actual quantities consumed. A comparison of a 1972 food consumption survey of the United Kingdom with the food balance sheet for that year indicated that the estimated per capita calorie supply was fifteen percent higher on the food balance sheet than it was according to the consumption survey (Burk and Pao, 1976).

The utility of food balance sheets in assessing the consumption effects of agricultural policies is further diminished because of the

lack of any disaggregation among population groups. Favorable overall food consumption trends may conceal problems for specific socioeconomic groups or in particular regions. Although food balance sheets are of limited use for rigorous policy analysis, they nevertheless provide valuable long-term time series data of consumption trends and may serve as a point of departure for more extensive investigations.

### Household Budget Surveys

National household budget surveys are probably the most prevalent source of data on household income and expenditures. They normally contain information on quantity and sources of income, expenditures on food, housing, durables, other goods and services, and taxes. Household budget surveys usually include explanatory variables such as education, household size and composition, occupational status, and geographic location.

The household budget survey (HBS) is a frequently used source of data for analyzing the consumption effects of development policies. These data can be used to predict how changes in a household's ability to acquire food, resulting from income and price changes, affect the quantity of food purchased, and the quantity which is presumably consumed by the household. The calculation of income and price elasticities of demand is the standard methodology for estimating this relationship from these cross-section data. Consumption analysis, however, is not usually one of the primary purposes for conducting the household budget survey. Therefore, the data present certain difficulties for parameter estimation. Discussions with researchers and investigation of CEAP mid-project

evaluations reveal several areas of consumption analysis which may be hampered by inadequacies in typical household budget survey data.

Income. Income change is a frequent outcome of agricultural policies. There are, however, numerous difficulties in obtaining data for estimating income elasticities of demand. Whether for reasons of privacy or from fear of tax collection, survey populations are frequently reluctant to reveal income information. Income data are particularly difficult to obtain when income earners are numerous or when a significant percentage of income is from non-cash earnings such as barter or payment-in-kind.

Consumption analysis can be facilitated if household budget surveys record non-cash income as carefully as they record cash income. Every source of income should be listed separately for each income earner in the household (B. Rogers, interview). Definitional and computational problems arise with many other non-cash sources of income, such as: income derived from ownership of housing, income derived from own-produced goods and services, and income derived from state-provided services. The values of these income sources must be imputed (Chandler, 1980).

Agricultural households are particularly difficult in terms of ability to obtain accurate income data. Sales of produce are intermittent and the proportion of income from home-produced and consumed food may be very high (FAO, 1982). The general tendency to underreport income has meant that in practice, "...household expenditures tend to exceed [reported] household income for typically 80-90 percent of the population." (Grootaert, p. 10). Total expenditures are frequently

judged to be more accurate than income, and are thus often used as an income proxy.

Parameter Estimation Problems with Household Budget Survey Data. The calculation of demand parameters presupposes adequate food expenditure statistics; food consumption analysis presupposes an ability to transform expenditures into quantities of food for nutrient analysis. Several data problems emerge at this stage of analysis. One type of problem occurs when the household budget survey questionnaire does not include all of the expenditure information necessary to conduct a CEAP analysis. Two frequently mentioned shortcomings are a lack of sufficient data disaggregation and a lack of food quantities or prices.

Average elasticities of demand across income strata are of little utility when malnutrition is the primary focus. Expenditure data should therefore be disaggregated by income groupings. Data should also include additional variables such as household composition, occupation of income earners and geographic location. Food expenditures must also be disaggregated if policy evaluation is the goal. At the minimum, expenditures for all of the major staples must be individually identified.

Another common deficiency of household budget survey data is the lack of food quantities or prices for the imputation of quantities. This information is essential for analyzing household intake and consumption changes.

A different set of problems occurs at the survey design stage; two of the more important problems affecting CEAP analyses are inadequate sampling coverage and insufficient survey time frame.

Accurate policy analysis may be constrained by sample bias or by selective targeting in household budget surveys. Surveys tend to underrepresent certain populations. These rural and low-income residents are of particular concern to CEAP. This suggests the need for better census data and more appropriate census techniques (D. Sahn, interview).

An accurate assessment of food consumption and nutritional status of a population must ensure full consideration of seasonal fluctuations. This is not always the case with household budget surveys. Government budget and time constraints often necessitate expeditious completion of the survey (S. Johnson, interview). From the standpoint of consumption analysis, household budget surveys should collect data for an entire year (Chandler, 1980). If this is impossible, at least the "fat" and "lean" periods of the year must be covered by the survey (P. Pinstrup-Andersen, interview).

One of the greatest problems in using the household budget survey data for CEAP analysis concerns the fundamental cross-sectional nature of these data and the implied difficulties in estimating price elasticities. Income elasticities of demand are easily generated if household budget surveys do not have any of the previously described shortcomings. Own-price and cross-price elasticities of demand, however, have been difficult to estimate using many of the household budget surveys currently available. Price elasticities can be estimated only with the use of strong assumptions unless the survey data, "...refer to various points in time or various geographical locations and thus

provide for sufficient and relevant price variation." (Alderman, p. 7). This reinforces the necessity of having price or quantity data in the household budget survey. Commodity disaggregation is also necessary if substitution effects are to be captured with some accuracy; a requirement if nutritional intake is to be calculated.

Even if price or quantity data are available, household budget surveys frequently cannot be used to directly estimate price elasticities. Surveys are often carried out over too short a period to allow for real price variability. A confounding difficulty is that whatever price variation may occur may simply reflect differences in prices per unit, depending on the quantity purchased, or differences in product quality (Alderman, 1984). One method for controlling for quality differences is to use the price paid by low-income groups as a standard.

It is believed that a survey conducted over the period of one year should normally contain enough price variation for estimation, except in cases where prices have been controlled during the period (Yetley, 1981). When price variation is limited, methodological innovations have allowed for the estimation of elasticities. The applicability of the assumptions underlying estimation methods, such as the Frisch technique or the Linear Expenditure System, for food consumption analysis, have frequently been called into question (see Evenson, 1983; Johnson, 1983).

The use of time series expenditure data would help resolve the problem of price elasticity estimation. Time series data are actually more appropriate for analyzing consumption changes over time; however, such data are rarely available. In the infrequent instances when time

series data have expenditures disaggregated by income groups, the limited number of observations may be the constraint to estimation. Food commodities are also infrequently disaggregated in these data sets (Alderman, 1984). High cost is often an impediment to the collection of appropriate time series data. A unique opportunity for analysis exists with the income and expenditure data being collected quarterly for the past ten years by the Philippine Ministry of Agriculture (H. Bovis, interview).

Experience with Household Budget Survey Data. The World Bank's Living Standards Measurement Study has examined the experiences of various other developing countries in designing and conducting household budget surveys. The usefulness of the data for consumption analysis varies greatly among countries. Sri Lanka and India have well-developed systems for collecting expenditure data. For example, the 1969/70 Sri Lanka Socio-Economic Survey, conducted over a full year, includes the value of non-monetary income, the rental value of owner-occupied housing, expenditures and quantities of food, and recent incidence of illness in the household. India conducts annual rounds of surveys which are free of seasonality, since data are collected throughout each year (Visaria, 1980). Comprehensive data collection in Africa, however, occurs only in selected countries. While the World Bank lists eighteen income, consumption and expenditure surveys in Africa during the 1960's, only fourteen are listed for the 1970's. The authors see African survey capabilities improving in other areas, such as population censuses and agricultural surveys. An effort has been made to improve

and institutionalize the survey capabilities of countries through the United Nations' Africa Household Survey Capability Program (Booker, et al., 1980).

Household Consumption Analysis. Once demand elasticities have been established, estimated changes in the derived nutrient intake of households can be calculated using food composition tables. However, it is necessary to be cautious when using such derivations of household nutrient intake. Errors may have occurred at various stages of the computation. Expenditure surveys often underestimate food consumption of low-income groups, since a relatively large proportion of consumption comes from non-market sources such as home production, gifts, and exchange. If quantities were derived from expenditure and price data, uncertainty about the precise amount consumed exists because of differences in food quality and in price per unit. Even if quantities are available, the actual nutrient content still depends on the quality of the food consumed, and on the methods of preparation (Srinivasan, 1981).

This procedure yields estimated changes in average per capita nutrient intake resulting from development policies. Such an indicator is useful for policy analysis, but if high-risk groups are of a special concern, it may be necessary to know more about the intra-household distribution of food. Household budget surveys can be used to help anticipate which policies may have detrimental effects on the food consumption patterns of households; however, they tell us nothing about how food is distributed within the household. The household composition data from the surveys can be used in conjunction with

family life cycles or adult equivalency units to add greater specificity to a model. Equivalency units, however, can be cumbersome since they must be nutrient specific.

In summary, household budget surveys are a prevalent and frequently used source of data for consumption analysis. To be useful for CEAP analysis, they must contain food quantities or prices in addition to expenditures, have sufficient information for disaggregating households and commodities, and show enough price variation across observations. Time series data do not present the estimation difficulties of cross-sectional data; they are, however, rarely available. Perhaps with the development of national survey capabilities, and an international emphasis on standardization of national survey techniques, the most promising direction may be the use of several cross-sectional budget surveys as time series data, thereby satisfying the demands of both disaggregation and price variation. Such methodological progress depends on the ability of consumption analysts to obtain raw data. This is necessary for ensuring the time-to-time comparability of the data being studied. Statistical offices must be encouraged to permit the analyst accessibility to the required data.

#### Food Consumption Surveys

Food consumption surveys allow us to examine the linkages between agricultural policies and health status at a level which is, compared with the household budget survey, more directly related to individual food consumption. Food consumption surveys place emphasis on the quantity of food consumed by the household, rather than the

expenditure for food. The estimated quantities should more closely approximate actual intake than do quantities which had been derived from expenditure statistics. The greater accuracy can give analysts more confidence in their understanding of how households adjust consumption habits in response to policy changes.

Food consumption surveys normally contain two broad types of information: data describing the household and its environment, and data describing the food consumed by that household. Information about the household includes family characteristics, such as household composition, occupations, educational levels, income, and ethnicity. Other information includes family activities and buying practices, the extent of home production, and environmental conditions such as sanitation facilities, cooking and storage facilities, and access to markets. The consumption data will usually include quantities of food (and sometimes the nutrient content), sources of food, and price, if available (Burk and Pao, 1980).

Four methods of collecting consumption data are frequently used: food account, food list, food record, and weighted household consumption. The reliability and validity of these methods have been frequently compared, and can be reviewed in Burk and Pao (1976 or 1980) and Ferroni (1980). The choice of methodology primarily depends on the purpose of a study and the practical considerations such as time and budget. If precise nutrient consumption is necessary, none of the methods may be satisfactory and a survey of dietary intake is preferable. For large-scale surveys, the relatively inexpensive 24-hour recall may

suffice, as it can be expected to "yield reliable mean estimates " (Martorell, p. 63). It should be noted, however, that the large temporal variation in daily household consumption would lead to a spurious assessment of the number of households at any given intake level if a one-day or three-day recall is used.

Food consumption surveys are intended to provide better information than do budget surveys on the important question of how well fed people are. For analyzing the consumption effects of policies, the additional information available in food consumption surveys is valuable. As indicated earlier, the household budget survey is a multi-purpose survey; therefore, it does not always provide sufficient detail about food consumption and its determinants. Food consumption survey estimates of food consumed by the household will include consumption from all sources, and should pick up information about home produced and consumed food which is frequently left out in the household budget survey. This information is extremely important in agricultural households. The data can be used for regression analysis of the importance of different income and socioeconomic variables on household food consumption, as well as for forecasting the consumption effects of different policies (FAO, 1980). Prices can be derived from the data if they are included, to be used in calculating price elasticities. The price elasticities estimation problems encountered in the household budget survey analysis will also exist with most of the food consumption surveys (Burk and Pao, 1980). A final prerequisite for consumption analysis is that the surveys must contain information on all expenditures,

food and non-food. Non-food expenditures can be collected in summary form; however, they are essential for parameter estimation (Pinstrup-Andersen, 1984).

Few developing countries have been able to afford to conduct specialized food consumption surveys. An informal examination of the FAO's Review of Food Consumption Surveys (1979 and 1983), indicates that most data on food consumption are actually collected as part of general household expenditure surveys. This is suitable for developing countries, where food is by far the largest expenditure, and where survey costs may be a luxury. In fact, countries such as Jamaica adequately incorporate consumption data into their household budget surveys (S. Johnson, correspondence).

The FAO has recommended that food consumption surveys should ideally be part of the general household survey (FAO, 1980). The greatest concern with an integrated expenditure/consumption survey is that the amount of information collected will overwhelm the interviewer and respondent and thus introduce bias as a result of fatigue. The FAO (1980) and the World Bank (Grootaert, 1983) have ultimately seemed to favor reducing survey costs by maintaining a common sampling frame for a core household budget survey which would have specialized modules for information such as food consumption.

#### Individual Dietary Intake

Household budget surveys and food consumption surveys do not inform us of what happens to food once it reaches the household.

Without this information, it is difficult to ascertain the relationship between agricultural policies and health status with a great deal of confidence. Knowledge of the quantity and nutrient content of food consumed by children and pregnant and lactating mothers is especially important for analyzing changes in nutritional status. There is sufficient evidence of the maldistribution of food within many societies (USDA, August 1983) so as to justify additional data collection in this area. Stanley Johnson believes this to be the area of greatest data needs (interview, July 1984). There are many complexities involved in determining the method in which the data should be collected.

A certain amount of information relating household composition to food consumption can be extracted from data in expenditure and food consumption surveys. O'Brien-Place describes four common methods for using household composition data as explanatory variables in regression analysis (1981, p. 47). However, Pinstrup-Andersen has pointed out that methods such as adult equivalency units may be too difficult to employ since, in principle, a different equivalency unit is needed for each nutrient (interview, August 1984).

A second approach to understanding household food distribution is through the use of individual dietary intake surveys. Dietary surveys are distinguished from food consumption surveys in that they attempt to measure actual food intake of individual persons. This is done through an interview-recall method, a food diary, or by actually weighing food consumed at each meal. Once again, the relative validity and reliability of these methods have been exhaustively compared

(see Burk and Pao, 1976). The 24-recall is the method most frequently used in large-scale surveys because of its low cost (Austin, 1976).

The nutrient intakes of individuals can be used in conjunction with derived nutrient prices to estimate individual nutrient demand functions. This is useful information for assessing the consumption and nutritional impacts of agricultural policies. However, there has been little evidence that individuals try to maximize consumption of any nutrients. This type of analysis also alleviates the need for food price variation since "...even at constant prices different households have different derived prices for nutrients." (Johnson, 1983). There are, however, numerous data difficulties involved in food consumption analysis at the level of the individual. The incomes of each household member must be obtained, which is extremely difficult because it includes any transfers between family members, and exchanges of services within the family (Alderman, 1984). A simpler procedure would be to assess the intake of each individual as a function of total household income. Obtaining accurate individual dietary intake also involves many measurement problems. One example is the prevalence in many countries of eating from the same bowl. Also, the daily intake of individuals is subject to great variability. Such difficulties suggest that large scale surveys of intra-household food distribution may be beyond the immediate scope of CEAP-type studies (P. Pinstруп-Andersen, interview).

#### Anthropometry and Other Indicators of Nutritional Status

Although the quantity of food and the quality of the nutrients are the primary determinants of nutritional status, one cannot assume that

dietary intake ensures adequate nutritional status. Various intervening variables can affect and obscure the relationship between intake and nutritional status. Of greatest concern when assessing the effects of agricultural policies is whether the physical environment has been changed in a way which may affect nutrient utilization by the body. Perhaps the most foreseeable occurrence is technology having an effect on sanitation levels, and ultimately, the incidence of disease. Thus, if the purpose of CEAP analysis is to measure the effects of agricultural policies on individuals, then the analysis must include an assessment of nutritional status--the ultimate outcome of consumption changes.

Three types of nutritional status indicators are commonly used: anthropometry, clinical assessment, and biochemical tests. Clinical and biochemical assays are normally prohibitively expensive and must be confined to small scale usage. Perhaps with sufficient funding, relatively simple biochemical tests can be conducted on a large scale. This has been done in the U.S. NHANES surveys and has been linked to food consumption surveys (S. Johnson, correspondence). Only anthropometry has been feasible for large scale CEAP-type surveys. The following appraisal of anthropometry is typical:

As growth is the most sensitive indicator of adequate nutrition, anthropometry is the most useful tool and is accurate for diagnosing nutrient deficits in children (Austin, et al., 1976).

Evers and McIntosh feel that, "...low cost and rapidity...make anthropometric techniques highly suitable for dealing with national samples over time." (1977, p. 193). The praise of anthropometry is

not unanimous. The significance of small stature has frequently been debated. Recently, George Beaton has challenged the widespread reliance on anthropometry on the grounds that there is not clear indication that a deviation in anthropometric status will necessarily accompany a deviation in any other function (Beaton, 1983). For the most part, anthropometry has been an accepted and widely used indicator of nutritional status.

The choice and standard of measurement has been the subject of much discussion; comprehensive reviews are available elsewhere (for example, Habicht, et al., 1979). It is the applicability of anthropometry for CEAP analysis which is of primary concern here. One of the biggest advantages of using anthropometry is that these are data which are frequently available in many schools and health centers in developing countries. It would not be difficult to incorporate such data into CEAP analysis, but it is likely that the available data are not evenly distributed across a country. A more fundamental reservation is that anthropometric measurements are not sensitive enough for policy analysis. It would be extremely difficult to control for factors such as sanitation, education and disease (P. Pinstруп-Andersen, interview). Nevertheless, anthropometric surveys are useful in conjunction with other indicators for a broad assessment of nutritional changes.

#### Health Indicators and Vital Statistics

A high incidence of insufficient food consumption will ultimately show up in high morbidity and mortality rates. These data and other

indirect indicators of malnutrition, such as weights at birth, are frequently available in developing countries, and therefore have potential for use in CEAP analysis. Health indicators are often suggested for use in targeting development programs and projects (Mason, 1982), and for preliminary qualitative evaluations (FAO, 1982). Their usefulness in evaluating consumption effects of agricultural policies is limited by reliability and variability problems with the existing data, and by methodological problems in using the data.

Morbidity rates may not be valid indicators because they are not collected through random surveys. There may be an individual bias in the data since they are generated only when individuals choose to report an illness (Martorell, 1982). It is also believed that the available data are highly inaccurate; deaths and births tend to be under-registered. The methodological problem is similar to the one involved in anthropometrics; it is extremely difficult to isolate malnutrition as a cause of illness or death. Evers and McIntosh conclude that:

...birthweight, morbidity, and mortality statistics must be made more reliable. Even if this should be accomplished, however, validity problems will continue to persist. These indicators reflect the combination of too many factors in addition to malnutrition making it nearly impossible to rely upon them for nutritional planning and policymaking. Reliable indirect nutritional status indicators will always have to be utilized in concert with one or more direct indicators.

## EXPERIENCE WITH DATA UTILIZATION

Researchers have had mixed experiences in being able to obtain data useful for analyzing the consumption effects of agricultural policies. Several recent studies are discussed to provide examples of the type of data available, and how these data have been utilized. Included are several CEAP studies, and one USAID sponsored study conducted by the International Food Policy Research Institute (IFPRI).

### Tanzania

Mitchell Renkow and associates examined the consumption effects of maize policies in Tanzania. Fixed producer prices, subsidized consumer prices, and an overvalued exchange rate resulted in an increased demand for maize and in stagnating levels of production. An increase in the level of concessionary imports was required to meet the shortfall.

Responses to alternative price and marketing policies were evaluated using demand parameters estimated from a subset of data from the 1976/77 Household Budget Survey (HBS). The survey included information on household expenditures, sources of income, and the quantities consumed of the cereal staples and of other major foods. Consumption trends were examined through a comparison with the 1969 Household Budget Survey. The 1969 data included total expenditures for cereals, budget shares, and year-mean retail prices which were used for the calculation of quantities consumed.

Income and own-price elasticities of demand were calculated using the 1976/1977 HBS. For the income elasticities, actual income data were used for Dar es Salaam; total expenditures were used for

other urban areas. The own-price elasticities were calculated using the Frisch technique. A problem with the estimation of price elasticities in Tanzania was the lack of significant price variation.

A model of the maize market in Tanzania is employed to assess the consumption effects of various policy alternatives. These are measured through changes in aggregate and per capita food supply in the affected urban areas. The model uses elasticities of marketed supply which were calculated from a household production model which uses regional farm budgets from secondary sources. Estimates of maize quantities in the official and unofficial markets are used to generate the maize market supply and demand parameters. These market quantity estimates are from regional production statistics and from consumption statistics projected from the 1976/77 HBS. Several assumptions underlie the derived consumption data: quantities demanded were assumed to change from population growth only; all urban parallel market demand is assumed to be met; and, all quantities of official sales are assumed to be consumed by urban dwellers.

By the authors' account, more could have been done if additional data were available from the 1976/77 HBS. Specifically, additional consumption statistics disaggregated by income level were needed. Also, additional consumption data for estimating substitution effects would have been useful for calculating the nutritional impact of various policies.

#### Sudan

To analyze the consumption effects of Sudan's policy of fixed bread and wheat prices, Youngblood, et al., used data from the 1978/79

Household Budget Survey, a 1982 Mini-household Survey of the greater Khartoum area, and available time series data on consumption, imports, production, and prices. The income data in the budget survey were judged to be unreliable; therefore, expenditure rather than income was calculated for three income strata. The aggregate time series data were used to calculate an initial estimate of the own-price elasticity of bread (actually wheat). Consumption was estimated by disappearance; seed and waste estimates were subtracted from national production and import statistics. Per capita flour consumption was regressed on prices which had been deflated by a government food price sub-index. After obtaining the initial estimate of the own-price elasticity of bread from the time series data, the Frisch technique and a Linear Expenditure System were utilized to estimate the remaining own-price elasticities from the expenditure data in the two household budget surveys.

In the Sudan study, the researchers also made use of the time series and expenditure data to evaluate the causes of the increase in bread consumption. The real price of sorghum (a proxy for the price of kisra, a bread substitute) was calculated from government time series data and was found to be a significant determinant of bread consumption. Female labor force participation rates, available from the 1982 Mini-household Survey, were also found to have some correlation with bread consumption. National income data were also examined, and were found to be unimportant in explaining changes in wheat consumption.

### Honduras

Data availability strongly affected the type of analysis completed in the Honduran CEAP project. Two CONSUPLANE surveys were the basis for analysis. The 1977-80 Income and Expenditure Survey included 5,668 households in all regions of the country. In 1979-80, a subsample of 210 households was used for a food consumption survey. The consumption survey was limited to three low-income regions where malnutrition was a suspected problem. Neither the income and expenditure survey nor the consumption survey included actual market prices. Imputed prices were calculated by combining the two surveys, a method found unsatisfactory. The annual report of the project explains:

From the analysis of the questionnaires of both surveys the conclusion was reached that the estimation of the demand relation of the principal alimentary products cannot be made based on the information of the survey "Consumo Real de Alimentos"...as:

It contains only data pertaining to consumed quantities, lacking information as to their price or value.

### Sierra Leone

The Sierra Leone study was unique in examining food consumption for semi-subsistence households using a household-firm model. The data for this study were collected by the 1974-75 Rural Employment Research Project conducted by the University of Sierra Leone. A comprehensive production survey included data on farm and non-farm activities for a one-year period. One-half of the sample was also included in an expenditure survey, although food consumption was not the primary focus. Food consumption was estimated by adding food purchased in the market to estimated consumption from home production,

a residual measure after subtracting sales, feed, and other items from production. With the extremely high percentage of income devoted to food in such economies, this study would have benefitted from a more direct measurement of household food consumption.

Elasticities of demand were calculated using a weighted average price of market purchases and home production. Retail prices were used for market expenditures while farm gate prices were used for home produced commodities. Consumption, including derived calorie intake, was analyzed in relation to three classes of variables: prices and expenditure, household characteristics, and sources of income. The detailed production data allowed the investigators to examine the hypothesis that the form of income may affect the quantity and quality of consumption.

#### Egypt

The International Food Policy Research Institute has prepared several reports on Egypt's food ration and subsidy system, including a study of its consumption effects. The data which were analyzed were collected specifically for this study. They include: a nationwide rural survey which had a production and income questionnaire, and a food purchase and consumption survey. About one-third of the rural sample was surveyed a second time to capture seasonal effects. An urban survey was conducted using a questionnaire similar to the one in the rural consumption survey.

This study shows how data, which are collected with specific research needs in mind, can add greatly towards creative policy

analysis. For example, consumption data were identified by the source of purchase or production. This enabled researchers to answer policy questions of greater specificity, such as: how much subsidized bread is used for human consumption, and how much goes to animals or waste? Another example of their thorough data utilization was the adjustment of protein consumption for amino acid limitations. This procedure is infrequently conducted in economic analyses.

### Conclusions on Case Studies

The four CEAP studies provide examples of how consumption analysis can be constrained by deficiencies in available data. The Tanzania study was limited by a lack of price variation. This is an obvious problem when analyzing price controls. A lack of price data was the problem in Honduras. The Sudan and Sierra Leone studies had to rely on disappearance as the measure of individual food consumption. Reviews of the CEAP studies point to data availabilities as one of the most limiting factors in the policy analysis (Evenson, 1983 and Johnson, 1983). Stanley Johnson concludes that:

...the requirements for evaluating consumption and nutrition impacts of agricultural policies seriously stretched the information available in existing time series and the cross section data bases and the theory.

The CEAP emphasis on using previously collected data highlighted the problem of data inadequacy in many developing countries. The Egypt study contrasts with the CEAP studies in that the data were collected in surveys undertaken specifically for the project. This enabled the researchers to answer much more specific policy questions. There are

evident trade-offs between the costs of new data collection and the type of policy analysis feasible. This points to the goal of improving national data collection capabilities. The purpose of this paper is to review the types of data most commonly available in developing countries and to assess their shortcomings for use in analyses of the consumption effects of agricultural policies. The recommendations which follow were determined after reviewing the literature and speaking with numerous food consumption analysts. The emphasis is on marginal improvements in the types of data collected and the ability of these improvements to help overcome some of the analytical problems described in this paper.

## CONCLUSION

A variety of data are needed in order to estimate the many relationships which link agricultural policies to their consumption and nutritional effects. The available consumption data have been used effectively in CEAP and other consumption studies. However, these studies could have produced stronger conclusions had the data contained additional pieces of information. The most important recommendations for improving data sources are listed below; three more general recommendations follow.

Household budget surveys and food consumption surveys are the most common data sources for food consumption analysis. These surveys can be improved by ensuring sufficient disaggregation of household data by income and other socioeconomic characteristics. Furthermore, the expenditure data should be sufficiently disaggregated by commodity type. In order to capture seasonal variations, the surveys should be conducted over a period of one year. Food quantities and/or food prices are also essential information for consumption analysis.

In order to improve the ability to assess consumption changes of vulnerable groups, it is recommended that CEAP surveys and national surveys pay an increasing amount of attention to individual dietary intake data. Also, because nutritional status is the ultimate outcome of food consumption, an effort should be made to incorporate relatively inexpensive anthropometric surveys in CEAP analysis.

Three general recommendations can be made in order to improve the quality of data at the national level. Integration of both the types

of data collected and the instruments used in data collection can help reduce survey costs while making the data usable for additional purposes in policy analysis. Both the FAO (1980) and World Bank researchers (Booker et al., 1980) have emphasized the usefulness of maintaining integrated data bases. This does not imply that comprehensive surveys should be undertaken to collect information on all aspects of family income, expenditure, and health. However, by using a common sampling frame with a core questionnaire and various modules, much data manipulation can be reduced when analyzing the many linkages involved (Grootaert, 1983).

A second recommendation is the need for comparability of data bases over time. Harold Alderman notes that a number of countries have now had significant experience in conducting national surveys (Alderman, 1984). Analysis of the consumption effects of agricultural policies would be greatly enhanced if survey information was comparable over time. The transformation of cross-sectional data which includes the requisite levels of disaggregation into time series data would help resolve the critical problem of insufficient price variation. The extent of analysis currently done with most expenditure and consumption surveys is limited by insufficient price variation.

A final recommendation is for increased dialogue between data users and data producers (Grootaert, 1983). The high cost of food consumption surveys has often limited researchers to household expenditure statistics in their efforts to conduct food consumption analysis.

Data needs should be communicated to ensure that the bare minimum of data for consumption analysis, such as quantities or prices and disaggregation of food staples, will be included.

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## BIBLIOGRAPHY

- Alderman, Harold. "Impact of Income and Food Price Changes on Food Acquisition by Low-Income Households." Submitted to USAID Office of Nutrition by the International Food Policy Research Institute, Washington, D.C., July 1984.
- Alderman, Harold and Joachim von Braun. The Effects of the Egyptian Food Ration and Subsidy System on Income Distribution and Consumption. Washington, D.C.: International Food Policy Research Institute, July 1984.
- Austin, James E., et al. "Urban Malnutrition: Problem Assessment and Intervention Guidelines." Submitted to the World Bank by Harvard University, September 1976.
- Beaton, George H. "Energy in Human Nutrition" Perspectives and Problems." Nutrition Reviews vol 41 (1983) pp. 325-340.
- Booker, William, Parmeet Singh, and Landing Savane. "Household Survey Experience in Africa." Living Standards Measurement Study, Working Paper No. 6. Washington, D.C.: World Bank, Oct. 1980.
- Burk, Marguerite C. "Nutritional Considerations in Agricultural and Rural Development Projects." Rome: FAO, 1982.
- Burk, Marguerite C. and E.M. Pao. Analysis of Food Consumption Survey Data for Developing Countries. Rome: FAO, 1980.
- Burk, Marguerite C. and E.M. Pao. "Methodology for Large-Scale Surveys of Household and Individual Diets." Home Economics Research Report No. 40, Agricultural Research Service. Washington, D.C.: U.S. Dept. of Agriculture, 1976.
- Casley, D.J., and D.A. Lury. Data Collection in Developing Countries. Oxford: Clarendon Press, 1981.
- Chander, R., C. Grootaert, and G. Pyatt. "Living Standards Surveys in Developing Countries." Living Standards Measurement Study, Working Paper No. 1. Washington, D.C.: World Bank, 1980.
- Evenson, Robert E. "A Review of the Consumption Effects of Agricultural Policies Project Findings: Data, Methods, Models, and Conclusions." Washington, D.C.: USDA Nutrition Economics Group, October 1983.
- Evers, Susan and W. Alex McIntosh. "Social Indicators of Human Nutrition: Measures of Nutritional Status." Social Indicators Research 4 (1977) pp. 185-205.
- FAO. "Integrating Nutrition into Agricultural and Rural Development Projects." Rome: FAO Food Policy and Nutrition Division, 1982.
- FAO, Asia and Pacific Commission on Agricultural Statistics. "Draft Programme of Statistics of Food Consumption and Nutrition." Rome, 1980.

Ferroni, Marco A. "Large-Sample Monitoring of Household Expenditures and Food Consumption in Partial Subsistence Economies: A Methodological Note." Washington, D.C.: USDA Nutrition Economics Group, April 1980.

Fleuret, Patrick and Anne Fleuret. "Nutrition, Consumption and Agricultural Change." Human Organization, Vol. 39, No. 3 (1980), pp. 250-260.

Grootaert, Christiaan. "The Conceptual Basis of Measures of Household Welfare and their Implied Survey Data Requirements." The Review of Income and Wealth, series 29, no. 1 (March 1983), pp. 1-21.

Habicht, Jean-Pierre, Charles Yarbrough, and Reynaldo Martorell. "Anthropometric Field Methods: Criteria for Selection." in D.B. Jelliffe and E.F.P. Jelliffe, eds. Nutrition and Growth. New York: Plenum Press, 1979.

Johnson, Stanley R. "A Review of the Consumption Effects of Agriculture Policies: Uses and Analyses of the Consumption Data." Washington, D.C.: USDA Nutrition Economics Group, November 1983.

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

Mason, John B. "Minimum Data Needs for Assessing the Nutritional Effects of Agricultural and Rural Development Projects." FAO, ACC-SCN Working Group on Nutrition in Agricultural and Rural Development. Submitted by Cornell Nutritional Surveillance Program, Cornell University, October 1982.

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

Pekkarinen, Maija. "Methodology in the Collection of Food Consumption Data." World Review of Nutrition and Dietetics, Vol. 12, pp. 145-171.

Permanent Secretariat of the General Treaty of Economic Integration of Central America. "Annual Report, Study of the Effects of Agricultural Development Policies on Food Consumption in Central America." July 1983.

Pinstrup-Andersen, Per. "Estimating the Nutritional Impact of Food Policies: A Note on the Analytical Approach." Washington, D.C.: International Food Policy Research Institute, 1983.

Pinstrup-Andersen, Per. "Introducing Nutritional Considerations into Agricultural and Rural Development." U.N. Administration Committee on Coordination - Subcommittee on Nutrition. New York: United Nations, July 1981.

Pinstrup-Andersen, Per. "Nutritional Consequences of Agricultural Projects: Conceptual Relationships and Assessment Approaches.: World Bank Staff Working Paper No. 456. Washington, D.C.: The World Bank, April 1981.

Renkow, Mitchell A., et al. "The Potential Effects of Alternative Structures and Pricing Policies in the Markets for Maize in Tanzania." Raleigh, N.C.: Sigma One Corp., Feb. 1983.

Roe, Terry. "The New Household Economics and Its Use in Food Policy Analysis in Developing Countries." Washington, D.C.: USDA Nutrition Economics Group, Oct. 1983.

Sahn, David E. Draft, "An Analysis of Food Consumption and Expenditure Patterns in Sri Lanka." Washington, D.C.: USAID, June 1984.

Simmons, Emmy. "Budget, Expenditure and Consumption Surveys in Developing Countries: What, Why, and How." Washington, D.C.: USDA Nutrition Economics Group, July 1981.

Smith, Victor E., et al. "Food Consumption Behavior: Rural Sierra Leone and Kano State, Nigeria." East Lansing, MI.: Department of Agricultural Economics, Michigan State University, 1982.

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

USAID Africa Bureau. Draft, "Nutrition Guidelines for Agriculture and Rural Development." Washington, D.C., November 1983.

USAID Bureau for Program and Policy Coordination. "Nutrition: A.I.D. Policy Paper." Washington, D.C., May 1982.

USAID Office of Nutrition, Bureau for Science and Technology. Project Paper, "Consumption Effects of Agricultural Policies." Washington, D.C., November 1981.

USDA Nutrition Economics Group. "Final Report on the Mid-Project Workshop on the Consumption Effects of Agricultural Policies." Washington, D.C.: USDA, November 1983.

USDA Nutrition Economics Group. "Intra-Family Food Distribution: Review of the Literature and Policy Implications." Washington, D.C., August 1983.

Visaria, Pravin. "Poverty and Living Standards in Asia: An Overview of the Main Results and Lessons of Selected Household Surveys." Living Standards Measurement Study, Working Paper No. 2. Washington, D.C.: World Bank, October 1980.

Yetley, Mervin J., and Sovan Tun. "Household Demand Analysis for Assessing Nutritional Impact of Development Programs." Washington, D.C.: USDA Economic Research Service, August 1981.

Youngblood, Curtis E., et al. "Consumption Effects of Agricultural Policies: Bread Prices in the Sudan." Raleigh, N.C.: Sigma One Corp. April 1983.