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# ADDING A FOOD CONSUMPTION PERSPECTIVE TO FARMING SYSTEMS RESEARCH

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## INTRODUCTION

This paper will suggest ways in which a food consumption perspective can be better integrated into each stage of the farming systems methodology. These suggestions are derived from a review of the literature focused on the topic (Tripp, 1982, 1983; Whelan, 1982; K. DeWalt, 1983; Smith, 1983, etc.) as well as the author's own experience with incorporating consumption concerns into farming system fieldwork. The paper will not attempt to outline a methodology for conducting separate, full-blown nutritional studies, but rather will focus on how food consumption concerns can be integrated into production oriented FSR procedures. Special emphasis will be given to the linkages between agricultural production and food consumption. Taking these linkages into account, this paper will address ways in which consumption consideration can and should be incorporated in target area selection, reconnaissance and formal diagnostic surveys, recommendation domain definition, on-farm research, evaluation, and extension. Recent FSR projects which have attempted to implement such procedures will also be identified.

Before proceeding with the discussion, it is important to emphasize why this paper focuses on a food consumption perspective rather than nutrition. The primary reason is that agricultural production is more directly linked to food consumption than to nutrition. A number of factors other than access to food may have an impact on the nutritional well-being of the farm family. For example, poor sanitation and/or exposure to disease could adversely impact nutritional status. Because of these confounding influences, FSR projects which bring about improvements in food consumption may not always improve nutrition. Thus, FSR projects should not be held accountable for nutritional consequences outside of their control. Since food consumption is more directly influenced by FSR production activities, it is more reasonable to expect FSR projects to take such considerations into account.

## CAN CONSUMPTION CONCERNS BE INTEGRATED INTO FARMING SYSTEMS RESEARCH?

The FSR approach provides an excellent framework within which to integrate consumption concerns into agricultural development. As it is based upon the analysis of production possibilities (the technical element), FSR identifies the potential livestock and crop enterprises which are technically feasible in such an environment. Through its focus on exogenous factors, it identifies the social, economic, and political institutions outside the control of the household which place limits on livestock and crop enterprise potential (Gilbert, et al., 1980). Exogenous factors such as community structures, norms and beliefs, as well as the marketing systems can have limiting effects on consumption patterns. Finally, its concentration on endogenous factors allows for

the identification of the available resources (land, labor, capital, and management) which are under the household's control. The relative scarcity of such resources can limit production/consumption alternatives.

If the aim of FSR is to increase the welfare of farm households as defined by the goals of the farmers themselves, then both consumption and production considerations must be taken into account. Promotion of production alternatives which maximize income will not always maximize the farm household's welfare. FSR practitioners should attempt to understand how each proposed production recommendation will affect household consumption. This would help to ensure that recommmendations optimize nutritional benefits and minimize adverse impacts, thereby enhancing the well-being of the entire farm family.

Greater understanding of the interrelationship of production and consumption decisions by households can begin by focusing on the linkages between them. Certain resource allocation decisions can influence food consumption levels and patterns, and vice versa. As Smith, et al., point out, "decisions concerning food consumption form part of a unified decision-making process which governs production decisions as to the extent to which households shall depend upon the market (either as a source of income or as a source of food) and decisions as to the use of household labor in farm, non-farm or off-farm production activities" (1979). Understanding these linkages is essential if we wish to predict whether proposed recommendations will be accepted or rejected by farm households and what will be their likely effect on household consumption.

The following discussion focuses on some of these linkages. Taking these linkages into account, cost-effective data collection procedures will then be proposed which can be implemented at each stage of the research process to better integrate consumption considerations in FSR activities.

## PRODUCTION-CONSUMPTION LINKAGES

Although research in this area is fairly recent, a number of production-consumption linkages have already been identified in the literature. Some of the more important aspects of production which are closely linked to consumption include: 1) seasonality of production (seasonality of food availability, malnutrition, human energy expenditure, incidence of disease, and terms of trade for the poor); 2) crop mix and minor crops (subsistence vs. cash, non-food crops); 3) income (regularity, kind, and recipients); 4) role of women in production; 5) crop-labor requirements; and 6) market prices and their seasonality. Although many of these linkages are strongly interrelated, they will be addressed separately to highlight their importance. In this discussion, strategies will be proposed which might overcome some of the adverse effects of these linkages.

### SEASONALITY OF PRODUCTION

Agricultural production has a seasonal dimension in most places in the world. This seasonality has significant implications for low-income

farmers attempting to secure adequate food supplies throughout the year. Farmers attempt to implement strategies which ensure adequate food supplies by making the best use of wet and dry seasons (Longhurst, 1983). However, many farmers suffer every year through a period of deprivation just before harvest often referred to as the "hungry season" (Longhurst, 1983; AID, 1982). The hungry season has a number of adverse effects on the nutritional well-being of low income farming households. These include the following:

1) Food shortages tend to occur during the peak labor period of the farming cycle when energy expenditures are at their highest (field preparation and weeding operations) (Longhurst, 1983; Smith, 1983; Chambers, 1979).

2) Periods of stress have a negative impact on the nutritional status and growth pattern of children (Longhurst, 1983; Smith, 1983).

3) Adults may lose as much as 7% of their body weight during the hungry season (Longhurst, 1983).

4) A higher incidence of disease (i.e., diarrhea, malaria, guinea worm, etc.) coincides with food shortages immediately before harvest (Longhurst, 1983; Chambers, 1979).

5) During pre-harvest food shortages, food prices rise and short-term loans are obtained at high interest rates to purchase food. At harvest, the bulk of the crop is sold immediately after (when the prices are low) because they need to pay back loans. Thus, the terms of trade turn against the poor (Longhurst, 1983; Chambers, 1979).

6) To meet their daily consumption needs, some farmers may be forced to sell their labor to other farmers. This pattern reduces labor input into their own fields, thereby lowering production of food crops. This process leads to food shortages in the coming pre-harvest season.

These periods of deprivation every year serve to perpetuate the poverty of the poor year-round (Longhurst, 1983). These households lack the technology to cut back on energy expenditure, the money or time to receive medical treatment, and the food reserves to cushion them through periods of scarce food supplies (Longhurst, 1983). They are trapped in a cycle of poverty which often prevents them from meeting their daily consumption needs.

If FSR programs are to have a greater potential for a positive impact on the comsumption levels of low-income farm households, the seasonal dimensions of production, food availability and malnutrition must be taken into account. Ways must be sought which make food available when supplies are low. To do this effectively, FSR teams should first assess whether seasonality is a a problem in a particular recommendation domain. Second,, the FSR team should consider the dimension of the "hungry season" in any recommended change in the amount

of labor needed to conduct field activities at planting and pre-planting time. Most farmers recognize the limitations the hungry season places on labor quantity and quality, and adjust farming practices accordingly (S. Poats 1984, personal communication).

Research should begin by focusing on the timing and extension of production as well as preservation and storage of food. Some possible strategies to overcome the detrimental effects of seasonality are presented in Table 1.

## CROP MIX AND MINOR CROPS

According to studies conducted in traditional societies, farm households have food production systems which make use of a wide variety of staple and non-staple food. In addition to cultivating minor crops such as vegetables, minor grains, tuber, legumes, and fruits, they collected a wide range of wild plants including leafy greens, fruits, roots, and mushroom (Fleuret and Fleuret, 1980). These foods supplemented the diet with key nutrients year round and may have provided as much as 15-20% of the total energy intake (Longhurst, 1983). During pre-harvest periods when traditional staple foods were usually in short supply, these minor foods were an essential input into farmers' diets (Longhurst, 1983).

In addition to a tremendously diversified diet, traditional small farmers reduced levels of risk and smoothed out irregularities in food supply by following multi-plot and multi-crop production strategies (Fleuret and Fleuret, 1980; Brokensha and Riley, 1978; Neitchman, 1973). These risk-averse strategies were followed in order to ensure that subsistence needs were met.

Presently, although many societies still have diversified diets and follow similar production strategies as those previously described, very few societies are purely subsistence oriented. Virtually every society in the world today is integrated into regional, national, and international markets (DeWalt, 1983). This integration has affected consumption patterns and preferences (both food and material goods) as well as crop production decisions. Non-food cash crops are becoming widely grown as well as a number of non-indigenous food staples and vegetables which may be sold. Although the extent of the adoption of cash crops varies, a number of trends associated with their adoption have arisen which could have detrimental consumption effects. Some of the trends worth noting include the following:

1) Commercial production of cash crops can lead to a decline in crop diversity thereby limiting the range of possibilites for food production (Reutlinger, 1983). Supplementary non-staples may be deleted from crop inventory putting the household at greater risk during pre-harvest periods when staple foods are in short supply (Fleuret and Fleuret, 1980).

2) Non-food cash crop production can exaggerate seasonal cycles of plenty and want (Fleuret and Fleuret, 1980).

3) Production of cash crops involves more risk than production for home consumption (Wharton, 1971). The risks associated with the production of subsistence crops are entirely production risks, whereas, the risks associated with cash crops are production as well as market related (Reutlinger, 1983; DeWalt, 1983). This may explain why some farmers may limit the time and land they are willing to devote to cash crops despite project desires to the contrary (Pines, 1983).

4) Commercial crop production can eliminate nutritious wild plants through the use of herbicides to control weeds (DeWalt, 1983; Messer, 1972).

5) Increasing allocations of land for non-food cash crops may decrease the land available for food crops. This could result in shorter fallow periods for land grown in food crops thereby lowering production year after year (DeWalt, 1983; Stavrakis and Marshall, 1978). This process is currently occuring in the Sudan and Liberia.

6) Non-food cash crops are usually introduced to and grown by male farmers in households. Although females may also grow non-food cash crops, they are usually responsible for the cultivation of food crops, particularly in parts of Africa. Since technical assistance and inputs are generally oriented towards the male farmers growing non-food cash crops, women as producers are often ignored (Longhurst, 1983).

7) As farm families shift from subsistence production to commercial production, they may experience malnutrition or undernutrition during this transitional period (Fleuret and Fleuret, 1980; Smith, 1983). This outcome often arises when families inadequately adjust to the substitution of cash purchased food for home produced food.

8) Farmers who produce their own supplies of food, store food in bulk after harvest. Farmers who purchase food with money earned from non-food cash crop sales do not usually purchase food in bulk after harvest when food is at its lowest price. Rather, they tend to buy food throughout the year in small quantities even though prices drastically rise as the season progresses. Thus, the positive income effects of shifting from subsistence to cash crop production are reduced. This difference in food securing strategies between food producers and non-food producers has critical nutritional implications (Reutlinger, 1983; DeWalt, 1983).

9) If an entire community or region shifts from producing food to non-food cash crops, local food supplies will become more limited and increase in price (Reutlinger, 1983; AID, 1982). Thus, individual household changes in production can have a cumulative effect on food availability. This could result in the transformation of an area from being self-sufficient to being a food importing area (Reutlinger, 1983). If regional

or national markets are inefficient or unstable, this area could become nutritionally vulnerable.

10) The introduction of non-food cash crops into a community may lead to the breakdown of traditional food sharing networks (DeWalt, 1983; Pines, 1983). In addition, social stratification may increase as some individuals who control the new technology and surpluses attempt to gain at the expense of the smallest landholders (DeWalt, 1983).

11) Project appraisals reviewing proposed cash cropping interventions tend to overestimate the positive income effects of cash crops and underestimate the cost of potential declines in production of food for home consumption (Reutlinger, 1983). This leads to overestimation of the nutritional benefits which farmers are supposed to receive by adopting cash crops (Reutlinger, 1983).

Although these negative consumption effects can occur through the introduction of cash crops into traditional societies, this does not mean farm families in near subsistence economies should abandon cash cropping. Anthropologists and nutritionists have been too critical of cash crops without offering a suitable alternative for governments to earn badly needed foreign exchange (Longhurst, 1983). Aside from their high market return, the attractiveness of cash crops stems from the fact that they tend to be more responsive to inputs such as water and fertilizer than food crops (Reutlinger, 1983). In addition, the productivity of land and labor seem to be higher when allocated to the production of cash crops (Reutlinger, 1983).

Further, cash crops can be regarded as complementary to food crops (Longhurst, 1983). The income generated from such crops can supplement subsistence production with purchased foods if market supplies are sufficient and reliable. Cash crops may also allow the farmer to pay for inputs such as fertilizer which can increase the production to all crops in the rotation. Farm families also have need of cash itself for items they cannot "produce" for themselves, such as metal tools, medicine, and education.

Care must be taken to ensure that FSR programs designed to introduce cash crops have carefully assessed the impact such crops may have on food crop production and the availability of food (Longhurst, 1983). Specifically, the FSR team should assess the effect of cash crop promotion on the availability and prices of food in local markets. If the cash crop is food, then the same exercise is necessary to ensure that complementary food items will be available locally. Where feasible, the FSR team (or planners operating from a farming systems perspective) should provide suggestions as to how to encourage marketing of food crops locally from other regions. The recommended cash crop mix can be assessed on the basis of whether it limits food crop variety, and whether food versus non-food cash crops might be preferable. In this way, the risk of a negative impact on consumption can be minimized. At the same time, farmers should be encouraged to maintain the production of food crops for home consumption. Farmers who produce some or all of their own

food avoid some of the risks associated with fluctuating and inefficient markets. Likewise, farmers should be encouraged by FSR projects to maintain diversified diets because of the positive nutritional benefit accruing from such diets. One factor inhibiting project promotion of minor crops is the reluctance of international donors to invest in such crops because of their low market return (Longhurst, 1983). The potential of these crops as exports is limited due to their perishability and low demand (Longhurst, 1983). Ways should be sought to overcome these biases. For instance, emphasis could be placed on the high positive consumption returns of these crops in benefit-cost ratios (Reutlinger, 1983).

The interrelationships between cash crops (food and non-food), food crops (both staple and minor crops) and consumption can be complex, and should be thoroughly investigated in FSR projects. Taking some of this complexity into account, Table 2 list several possible strategies which could be expected to result in positive consumption effects.

INCOME

Although the linkage between income and consumption is strongly related with crop mix (e.g. cash crops) and seasonality, there are several aspects about income which can be taken into account separately. Income can have an impact on consumption levels depending on how regularly it is received, what form it is in and who is the recipient in the household (AID/Africa Bureau, 1984). The possible effects which income can have on consumption include the following:

1) The regularity in the flow in income tends to be a more important determinant of nutritional status than the total amount (AID/Africa Bureau, 1984; Pines, 1983). Lump sum payments for cash crops often lead to inappropriate expenditures on non-food items which could endanger the household's nutritional well-being as the season progresses (Katona-Apte, 1983; AID, 1982). It is often difficult for households to adjust to spending money on food, and to save enough to carry them through the next harvest season (Katona-Apte, 1983).

2) The appearance of excess cash may (temporarily) drive up the price of food in a community or region (Fleuret and Fleuret, 1980).

3) When income is in the form of food rather than in equivalent amounts of non-food crops or wages, there is a greater likelihood that consumption will increase (AID/Africa Bureau, 1984). When cash income replaces food income, there is a greater chance that a larger portion of the household budget will be spent on non-food items (AID, 1982a).

4) When women are the recipients of income, more of the income is spent on food than when men are the recipients (Katona-Apte, 1983; Bender, 1967; Guyer, 1980; Kumar, 1971; Tinker, 1979; Tripp, 1982; AID, 1982a). Women are less likely to make

non-food purchases with earned income because of their household responsibilities for food cultivation, preparation, and childcare duties (Pines, 1983; Savane, 1981).

Persons planning and managing FSR programs should be aware of these income effects when developing research strategies. Many of the possible strategies proposed for the effects of seasonality and crop mix (Tables 1 and 2) are also applicable here. For instance, one way to decrease seasonal fluctuations in income would be to generate opportunities for off-farm employment (AID/Africa Bureau, 1984). Similarly, the form which the income stream takes can be influenced by the farm household if they invest in both food crops and cash crops. Finally, development projects which include women and crops primarily grown by women would be most likely to have a positive impact on consumption.

## THE ROLE OF WOMEN IN PRODUCTION

The production activities of women play a significant role in the nutritional well-being of most farm households. As Longhurst points out, "in rural economies, women are the pivot between production and consumption" (1983). Some of the interrelationships between women's activities and consumption include the following:

1) Women are usually responsible for growing food crops in many parts of the world, especially Africa. In addition most of the income women receive is used for food purchases (Katona-Apte, 1983; Pines, 1983; Smith, 1983; Longhurst, 1983). It has been estimated that women's income is twice as important in determining the nutritional status of children as men's income (AID, 1982a).

2) It appears that children of working women are less likely to be malnourished than children of non-working women (AID, 1982a).

3) Cash crop interventions which increase the labor demands of women may result in a change in cooking habits (Fleuret and Fleuret, 1980). Quicker, less nutritious preparation techniques may be substituted for more nutritious traditional methods of preparation (Knuttson, 1972). In addition, women may resort to preparing only one meal a day (Katona-Apte, 1983). Foods that are prepared long in advance are at risk of becoming contaminated; children, anyone who is ill, the elderly and the undernourished are most likely affected by this food spoilage (Longhurst, 1983; Katona-Apte, 1983).

4) Increasing the agricultural labor demands of women through cash crop development programs may lead women to plant less labor intensive and less nutritious food crops as a substitute for more nutritious but more labor intensive food crops (Fleuret and Fleuret, 1980). For instance, cassava may be substituted for yams (Idusogie, 1969).

5) Cash crops which increase the agricultural labor demands of women may give women less time to devote to childcare and breast feeding (Katona-Apte, 1983; AID/Africa Bureau, 1984). This could have significant nutritional consequences because the quality of care and the food intake tend to go down when sibling or elderly members of the family are taking care of the children (AID, 1982).

6) Women are often neglected by agricultural extension services, while men are usually the beneficiaries of such services. This tendency could lead to a reduction of family food production, and increased male control over income (Pines, 1983; Boserup, 1971). This pattern was observed in Tanzania (Knuttson, 1979).

Understanding the patterns and extent of female participation in agriculture is essential for planning FSR programs if negative consumption effects are to be minimized. Such data could be collected during the diagnostic phase of FSR projects. Those individual research activities which have potential positive impacts on both the well-being and income earning capacity of women should be encouraged (Longhurst, 1983). Taking this into consideration, Table 3 lists some possible strategies.

CROP LABOR REQUIREMENTS

In addition to the adverse consumption effects associated with increased labor demands on women, other effects associated with new crop labor requirements are worth noting (Figure 1). These include the following:

1) The introduction of new cash crops may require more human energy input than previously grown crops (Fleuret and Fleuret, 1980). This increased energy requirement may be greater than the value of the output (Smith, 1983). Gross and Underwood (1971) found such a situation existing in Northeastern Brazil where sisal was being introduced as a cash crop.

2) The increased energy demands imposed on some members of the household through the introduction of new cash crops may have deleterious nutritional effects on intrahousehold food distribution patterns (Fleuret and Fleuret, 1980; USAID/Africa Bureau 1984). If male members of the household require more food to meet the labor demands of the new crop, less food may be available for women and children (Katona-Apte, 1983; Smith, 1983; Gross and Underwood, 1971).

Farming systems researchers should attempt to assess the labor impacts of new technologies which they are introducing. Such labor assessments can be done during on-farm testing so that researchers can determine the probable impacts on consumption should the household choose to adopt the technology under investigation. Careful consideration should be given to changes in intrahousehold food distribution patterns which may result from these strategies.

## MARKET PRICES AND SEASONALITY

As stated earlier, limited resource farmers in most areas of the world are integrated into regional, national, and international markets. Thus, market prices of food crops as well as cash crops have an impact on the consumption patterns of small farm households. Price fluctuations due to world market buying trends, national market policies and seasonal variation can place the small farm family nutritionally-at-risk. Some possible effects which marketing trends can have on consumption include the following:

1) As stated earlier, retail food prices tend to peak before harvest and then drop immediately after harvest. These high retail prices coincide with farmer food shortages. To purchase food, loans are taken out. These loans must be paid back immediately after harvest when crop prices are at their lowest. Thus, the terms of trade do not favor the poor (Longhurst, 1983).

2) Urban populations can pay higher prices for scarce nutritional foods such as meat, thereby removing these foods from the diets of poor farmers (Fleuret and Fleuret, 1980). This marketing pattern was recently observed in Liberia (personal observation, July 1984). Wild meat which previously had been a major protein source for small farmers in a particular region was being sold in Monrovia for cash.

3) Food imports may adversely affect the prices of crops grown locally (Marchione, 1977). This trend was observed in Jamaica.

4) Food stocks can be hoarded by local big merchants and middle men to drive up prices (Longhurst, 1983).

5) Governments in most developing countries attempt to keep farmgate prices of export crops low in order to increase their foreign exchange earnings (Reutlinger, 1983). This has had the adverse effect of keeping the purchasing power of small farmers low when food prices are high (AID, 1982a).

6) Market inefficiencies and periodic market instability can place a region that is dependent on market purchased food in a vulnerable position. Unless distributive marketing networks and prices are stable, small farmers will be nutritionally-at-risk (Fleuret and Fleuret, 1980).

In most FSR activities, not enough attention is given to markets. A good understanding of the local markets will indicate whether a crop that is being introduced has the potential to be sold. Likewise, if new crop mixes are advocated which partially displace food crops with cash crops, the researchers should take into account whether marketed food will be consistently available to avoid adverse consumption effect. Thus, a good marketing study will be useful for prescribing appropriate crop promotion

programs and should be a prerequisite to any proposed modifications to existing farming systems.

Although this paper has attempted to deal with a number of linkages between production and consumption, it has not addressed them all, nor has it addressed the many other factors which contribute to malnutrition. The primary purpose of the preceeding discussion was to demonstrate how complicated these linkages are and how important it is to be aware of them. An understanding of these interrelationships is essential if FSR is to produce new information which will enhance the well-being of small farmers. Farming systems researchers should be cognizant of the unexpected effects which newly introduced production alternatives could have on consumption. To obtain such an awareness, consumption concerns should be integrated into every phase of the FSR process. This does not mean that full-blown consumption studies should be conducted every time a farming systems project is implemented. Rather, cost-effective date collection techniques should be incorporated into existing data collection procedures. How this can be done is the topic of the next section of this report.

## INCORPORATING A FOOD CONSUMPTION PERSPECTIVE INTO THE STAGES OF THE FARMING SYSTEMS RESEARCH PROCESS

To better integrate a food consumption perspective into FSR activities, cost-effective data collection procedures which focus on such considerations can be included in target area selection, diagnostic surveys, (reconnaissance surveys, ethnographic surveys, and formal surveys), recommendation domain definition, on-farm research, evaluation, and extension. The following discussion will address the kinds of data that can be collected at each stage, beginning with target area selection. This information is summarized in Table 4.

### TARGET AREA SELECTION

The first step to take to ensure that FSR projects will have a positive impact on the well-being of participating farmers is to integrate consumption-related criteria into target area selection. By making sure that nutritionally-at-risk populations are included in the research target area, there is a greater chance that production increases brought about by the project will improve consumption levels (Mason, 1983). Although flexibility in the selection process is usually limited by program mandates and government policy directives, a balance can be struck between potential nutritional benefits and agricultural returns.

Since extensive consumption and/or nutrition surveys are unlikely to be included in an FSR project's implementation plan, existing data sources may be used to aid in area selection. Secondary data sources include government administrative and census documents as well as reports from previous studies conducted in the area (Mason, 1983). The types of data needed for each alternative area include: 1) information on ecological conditions (physical and biological); 2) information on agricultural characteristics (main crops grown, size of holdings, yields,

etc.); and 3) indicators of nutritional conditions. Nutritional indicators might include: 1) clinic derived data (records of malnutrition, birthweights); 2) census derived data (mortality rates, quality of housing, water supplies, literacy rates); 3) school records (height and weight information for anthropometric measures); 4) household budget surveys; and 5) previously analyzed consumption surveys (Mason, 1983). In addition to these secondary data, the research team may want to visually examine potential areas to estimate the nutritional level of each area (D. Galt, 1984, personal communication). This simple approach could help cut down on the amount of secondary data which is needed as well as help verify the data which is used.

Although it is not necessary to have information on all these variables, several indicators should be used to ensure that a problem area is properly identified. The particular combination of indicators used will depend on the kinds and quality of data available, the time and resources allocated to identify and collect such data, and the specific objectives of the project. The type of data and method of analysis chosen should be compatible with that performed on other areas of concern.

Once these data have been assembled, they can be tabulated by area to determine which areas are nutritionally vulnerable but also have some agricultural potential. Although a very poor agricultural region may benefit from the introduction of new foods or "simple" system improvements, the government could probably not base most of its agricultural development on such regions agricultural potential. The target area finally chosen should balance nutritional considerations with those criteria specified by government policy directives and project mandate (if the latter is applicable).

Recently, some efforts have been made to integrate a consumption/nutrition perspective more systematically in target area selection for agricultural projects. Rafferty, et al. (1982), combined nutritional status indicators with agroeconomic information in classifying rural Kenyan population groups. In Papua New Guinea, Heywood, et al. (1983), have classified areas using a combination of variables including physical environment, food production systems, and nutrition. Using this classification scheme, development planners in New Guinea can more effectively orient agricultural development projects towards areas that are nutritionally-at-risk (Heywood, 1984, personal communication). Both of these efforts indicate that it is feasible to make targeting efforts more responsive to consumption concerns.

## THE DIAGNOSTIC STAGE -- PROBLEM IDENTIFICATION

The diagnostic stage of FSR may consist of three substages, which include a reconnaissance survey, and ethnographic study and a formal diagnostic or verification survey. Some or all of these procedures will be implemented, depending upon the project's resources and the existing information . Each procedure will be discussed separately.

Reconnaissance Surveys. Reconnaissance surveys (rapid rural appraisal, sondeo, etc.) are quick, informal, cost-effective surveys that

attempt to identify the key characteristics of the farming systems found within the target area. They represent an intermediate step between using existing data and conducting formal surveys (Mason, 1983). Reconnaissance surveys are usually implemented at the beginning of an FSR project to familiarize the research team with the key constraints facing farmers within an area. Thus, they provide descriptive information as well as identify opportunities for research (Tripp, 1983). The hypotheses generated from such studies may later be tested and refined in the formal diagnostic surveys, if required. Reconnaissance surveys also identify aspects of the existing system that are confusing or initially difficult to interpret without indepth inquiries. In addition, such surveys begin to identify the key variables that can be used to classify farmers into different recommendation domains. Again, these domains may be modified or refined after a formal diagnostic survey.

Reconnaissance surveys are usually conducted with the aid of a semi-structured guide or checklist of topics to direct interviewing and observation (Pacey, 1982). These surveys do no employ detailed or rigid questions like those used in more formal surveys. Consumption patterns can be investigated with such a checklist. General topics of inquiry which could be added to the list might include:

1) <u>household food supply</u> -- Interviews should attempt to identify what are the potential food resources or pathways through which food enters the household (DeWalt, 1983), for example, home produced foods, purchased foods, shared foods, donated foods, etc. This information will give some idea of what types of crops to focus on at the design stage (i.e., food crops or cash crops or both).

2) <u>types of foods and preparation techniques</u> -- What are the various types of foods eaten (both traditional and newly introduced) and how are they commonly prepared (Tripp, 1982)? This information will give some indication of diet diversity and whether preparation techniques are nutritionally appropriate. Preliminary information on food preparation will also give some notion of the qualities households lock for in crops regarding ease and type of preparation. In addition, information collected on preparation techniques can indicate the fuel requirements of certain foods. The interaction between food preparation and fuel requirements is an important factor to consider in any proposed food crop interventions.

3) <u>food preferences</u> -- Determining what types of foods are preferred and their distinguishing features will aid researchers in devising acceptable cropping programs.

4) <u>seasonality</u> --Preliminary investigations regarding seasonal or periodic fluctuations in food consumption can begin with these informal surveys. Questions concerning previous seasonal shortages of marketed food and fluctuations in food prices can also be asked (Mason, 1983). Such information can generate hypotheses that can be followed up in formal, in depth surveys. These data can then be compared to historic records

of price fluctuations and previous studies of seasonal changes in food consumption to gain a better picture of household vulnerability to food shortages.

5) meal times and number of meals -- Inquiries regarding the number of meals consumed in a day can give some indication of inadequate caloric intake (Tripp, 1984). This information may also indicate whether the agricultural labor demands placed on women are limiting the number of meals which are prepared (seasonal differences in the number of meals prepared should be taken into account).

6) food habits -- Preliminary information could be gathered on eating patterns, intrahousehold food distribution, food taboos, specialty foods, etc.

The qualitative data gathered in the reconnaissance survey combined with other secondary data sources can give FSR researchers a general overview of household consumption patterns in a given area (Tripp, 1982). Such surveys can indicate what are the potential consumption problems associated with the existing farming systems (Mason, 1983).

Recently, the role of the reconnaissance survey has increased in importance relative to the formal survey (Franzel, 1984). This is primarily due to their cost effectiveness and rapid turnaround of results (Franzel, 1984). However, such surveys tend to be insufficiently focused to determine the relative importance of factors which are contributing to adverse consumption patterns (Mason, 1983). Therefore, other diagnostic procedures may be required to verify and fine tune the hypothesis generated by reconnaissance surveys. Ethnographic surveys are one of these procedures.

Ethnographic Surveys. Although ethnographic surveys are not always included in FSR diagnostic analyses, they can provide a considerable amount of useful information and insights. Given that the agronomic research system may not be able to carry out an ethnographic survey, efforts should be made by the FSR team or experiment station to obtain such a survey from another national institution with interest in social data. If information collected during the reconnaissance survey is confusing or very complicated, an ethnographic survey can be the focus for a more indepth study. In this way, hypotheses generated from the initial survey are fine tuned. Ethnographic research can also help in the design of specifically focused formal surveys by determining the key consumption variables that should be pursued in interview schedules. In addition, they provide some understanding of the social, cultural, and political aspects of poverty and poor consumption patterns (Mason, 1983). Ethnographic surveys allow more prolonged contact with a culture, providing more detailed information, and facilitating exploratory questions. Finally, such surveys give some indication of potential household consumption responses to proposed changes brought about by project activities (Mason, 1983).

Consumption issues which can be pursued by ethnographic research may

include more detailed information on: 1) food availability, preparation, and distribution; 2) commonly used wild foods; 3) demonstrated cooking techniques; 4) ways food is categorized and classified; 5) place of food in celebration and ritual; 6) food beliefs; 7) market sales and purchases; and 8) seasonal and longterm changes in food consumption patterns (DeWalt, 1983a; Tripp, 1983). In addition, dietary surveys such as 24-hour recalls can be conducted during this research phase. (This will be discussed later).

Some FSR practitioners feel that extensive ethnographic surveys are too costly and not time effective enough to be conducted prior to initiating on-farm research activities (Tripp, 1983). They advocate that such studies should be implemented concommitantly with on-farm trials so detailed data generated from such studies can feed directly into the results. Others have found it useful to initiate ethnographic studies in the interim between reconnaissance surveys and formal diagnostic surveys and to continue these efforts as on-farm trials are being conducted (Reeves and Frankenberger, 1982). If formal diagnostic surveys are implemented, ethnographic data can feed directly into the design of interview schedules. The kind of information generated by ethnographic research can make interview schedules more concise. In addition, continuing the ethnographic research while on-farm trials are being conducted can help monitor farmer reactions to experiments and provide continual feedback between farmers and researchers.

Although differences may exist among FSR projects regarding the timing and use of such surveys, the kinds of food consumption data generated from ethnographic studies are extremely valuable. Thus, the implementation of such surveys could be beneficial to a consumption perspective for FSR activities.

Formal Diagnostic Surveys. Formal diagnostic surveys (verification surveys) are structured interviews which are administered to a statistically valid sample of farm households in the target area to get at variations in access to resources (both technical and human), farming practices and possibly food consumption patterns. They help verify and refine hypotheses generated by reconnaissance surveys and ethnographic research with a minimum amount of hard data. The baseline data generated from such surveys can serve three purposes. First, they provide a further basis for dividing farmers into homogeneous groups called recommendation domains. Second, these data delineate the major constraints in the existing farming (and nutrition) system and identify opportunities for research. Third, these data provide a basis for future evaluation of the effects of programs on production and consumption.

Two kinds of consumption data should be integrated into formal surveys. First, a series of food related questions should be added to the list of questions focusing on the demographic, agricultural, and economic characteristics of households. Such questions could include inquiries into: 1) varietal preferences; 2) common preparation techniques; 3) marketing habits; and 4) household food supply (e.g., seasonality of diet, use of secondary crops) (Tripp, 1982). These questions should be designed on the basis of previous informal surveys and ethnographic analyses (if conducted) to ensure their appropriateness

(Tripp, 1982).

The second set of consumption data which should be included in such surveys are referred to as consumption status indicators. These data give some indication of the nutritional conditions under which each household must adapt. The types of data which might be useful as status indicators and how these can be combined with economic variables to delineate recommendation domains are discussed below.

RECOMMENDATION DOMAINS

As stated earlier, the FSR team attempts to disaggregate farm households into homogeneous subgroups called recommendation domains. This is done in order to devise appropriate technologies that would be applicable to groups of farms with similar circumstances (Tripp, 1983). Although ecological and economic criteria are normally used in FSR projects for devising such domains, it is also possible to include consumption considerations in such criteria. By incorporating consumption status indicators into the classification systems, it is more likely that nutritionally-at-risk households will be targeted, and major nutrition problems addressed.

A number of variables or sets of variables could be used as indicators of consumption status. Data collection procedures for these variables should be cost-effective and relatively easy to implement if FSR teams are expected to incorporate them into their diagnostic surveys. The following discussion focuses on three such variables beginning with the simplest measures to implement.

One type of consumption status indicator which would be easy to measure would involve identifying one or more critical factors which have a limiting effect on consumption (Smith, 1983). For instance, the amount of food stored in the household just prior to harvest (i.e., hungry season) might be a good indicator of nutritional risk (Smith, 1983). Similarly, the income or liquid assets such as animals which are available to the household prior to harvest may also be a good indicator (Smith, 1983). Viewed together, these indicators are a cost-effective means of classifying households.

A second measure of consumption status is based on a measure of resources available to the farm household for obtaining food from the farm directly (food crops produced) or indirectly (cash crops sold to purchase food) (Whelan, 1982). The simplest indicator of resources available to the family is land area per household member. This could be calculated very easily from existing FSR "production-type" data and would give some general idea of the relative resource limitations of households as expressed on a per person basis. This indicator, however, lacks an indication of the productivity of the land, as well as, differences in age-sex composition of households which effect the food consumption requirements of these households. One indicator of food consumption resources which attempts to incorporate these factors is referred to as the subsistence potential ration (SPR) (Whelan, 1982). "In its simplest sense, the SPR is simply the ration of the household's ability to feed itself to its need to feed itself" (Whelan, 1982). The ratio compares

the amount of food (calculated in energy or protein value) which a household can produce over a year with the energy or protein requirements of the entire household for the year.

The SPR is intended to estimate household resources while avoiding the problems of gathering income data. The data needed for calculating this ratio are size of farm, expected yield, and age and sex composition of the household. Expected yield is defined as the yield of the area's staple food which is possible on the farm's type of land. Alternatively, the SPR can be defined as including purchases and production of food instead of capturing just farm land resources, if the FSR team has the necessary data gathering capabilities. This definition is preferable if the SPR is to be used as an evaluation criteria.

The positive attributes of this measure, in addition to its being easy to calculate from production data readily available on FSR projects, is that it is a proxy for income (which is one determinant of consumption and nutrition status), and it emphasizes the relationship between production and consumption. Another possible advantage is it may correlate with the primary food source of the household (Whelan, 1982). This may be important insofar as knowledge of the source (along with the amount) of food can indicate those households which may be at risk nutritionally under different circumstances. For example, households that rely heavily on the market face different food-related risks than households which rely heavily on home produced food. This knowledge can be used to help better design food strategies which minimize rather than increase the degree of related risk.

An assumption inherent in the SPR is that the household would potentially use all its farmland for food if necessary. Also, the SPR should be used in conjunction with one of the measures discussed above, in order to take account of the seasonal effects of production on consumption.

A third type of consumption status indicator involves collecting simplified dietary information. Inquiries are made regarding the frequency of key foods consumed by children in the 0-30 month age group as well as household members within a 24-hour period (Villere, 1981). These interviews employ a list of locally consumed foods which has been developed on the bias of secondary data, field observation, and pre-testing (Villere, 1981). Seasonal differences in food consumption are taken into account in these dietary surveys. From these interviews, a food variety index can be constructed for each household. Although the information generated is non-quantitative and cannot be translated into quantitative nutrient terms, it can provide insights into household consumption patterns, especially for small children. Villere (1981) has identified some aspects of the diet which may indicate a household's nutritional vulnerability. These include (Villere, 1981):

1) "A monotonous diet consisting of one or two key foods is at risk of being deficient in calories and nutrients".

2) "A diet low in fat is at risk of being calorically deficient."

3) "If consumption of fruits and vegetables is seasonal, vitamins A and C are likely to be low at certain times of the year".

4) "Because milk is deficient in iron, a diet of milk only for a child beyond four to six months of age is likely to result in anemia."

In addition to obtaining information on the frequency of key foods consumed, this measure can shed light on breast feeding patterns and the use of food supplements and weaning foods (Villere, 1981).

This measure of consumption status is somewhat more complicated than the first two measures, and may require the input of a nutritionist. If the resources are available to provide such a person, the indicator could be effectively used to classify households.

Taken individually, each of the indicators previously discussed may not be precise in discriminating difference in consumption status among households. Taken together, the chances of identifying nutritionally-at-risk households is greater. For this reason, more than one indicator should be used.

In addition to the data gathered by the FSR team on one or more of the consumption status indicators previously described, opportunities for obtaining complementary nutritional data from other sources should be explored. For instance, FSR projects could collaborate with regional ministry of health projects so additional information on nutritional conditions could be gathered in the FSR project area by the health project staff. Such health projects often use anthropometric measures (i.e., weight for age, weight for height, and height for age) for assessing the nutritional status of local populations (Mason, 1983). These measurements might be used in conjunction with the other consumption status indicators for nutritional targeting.

FSR team members should be aware of the problems associated with such measures when considering their use for targeting. Some of the problems include (Sahn, 1984):

1) "Weight for age, which is a composite of stunting and wasting, may be low due to deficits incurred years previously and not to present status. Children may be misclassified as malnourished even if their status has improved."

2) "Weight for height measures are not sensitive to improvements in mildly or modestly malnourished populations."

3) "Little is known about the dose response of increased caloric intake, and how this will be manifested in terms of improvements in growth indicators."

4) There is no universal agreement as to what cut-off points and statistical techniques should be used in determining levels of undernourishment or malnourishment. Thus, comparisons between impact studies are spurious.

Despite these limitations, the additional information obtained from anthropometric measurements may still help farming systems researchers identify nutritionally-at-risk households. If these data are collected by health professionals operating in the area and are available, they should be combined with other indicators of consumption status to classify households. However, if health programs are not collecting anthropometric data in the target area, the FSR team should not be expected to collect these measurements themselves. The FSR field staff usually lacks the time, resources and training to collect such measurements.

After data have been collected on a number of consumption status indicators and have been derived from other sources of nutritional information, they should be compared across households which have been previously grouped into categories on the basis of specific ecological or economic criteria. Such criteria might include income, landholding, animal or crop production, socioeconomic status or household composition (Smith, 1983). Which variables are used for classifying households will be determined by the particular area in which the research is being conducted and the objectives of the study. Recommendation domains derived in this way could ensure that nutritionally-at-risk households can be identified and targeted.

## ON-FARM RESEARCH

On-farm research involves the actual design and testing of agricultural technology on farmers' fields. On-farm trials and recommendations should follow from the assessment of farmers current practices and constraints (i.e., knowledge of existing farming system and consumption needs) as well as how such modifications may impact consumption patterns (i.e., knowledge of production/consumption linkages). Other important factors to take into account in the development of recommendations include the following:

1) In assessing a proposed recommendation's potential impact on consumption, attempts should be made to look at a number of farm households who have already adopted the change to get some notion of what the effect might be (Mason, 1983).

2) When a new crop variety is introduced that is higher yielding than the variety it is replacing, researchers should make sure variability in yield is not also increased (Mason, 1983). Some varieties are less drought resistant than traditional varieties.

3) Initially, recommendations should be oriented towards those crops that are most important to the household's diet and livelihood (Tripp, 1983). Such efforts also should take into consideration the effects these recommendations might have on minor crops (diet diversity and labor allocation).

4) The importance of wild herbs to the diet should be considered in any herbicide trials (Tripp, 1983).

In addition to testing alternative technologies and/or practices on farmer's fields, on-farm research allows researchers an opportunity to collect more specific kinds of information on consumption patterns. If ethnographic research was not conducted previously, many of the indepth inquiries applicable to that research activity can be carried out during this phase. For instance, inquiries might be focused on food tastes and preferences, preparation techniques, food beliefs, market sales and purchase, and seasonal fluctuations in food supply (Tripp, 1982). On-farm research also gives researchers a chance to investigate food storage practices of farm households (Whelan, 1982). Periodic inventories will give some indication of food availability and losses due to rodents and insects (Whelan, 1982).

Another kind of useful consumption data to collect during on-farm research is dietary information. Qualitative 24-hour dietary recall surveys are the easiest method to employ for this purpose (Tripp, 1982; DeWalt, 1983). Such a technique can provide information on the frequency and manner or use of crops, how each food is prepared, the variety of each crop being used and source of each food (Tripp, 1982). These recall interviews will also give some idea of the number of meals consumed in a day and the number of items in each meal (Tripp, 1982). The information also can give some indication of whether the household is consuming adequate amounts of calories and protein, and whether there are any vitamin or mineral deficiencies (Tripp, 1982). The major disadvantages of such recall methods are: 1) they tend to underreport foods that are not eaten in the home such as snacks, fruits and beverages; and 2) the intrinsic variation in day-to-day household and individual consumption patterns may not be accurately represented in these interviews (Tripp, 1982; Mason, 1983). To compensate for this shortcoming, recall interviews should be repeated several times for different seasons to get at seasonal variations in consumption (Tripp, 1982). In addition, recall data can be improved when the researcher is familiar with the community (DeWalt, 1983).

As with other FSR procedures, the primary purpose of data collection during on-farm research is to obtain practical information on production and consumption to feedback to researchers. During such investigations it is important to elicit farmers' opinions about the qualities of new varieties, not only from an agronomic viewpoint, but from a marketing, storage, and cooking standpoint as well (Tripp, 1982). Thus, the acceptability of a new variety should be assessed one year after on-farm experiments have been initiated to make sure families base judgements both on taste and performance (Tripp, 1982).

## EVALUATION AND EXTENSION

After on-farm trials have been carried out for a particular recommendation domain of farmers, the effects of the trials should be evaluated. This evaluation should encompass both production and consumption outcomes. To accomplish this task, evaluation criteria must be established at the beginning of the FSR project to ensure that meaningful evaluation and extension can take place. Although this paper has emphasized how nutritional considerations can be handled explicitly

at the beginning of the FSR project, some of the indicators previously discussed can be used in an evaluation setting as well (Table 4). The important point in doing this would be to identify whether the technology introduced has resulted in a material improvement in the quality and quantity of food consumed by all those affected by the technology. This can be done by comparing consumption-related measurements collected prior to the project with measurements collected both during and after the project. To strengthen such comparisons, any alternative explanations or confounding influences which could account for existing production/consumption outcomes must be taken into account (Mason, 1983). If such confounding influences can be controlled for, then the actual project impact on production and consumption can be assessed.

The value of such evaluations are two-fold. First, they help determine whether the present FSR activities should be implemented in future FSR undertakings (Whelan, 1982). Second, they provide extension personnel with some way of assessing whether such intervention strategies will have a positive impact on farmers in similar recommendation domains in other areas. Before such interventions are extended, however, diagnostic surveys should be conducted to ensure that the potential household participants do fall into similar domains. Following such a procedure, it may be possible to avoid unanticipated adverse consumption effects.

## RECENT FARMING SYSTEMS APPROACHES THAT HAVE ATTEMPTED TO INTEGRATE CONSUMPTION CONCERNS IN THEIR RESEARCH ACTIVITIES

To date, very few FSR projects have integrated food consumption concerns systematically into their research approach. Taking this into account, five projects have been identified which have made various attempts to address such concerns. These projects have been implemented in Imbabura, Ecuador (two projects); Southern Honduras; North Kordofan, Sudan; and Southwest Virginia. The following discussion briefly summarizes how consumption concerns have been integrated into each of these FSR projects.

One example of an FSR project which has collected some food consumption information while conducting on-farm research is the Production Research Program in Imbabura Province, Ecuador (Tripp, 1982). Established in 1977 by the National Agricultural Research Institute (INIAP) with assistance from the CIMMYT Economics Program, the project assigned technicians to carry out on-farm research on maize and associated climbing beans (Tripp, 1982). The work began with a farmer survey which assessed maize practices and identified priorities for maize research. After this survey, on-farm trials were initiated on a number of farmers' fields. This trial work on lines of maize and beans focused on alternative maturity-lengths, fertilizer levels, and insect and weed control technologies (Tripp, 1982). Work was also initiated on simple methods of maize storage (Tripp, 1982).

Aside from these activities, other kinds of food consumption data were collected. These included: 1) in 1980, a number of 24-hour dietary recall surveys were conducted in three communities in the research area;

2) in 1981, a few questions on diet were incorporated into a formal survey carried out in 9 communities in the area; 3) information on food utilization was derived informally from farm families participating in on-farm trials; and 4) secondary data were reviewed which included quantitative dietary surveys from the research area (Tripp, 1982).

The information collected on food consumption was used in assessing the introduction of new maize varieties. For instance, harder endosperm materials were found to be unacceptable given the local preparation techniques (Tripp, 1982). One quick-maturing variety was identified (INIAP 101) which farmers found acceptable; both from an agronomic viewpoint as well as ease of preparation (Tripp, 1982). This variety is being considered for wider dissemination. In addition, breeders have begun including shelling characteristics in their selection procedures for further improving maize varieties (Tripp, 1982).

Another FSR project also focusing on Imbabura Province, Ecuador is presently being implemented by Cornell. Initiated in 1982, this project has been sponsored by the Bean/Cowpea Collaborative Research Support Program (CRSP), which is funded by AID/Washington. The major objective of this research is to assess the biological, environmental, economic, and social roles of bean production in the target area, in order to identify and introduce improved bean production practices (Bean/Cowpea CRSP Annual Report, 1983). Collaborative links have been established with the National Agricultural Research Institute (INIAP), and joint FSR activities have been conducted in 4 zones in Imbabura Province (Bean/Cowpea CRSP Annual Report, 1983). Interview schedules have been designed and implemented and microcomputer techniques for analyzing this information have been developed. On-farm trials were initiated on small farmer fields in 1984 at different altitudes.

Recently, Cornell has employed a nutritionist to help design a number of data collection procedures so that nutritional information can be better integrated into on-going FSR activities. Some of these data collection procedures may be implemented in upcoming FSR efforts.

A third example of an FSR project which has incorporated food consumption concerns into its research activities is a study conducted by the University of Kentucky in Southern Honduras. This study began in 1981, and was sponsored by the International Sorghum and Millet Project (INTSORMIL): another CRSP funded by AID/Washington. Host-country collaboration was established with the Ministry of Public Health, the National Planning Commission and the Ministry of Natural Resources (INTSORMIL, 1985). The major objective of this research was to do a baseline study of the production, marketing, and nutritional systems found in an area of Honduras in which sorghum is an important crop (DeWalt and DeWalt, 1982). A number of informal and formal surveys were conducted in 7 communities, focusing on aspects of production as well as consumption. On-farm sorghum trials were also initiated.

The major objectives of this dietary and nutritional research in the FSR project were threefold (DeWalt, 1983). First, information was gathered on the uses and methods of preparation of basic food stuffs (especially sorghum) so new varieties of seed which are developed may

have the characteristics which are acceptable to farm families (DeWalt, 1983). Second, assessments were made of the impact of existing farming systems on the diets and nutritional status of farming communities (INTSORMIL, 1985). This information could help predict the probable impact of agricultural technologies on household diets and nutritional status (DeWalt, 1983). Third, baseline data were collected on both diet and nutritional status to provide a basis of evaluation for future recommendations (DeWalt, 1983).

To meet these objectives, food consumption and nutrition data were collected using several procedures. Ethnographic research techniques were employed to obtain information on household consumption patterns (DeWalt, 1983). Formal surveys were used to collect data on food resources, diet and health related practices and beliefs (DeWalt, 1983). Dietary data were obtained through the use of 24-hour recall surveys and "market basket" interviews (DeWalt, 1983). In addition, anthropometric measures of children under 6 years of age were collected to get an independent evaluation of nutritional status (DeWalt, 1983).

A fourth FSR project which has integrated consumption concerns into its data collection procedures was also implemented by the University of Kentucky. This project focused on limited resource farmers in a semi-arid region of North Kordofan, Sudan. Support was also provided by INTSORMIL. Initiated in 1981, the major objective of this research was to identify socioeconomic constraints to the production, marketing, and utilization of millet, sorghum, and cash crops in this region (Reeves and Frankenberger, 1981; 1982). The research was also designed to provide a data baseline to the Kordofan Regional Ministry of Agriculture, the Western Sudan Agricultural Research Project (co-sponsored by the World Bank, USAID, and the Sudan Government), and USAID Khartoum (Reeves and Frankenberger, 1981).

The study was carried out in 15 villages within 50 km of El Obeid. Information was collected on household production, marketing, off-farm employment, and consumption. Both informal and formal survey techniques were used. The diagnostic study concluded with a formal survey of 205 farmers and 58 local merchants. On-farm research focusing on new varieties of millet and sorghum was initiated following the completion of this survey.

Various types of food consumption data were collected in this study. For instance, information was gathered on the types of food eaten and how these are normally prepared (Reeves and Frankenberger, 1982). Inquiries also focused on general consumption patterns of the households (i.e., number and timing of meals, intrahousehold food distribution, etc.), seasonal differences in consumption, and specialty foods (Reeves and Frankenberger, 1982). Although most of this information was collected informally, formal interview focusing on food consumption were also conducted among the women of 20 farm families.

A fifth example of an FSR project which has considered food consumption in its research activities is a domestic U.S. project which was conducted by Virginia Polytechnic Institute (VPI). The project was initiated in 1981, and was supported by a USDA/OICD grant entitled

"Extension and Family Economics in Farming Systems Programs" (Caldwell and Rojas, 1983). The research was conducted in a county in southwest Virginia. Three objectives of this research were: 1) to develop an interdisciplinary team at the paraprofessional level; 2) to incorporate a farming systems methodology into the extension program; and 3) to include the family system in the farming system (Caldwell and Rojas, 1983).

Initially, informal reconnaissance surveys were conducted in the area. These were followed by indepth time allocation surveys and dietary recall surveys in 1982. Based on these surveys, broccoli was introduced as a new crop to substitute for tobacco as a cash crop and to add needed nutrients to the diet. On-farm trials were initiated as well as in-home broccoli freezing and preparation trials. This effort led to a wider dissemination of broccoli in the area. Subsequently, a cooperative took on the role of marketing this crop in the region.

## CONCLUSION

This paper has set out to accomplish three primary objectives. First, it has emphasized the importance of consumption considerations in the goal sets of small farmers. Development efforts which ignore such goals are likely to fail because the technology packages will be rejected. Thus, these efforts are not likely to enhance the level of well-being of project participants. Second, the paper has identified a number of production and consumption linkages which FSR teams must be aware of if they are to properly evaluate alternatives. To ensure extension packages maximize consumption benefits and minimize adverse consumption impacts, greater understanding of the consumption effects of seasonality, crop mix and minor crops, income, the role of women in production, crop labor requirements and market prices is essential. Third, this paper provides suggestions for ways a consumption perspective can be integrated into each stage of the FSR process. Through the incorporation of this perspective in target area selection, nutritionally-at-risk regions and families are more likely to be included in research priorities and in project activities. By including a consumption perspective in diagnostic baseline studies, existing consumption patterns can be better understood. Such information is valuable in the definition of recommendation domains which aid in selection of appropriate research priorities and the selection of best-bet technologies for on-farm testing. Finally, evaluating proposed technologies using both production and consumption criteria should provide extension personnel with a better idea of the potential consumption impacts of alternative programs.

Given FSR's integrated approach to technological change, a consumption perspective can be effectively included. For this reason, consumption consideration should receive more attention in future FSR endeavors.

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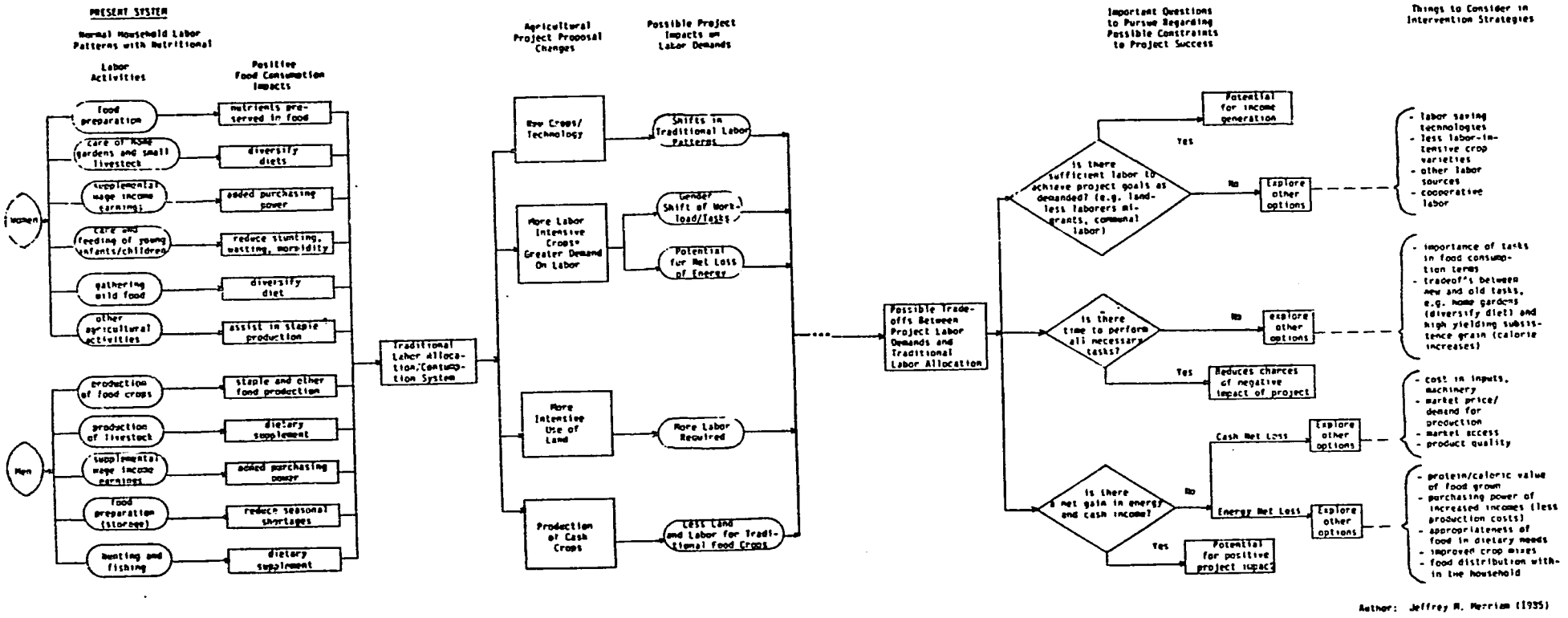


Figure 1. Labor/Consumption Linkages.

TABLE 1

Possible Strategies *for Addressing Seasonal Food Shortages and Their Effects on Consumption

| Goal | Suggested Strategy | Procedure | Personnel |
|---|---|---|---|
| To fill the gap of pre-harvest food shortages | Research could be conducted on short maturing varieties of food crops | 1. Determine the important attributes of existing varieties | FSR Team |
| | | 2. Develop or identify new varieties with similar desired attributes | Experiment station researchers |
| | | 3. Varieties should be tested through on-farm research | FSR team |
| | | 4. Disseminate successful varieties | Extension agents |
| To extend production | Better water management and irrigation techniques could be implemented where feasible | 1. Assess existing techniques, constraints and feasibility | FSR team |
| | | 2. Develop improved water management and irrigation techniques | Experiment station researchers |
| | | 3. Test new techniques on farmers' fields | FSR team |
| | | 4. Disseminate successful techniques | Extension agents |
| To provide a buffering device for lean periods | Investment in small livestock could be encouraged | 1. Assess existing husbandry patterns, constraints and feasibility | FSR team |
| | | 2. Identify appropriate livestock for farming system | Experiment station researchers |
| | | 3. Introduce livestock in on-farm experiments | FSR team |
| | | 4. Encourage the adoption of such husbandry practices if proven successful | Extension agents |
| To determine the best planting strategies which create complementarities in growth and canopy cover | Research could focus on farmer practices of intercropping and serial cropping | 1. Assess existing cropping practices, constraints, and feasibility | FSR team |
| | | 2. Develop or identify improved intercropping and/or serial cropping | Experiment station researchers |
| | | 3. Test new planting strategies on farmers' fields | FSR team |
| | | 4. Disseminate successful planting strategies | Extension agents |

TABLE 1 (continued)

| Goal | Suggested Strategy | Procedure | Personnel |
|---|---|---|---|
| To reduce storage loss and extend existing stocks | Cost-effective storage and preservation techniques could be devised and utilized for food staples | 1. Assess existing techniques, constraints and feasibility | FSR team |
| | | 2. Develop or identify improved storage and preservation techniques | Experiment station researchers (food technologists) |
| | | 3. Test new techniques in on-farm trials | FSR team |
| | | 4. Encourage the adoption of successful practices | Extension agents |
| To avoid seasonally high food prices | Price regulating measures could be implemented | 1. Government market interventions may be necessary along with policy changes | Ministry level officials (FSP) |
| | Community grain banks could be set up as a food security measure | 1. Assess the constraints and feasibility of establishing a community grain store | FSR team (maybe ethnographic research) |
| | | 2. Test the concept in receptive villages | FSR team with extension agents |
| | | 3. Encourage the establishment of such grain banks if tests prove successful | Extension agents |

* These are derived from Longhurst, (1983:3) and AID (1982a:3).

TABLE 2

Possible Strategies* for Taking into Account the Relationship Between Crop Mix, Minor Crops and Consumption

| Goal | Suggested Strategy | Procedure | Personnel |
|---|---|---|---|
| To maintain adequate food consumption levels to guard against nutritional stress | Research could focus on both cash crops and food crops | 1. Assess existing cropping patterns for both food crops and cash crops (non-food) | FSR team |
| | | 2. In proposed crop interventions assess risks for alternative crop mixes rather than crop by crop.+ | Experiment station researchers |
| | | 3. Test proposed crop mixes on farmers' fields | FSR team |
| | | 4. Disseminate successful planting strategies | Extension agents |
| | Projects could make careful attempts not to reduce crop diversity if adequate substitutes are not available in the market | 1. Determine the existing diversity of crops grown | FSR team |
| | | 2. Review availability (amounts and types) of food in market | FSR team |
| | | 3. Assess the impact of proposed interventions on diversity (i.e., herbicides, mono-cropping, strategies, etc.) | Experiment station researchers |
| | | 4. Test those interventions which have a minimal impact on diversity on farmers' fields | FSR team |
| | | 5. Disseminate successful interventions | Extension agents |
| | Research could focus on minor food crops grown by women | 1. Identify minor food crops presently grown by women; assess their constraints and potential | FSR team |
| | | 2. Develop or identify ways of improving minor food crop production (e.g., improved varieties, new planting strategies, inputs, etc.) | Experiment station researchers |
| | | 3. Test minor food crop interventions on farmers' fields | FSR team |
| | | 4. Disseminate successful technology and/or practices | Extension agents |

TABLE 2 (continued)

| Goal | Suggested Strategy | Procedure | Personnel |
|---|---|---|---|
| | Emphasis could be placed on expanding output and consumption of indigenous vegetables before bringing in new vegetables and fruits | (same as minor crops) | (same as minor crops) |
| To reduce storage loss and extend existing stocks | Processing and preservation techniques could be introduced for minor crops | 1. Assess existing techniques, constraints and feasibility<br>2. Develop or identify improved methods of processing and preservation<br>3. Test new techniques with farm families<br>4. Encourage adoption of successful practices | FSR team<br>Experiment station researchers(food technologists)<br>FSR team<br>Extension agents |
| To avoid sesonally high food prices | Farmers who purchase food from the markets with money earned from cash crops could be encouraged to buy in bulk right after harvest (depends on storage, see above) | 1. Assess existing purchasing patterns, constraints and feasibility<br>2. Test new buying patterns with a few farmers<br>3. Encourage farmers to buy food in bulk if tests prove successful | FSR team<br>FSR team with extension agents<br>Extension Agents |

*These interventions are derived from Longhurst, (1983:4-5), Fleuret and Fleuret (1980:254-256) and Reutlinger (1983:15).

+A mix of crops can likely reduce income and food consumption risks, particularly if the sources of risk are varied.

TABLE 3

Possible Strategies* For Taking into Consideration the Linkages Between Women's Roles in Production and Consumption

| Goal | Suggested Strategy | Procedure | Personnel |
|---|---|---|---|
| To avoid increasing the labor demands placed on women so that they do not reduce labor inputs into food crops, food preparation and child care | Cash crops could be introduced that don't directly compete with food crops (especially) for women) | 1. Assess the seasonal labor demands of present cropping patterns and domestic duties on women | FSR teams |
| | | 2. Identify cash crop alternatives which minimally compete with present labor demands imposed on women by food crops and other duties | Experiment station researchers |
| | | 3. Test these cash crop alternatives on farm family fields to assess their demands on labor | FSR team |
| | | 4. Disseminate cash crop alternatives which are complimentary to women's existing seasonal labor patterns | Extension agents |
| | Labor saving technology could be developed and/or introduced to women to help reduce excessive labor inputs | 1. Assess existing technology (farm as well as non-farm: potable water access, food processing, etc), constraints and feasibility | FSR team |
| | | 2. Identify or develop new labor saving technology, wells, food processing techniques, etc. which are affordable to small farmers | Experiment station researchers (including food technologists) |
| | | 3. Test the new technology with women farmers | FSR team |
| | | 4. Disseminate successful technology | Extension agents |
| | Adequate community child care facilities could be introduced in situations where agricultural labor demands are high on women (to avoid adverse nutritional impacts on children) | 1. Assess existing child care practices as well as the constraints and feasibility of establishing a community child care facility | Social scientist of FSR team (ethnographic research) |
| | | 2. Test the concept in receptive villages | Social scientist of FSR team with extension agents |
| | | 3. Encourage the establishment of such child care facilities if tests prove successful | Extension agents |

TABLE 3 (continued)

| Goal | Suggested Strategy | Procedure | Personnel |
|---|---|---|---|
| To increase production of supplementary non-staples to enhance the nutritional well-being of the household | Research could focus on the crops grown by women in order to devise nutritionally beneficial interventions | (see Table 2) | (see Table 2) |
| To increase women's access to cash inputs and labor to maintain adequate production levels of both food and cash crops | Women's indigenous credit associations and labor organizations could be promoted and/or stengthened through project activities | 1. Assess existing credit associations and labor organizations specifying their major constraints and potential | FSR team |
| | | 2. Introduce or strengthen such organizations in a few receptive villages as a test | FSR team with extension agents |
| | | 3. Encourage the establishment of such organizations if tests prove successful | Extension agents |

* These interventions are derived from Longhurst, (1983:4-5, AID (1982a:5), and Katona-Apte (1983:36)

TABLE 4

Types of Consumption Data that Could Be Collected During the Various Research Stages of FSR Projects

| Questions to Address or Information to Gather | Diagnostic Stage | | | | Design and Testing Stages | | |
|---|---|---|---|---|---|---|---|
| | Target Area Selection | Reconnaissance Surveys | Ethnographic Surveys | Formal Surveys | Recommendation Domains | On-Farm Research | Evaluation and Extension |
| Secondary Data which are Indicators of Nutritional Conditions (e.g., clinic derived data, census derived data, school records, household budget surveys, previous consumption surveys) | * | * | | | | | |
| Household Food Supply (home produced foods, purchased foods, shared foods, donated foods, etc.) | | * | * | * | | + | |
| Types of Food Consumed (traditionally grown, wild food, and new foods) | | * | * | + | | + | |
| Preparation Techniques (methods, length of time to prepare food, food qualities, as they relate to preparation) | | * | * | + | | + | |
| Food Preferences (distinguishing features of preferred food) | | * | * | | | * | |
| Meal Times and Number of Meals (associated labor constraints) | | * | * | | | + | |
| Seasonality of Consumption (food price fluctuations, seasonal shortages) | | * | * | * | | + | |
| Food Habits (eating patterns, intrahousehold food distribution, food taboos, specialty foods, foods used in celebration and rituals) | | * | * | | | + | |

TABLE 4 (continued)

Types of Consumption Data that Could be Collected During the Various Research Stages of FSR Projects

| Questions to Address or Information to Gather | Target Area Selection | Diagnostic Surveys: Reconnaissance Surveys | Diagnostic Surveys: Ethnographic Surveys | Diagnostic Surveys: Formal Surveys | Design and Testing Stages: Recommendation Domains | Design and Testing Stages: On-Farm Research | Design and Testing Stages: Evaluations and Extension |
|---|---|---|---|---|---|---|---|
| Food Classification | | | + | | | + | |
| Food Beliefs | | | * | | | + | |
| 24-Hour Recalls | | | * | | | * | |
| Varietal Preferences | | + | * | * | | * | |
| Marketing Habits | | + | * | * | | + | |
| Food Storage Habits | | * | * | * | | * | |
| Consumption Status Indicators | | | | | | | |
| 1) The amount of food stored in the household just prior to harvest and the income or liquid assets such as animals which are available to the household prior to harvest | * | * | + | * | * | * | * |
| 2) Subsistence potential ratio (SPR) (amount of potential food production divided by energy requirements of the entire household over the year) | * | * | + | * | * | + | * |
| 3) Frequency of consumption of key foods within 24-hour period | | * | + | * | * | * | * |

+ do if time, personnel and dollars permit