Part II

Indicators and Data Collection Methods for Assessing Household Food Security

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Summary

The purpose of this paper is to provide an overview of the various indicators and data collection methods that have been used for assessing household food security (HFS). Much conceptual progress has been made in developing indicators due to a greater understanding of the processes that lead to food insecure situations for households. We have moved away from simplistic notions of food supply being the only cause of household food insecurity to assessing vulnerability of particular groups in terms of their access to food.

Food availability and stable access are both critical to HFS. For this reason, information should be collected on factors that play a role in limiting food availability and the options that households have for food access. A household's stable access to food will be determined by its means of procuring food (produced, purchased, gathered) and the social mechanisms that buffer households from periodic shocks. Vulnerability to food insecurity is location specific, therefore indicators are needed that measure supply and food entitlement changes at the local level.

A number of different indicators can be used for delineating HFS. These are divided into process indicators that reflect both food supply and food access, and outcome indicators which serve as proxies for food consumption. Indicators that reflect food supply include inputs and measures of agricultural production (agrometeorological data), access to natural resources, institutional development and market infrastructure, and exposure to regional conflict and its consequences. Indicators that reflect food access are the various means or strategies used by households to meet their HFS needs. These strategies will vary by region, community, social class, ethnic group, household, gender, and season. Thus, their use as indicators is location specific. Outcome indicators can be grouped into direct or indirect indicators. Direct indicators of food consumption include those that are closest to actual food consumption rather than marketing channel information or medical status (eg. household consumption surveys). Indirect indicators are generally used when direct indicators are either unavailable or too costly (in terms of time and money) to collect (eg. storage estimates, nutritional status assessments). The indicators that are used will depend upon the financial, human, institutional, and infrastructural resources available.

To date, few information systems are presently in place that adequately incorporate both food supply/production data and access/entitlement data in the same indicator set. A food supply orientation focusing on production data and nutritional status persists primarily because these data are easiest to obtain and are well suited to aggregated analysis. Few donors or governments are willing to commit the time or resources necessary to obtain information on socio-economic indicators that are sensitive to the vulnerability of different local groups. Decentralized HFS monitoring systems would be the best means of obtaining such information. Centralized HFS monitoring systems

are likely to experience more difficulties in adequately assessing the HFS status of local populations.

The information needs of different user groups will influence the selection of HFS indicators and data collection methods to be used. National governments and donors require quantitative information in a centralized system to help make informed planning and policy decisions regarding the sharing of limited resources across regions. Local governments, NGOs and local communities require qualitative, location specific information in a decentralized system to design appropriate interventions. A balance must be struck between the need for data for central decisions on the allocation of resources and a need for information appropriate for decentralized HFS monitoring and interventions.

HFS information systems can be designed to take both of these concerns into account. Using a staged process, vulnerability maps can help determine, in a cost-effective manner, where the decentralized food security monitoring systems should be located. Contingency plans can then be developed to link information to response.

For projects already established, monitoring systems should incorporate HFS process indicators as well as outcome indicators in order to detect changes in entitlements and food availability. Such changes may require modifications in the intervention mix presented by the projects in the course of the project life. Contingency plans also could allow for income transfer during stress periods to protect the asset base of the project beneficiaries.

Section I:

Indicators Used for Assessing Household Food Security

Introduction

Household Food Security (HFS) is emerging as an organizing principle for development thinking and an objective of development initiatives. To reduce and monitor food insecurity we must determine who is food insecure, why and how they became vulnerable, and where they reside? Government policy makers, donor agencies, and Non-Governmental Organizations (NGOs) have all attempted to operationalize this concept by deriving a series of indicators. Typical indicators of food consumption, for example, household calorie adequacy from recall, or more complex indicators such as income level and food expenditure, have proven to be difficult and too expensive to incorporate into on-going monitoring and evaluation systems (Haddad et al. 1991; O'Brien, Place and Frankenberger 1988). Alternative indicators have been sought which are less expensive, timely, and reliable in locating the food insecure. Consensus still has not been reached on acceptable indicators and methods of measurement (Haddad et al. 1991; University of Guelph 1991).

In the past, food security indicators have been measures of regional or national food supply or its correlate (rainfall) (Staatz et al. 1990). Many policy makers believed that supply indicators were highly correlated with indicators of household food access. Recently, however, many have begun to question the validity of commonly used indicators of food security measured at the national level as representative of indicators of access to food at the household level. The notion of food entitlement (Sen 1981) has played a critical role in this reassessment.

This section begins with an historical overview of the development of indicators used for measuring HFS. This is followed by a discussion of the various types of indicators presently used for HFS targeting and monitoring. The section concludes with a discussion of the criteria for selecting indicators and a number of issues related to their use.

Historic Overview of the Development of Indicators

One of the earliest examples of HFS monitoring comes from India. Because famine was a recurring phenomena in India, the British Administration drafted the Indian Famine Codes in 1880 (DeWaal 1989). The aim of these codes, developed on a provincial basis, was to "ensure the maintenance of efficient channels of information by means of which the approach of scarcity or famine may be detected in time and to provide for a state of preparedness in respect to measures of relief when the emergency arises." (Indian Famine Commission cited in DeWaal 1989:4; cited in Davies et al. 1991a:101). The information system relied on prices used as stress indicators as well as rainfall, agricultural production, and social indicators (e.g. credit, beggars, grain markets, crime, migration) (Davies et al. 1991a). The famine codes also outlined detailed contingency plans to ensure that information and response were intrinsically linked. Mass public works programs were devised to provide employment to the food insecure. While these famine codes did not work effectively in all provinces, they demonstrated that famine prevention involved extensive entitlement protection (Dreze and Sen 1989 cited in Davies et al 1991a:101). More recently designed food monitoring information systems have drawn their inspiration from this system, and will be discussed in greater detail in Section II (e.g. Botswana; Turkana, Kenya).

Focus on Food Supply

In Africa, the food crisis in the early 1970s stimulated a major concern on the part of the international donor community regarding supply short falls created by production failures due to drought and desert encroachment (Davies et al. 1991a:1). This primary focus on food supplies/production as the major cause of food insecurity was given credence at the 1974 World Food Conference. As a result, Early Warning Systems (EWS) were created to monitor the food supply situation for developing countries (Ibid. 1991). Indicators were developed on the basis of a food supply deficit model where the scale of the crisis could be measured at the macro (regional or national) level by shortfalls or deficits in supply of basic food stuffs in relation to aggregate population requirements (Shoham and Clay 1989). It was assumed that the crisis at the micro (individual or household) level would manifest itself in malnutrition or undernutrition (Ibid. 1989). Thus, supply deficits were translated directly into a decline in nutritional status. The strength of this food supply model in the choice of indicators in the late 1970s and early 1980s is demonstrated by the emphasis given to macro food balance sheets (45 countries in Africa) and nutrition surveillance programs (Davies et al. 1991a).

Nutritional Surveillance

Nutrition surveillance began to be established in developing countries from 1976 onward (Mason et al. 1984). Nutrition surveillance methods provided regular information about the nutrition situation in populations, relying on the nutritional status of children as the central indicator for monitoring progress. The most common use of nutrition surveillance was for health and development planning. Nutrition surveillance was also used for program management and evaluation and timely warning and intervention to alleviate epidemic inadequacies in food consumption (Ibid. 1984).

A recent assessment of the Inter-Agency Food and Nutrition (IFNS) Program (UNICEF, FAO, WHO/PAHO) has identified several problems associated with past nutrition surveillance systems. First, nutrition surveillance has had minimal impact on wider policy decisions because it has become closely identified with the health sector (Health Sector Entrapment). Second, a focus on nutritional status rather than the causes of nutritional problems has also contributed to weak impact on decision-making. Data which is more closely related to socio-economic development and economic policy is more likely to capture the interest of key government decision makers. In fact, in some countries where there has been a strong impact, there has been a focus on early warning that has encompassed other indicators in addition to nutritional status (e.g. Indonesia, Botswana). Efforts are currently ongoing to broaden the scope of nutrition surveillance programs (UNICEF 1991).

Focus on Food Entitlement: A Paradigm Shift

The food crisis that again plagued Africa in the mid-1980s was accompanied by a paradigm shift in the way famines were conceptualized. Researchers and development practitioners realized that food insecurity occurred in situations where food was available but not accessible because of an erosion of peoples entitlement to food (Borton and Shoham 1991). Sen's (1981) theory on food entitlement has had a considerable influence on this shift in thinking. Entitlement involves how much food households actually have access to from their own production, income, gathering of wild foods, community support (claims), assets, and migration. Thus, a number of socio-economic variables have an influence on a households' access to food. In addition, worsening food insecurity was viewed as an evolving process where the victims were not passive to its effects. Social anthropologists observed that vulnerable populations exhibited a sequence of responses to economic stress, giving recognition to the importance of behavioral responses and coping mechanisms in food crises (D'Sousa 1989; Campbell 1990; Flueret 1986; Corbett 1988; Watts 1983; Frankenberger 1990). For this reason, by the late 1980s, donor organizations (e.g. WFP, FAO, USAID), local governments (e.g. Ethiopia, Sudan), and NGOs (Save the Children Fund (U.K.), Sudan Red Crescent Society) began to incorporate socio-

economic indicators related to access/effective demand into their information monitoring systems.

In the wake of this paradigm shift has arisen more clarification of the concept of *vulnerability*. Chambers (1989) defines vulnerability as defenselessness, insecurity, exposure to risk, shocks and stress, and difficulty in coping with them (Borton and Shoham 1991). Vulnerability is not equal to poverty — it is not lack or want (Downing 1990). Vulnerability to food security, according to Borton and Shoham (1991), is "an aggregate measure for a given population or region of the risk of exposure to different types of shocks or disaster events and the households ability to cope with these events" (Ibid. 1991). Downing (1990) points out that an analysis of vulnerability provides us a basis for understanding HFS indicators. This understanding is enhanced by distinguishing between *baseline vulnerability* and *current vulnerability*. *Baseline vulnerability* assessments focus on the underlying factors that influence exposure to food insecurity and a household's predisposition to the consequences (Downing 1990). It provides the context for interpreting indicators of the current HFS risk. These contextual factors may encompass the food insecurity events over the previous season or years (See Figure 2.1: Household Vulnerability Assessment Matrix). *Current vulnerability* is related to the shocks overlaying the baseline (e.g. food shortages, exchange failure, institutional failure) (Borton and Shoham 1991). Vulnerability is thus a composite of the status of past and current events (Ibid. 1991) and monitoring household food insecurity requires an understanding of both the causal mechanisms of vulnerability and the current situation (Downing 1990). *Future vulnerability* can also be determined from this analysis by matching the coping responses of vulnerable households to long-term food security risks (Phillips and Taylor 1990) (See Figure 2.1). Pioneering efforts in vulnerability/risk mapping have been carried out in Bangladesh and Sudan under World Food Programme (WFP) support (See Section II). The USAID-funded Famine Early Warning Systems Project has also contributed substantially to this conceptual development.

This brief discussion has demonstrated that much conceptual progress has been made in developing indicators based on a greater understanding of the processes that lead to household food insecurity. First, we have moved away from simplistic notions of food supply being the only cause of household food insecurity to assessing vulnerability of particular groups in terms of their access to food (Davies et al. 1991a). We have come to realize that food availability and stable access are both keys to HFS. Households will have stable access to food if they have viable means for procuring food (either produced or purchased) that do not lead to environmental degradation (future vulnerability). Stable access is also influenced by local, informal social mechanisms that buffer households from periodic shocks, i.e. claims (Swift 1989a), food sharing networks, and by the local political/institutional environment (Campbell 1990). Thus, indicators for HFS must be able to measure food entitlement changes (Downing 1990).

Figure 2.1

Household Vulnerability Assessment Matrix

Risk of an Event	Ability to Cope			
Shocks/Trends	**HH Characteristics**	**Access to Resources**	**Production/Income Opportunities**	**Support Structures**
Baseline Vulnerability *Crop Production and Livestock Risks* drought episodes soil conditions pest infestations *Market Risks* market infrastructure price fluctuations (assets, food, cash crops, livestock) food shortages access to employment *Political Risks* conflict/war	composition (age dependancy ratio) education health status out migration	access to land access to labor liquid assets productive assets credit common property resources (for wild foods and other products) food stores	crop/livestock production other income sources seasonal migration	community support mechanisms (claims) NGOs government policies access to social services
Current Vulnerability *Crop Production and Livestock Risks* current drought pest attack *Market Risks* market infrastructure price fluctuations (assets, food, cash crops, livestock) food shortages access to employment *Political Risks* conflict/war	composition (age dependancy ratio) education health status outmigration	access to land access to labor liquid assets productive assets credit common property resources (wild foods and other products) food stores	crop/livestock production other income sources seasonal migration	community support mechanisms (claims) NGOs goverrnment policies access to social services
Future Vulnerability (trends) *Environmental Degradation* *Land Pressure* *Out Migration*	demographic changes	land tenure changes	employment trends	support structure changes

Second, it is important to acknowledge that conceptual models implicitly or explicitly influence our choice of indicators (Borton and York 1987). Therefore, we should make every attempt to understand the processes at work in a specific location in order to develop a model to choose the most appropriate indicators. Models that ignore the locational specificity of ecological and economic aspects are likely to select proxy indicators which are inappropriate or misinterpreted. Few agencies or researchers (with the exception of Cutler) have presented the HFS model they are using to determine the key indicators for monitoring.

Despite these conceptual advances in our understanding of HFS, few systems are presently in place that adequately incorporate both food supply/production data and access/entitlement data as part of their indicator set. The food supply orientation persists primarily because these data are the easiest to get and are well suited to aggregated analysis (Buchanan-Smith et al. 1991). To effectively use socio-economic indicators, an in-depth knowledge of the local area is needed. Few donors or governments are willing to commit the time or resources necessary to obtain these type of data, despite the fact that decentralized HFS monitoring systems hold the greatest promise for being sensitive to the vulnerabilities of different groups. It is time that the institutional capacities for HFS monitoring catch up to the conceptual development (a strategy for improving this capacity is outlined in Section II).

The following discussion describes a number of different indicators that can be used for delineating HFS. These are divided into *process indicators* that reflect both food supply and food access and *outcome indicators* which serve as proxies for food consumption. It is important to stress that the process indicators reflect some degree of vulnerability to HFS, either through availability of food supplies or access to food. Each indicator will be briefly described and assessed for its value for use in HFS monitoring. In most cases, a subset of these indicators would be used in any particular monitoring system.

Types of Indicators

Process Indicators

Indicators that Reflect Food Supply

One critical dimension of HFS is the availability of food in the area for the households to obtain. Regional food shortages have a strong influence on household food availability. A number of factors play a role in limiting food availability and the options households have for food access. Borton and Shoham (1991) classify these types of indicators as *risk of an event indicators*. These are indicators that provide

information on the likelihood of a shock or disaster event that will adversely affect HFS. They include such things as inputs and measures of agricultural production (agro-meteorological data), access to natural resources, institutional development and market infrastructure, and exposure to regional conflict or its consequences (influx of refugees). These types of indicators are not mutually exclusive of food access indicators, and considerable overlap and interaction between the two categories may exist. For example, market infrastructure and market coping responses are strongly related. Similarly, access to common property resources and reliance on gathered foods are closely linked. Distinctions are drawn here in the discussion to highlight the differences in vulnerability between availability and access. The following list of food supply indicators is not exhaustive but representative of those normally used in food monitoring systems.

Meteorological Data

Throughout the Sahel and the Horn of Africa, production is strongly influenced by climatic factors; especially rainfall (Davies et al. 1991a). Most countries monitor rainfall as part of their on-going agricultural monitoring activities so good historical data and current records of rainfall levels and variability normally exist (Borton and Shoham 1991). The availability of this data reflects the conventional emphasis on supply determinants of food security (Davis et al. 1991). From these data it should be possible to determine the probability of rainfall failure.

Rainfall is an appropriate indicator when acute food shortages result from drought. However, caution should be exercised in the way the data are used. For example, total rainfall may not correlate with yield unless distribution is taken into account (Mason et al. 1984). In addition, the start of the rainy season may vary by as much as a month in the Sahel, which may or may not adversely affect yield (Ibid. 1984).

Rainfall monitoring also has been enhanced by satellite remote sensing (FAO 1990a). FAO has been supporting the development and use of the METROSAT system for monitoring cold clouds that influence rainfall distribution (FAO 1990a). However, the establishment of remote sensing capacity in many national government monitoring systems on a sustainable basis is unlikely without donor support.

Information on Natural Resources

Agro-ecological differences across regions can contribute to substantial differences in food availability. For example, semiarid agricultural zones are likely to be more prone to fluctuations in food production due to recurrent droughts than humid zones (Downing 1990). Access to pasture resources will influence household coping responses with regards to livestock. The nature and extent of the availability of common property resources will have a strong influence on the part of rural households to buffer seasonal food shortages (Jodha 1986). The exploitation of

common property resources is particularly important for resource poor farmers for meeting HFS needs. Common property resources provide poor households with resources to meet basic subsistence needs for housing, fuel, food supplements as well as income generating activities (Campbell 1990; Haddad et al. 1991; Davies et al. 1991b). These resources are relied upon heavily during times of stress (Jodha 1986). Therefore, the degradation of common property resource and loss through the encroachment of privatized agriculture has disproportionately affected the HFS of the poor (Davies et al. 1991b). A decline in these resources may indicate regional food shortages.

Women are often more vulnerable to the effects of environmental degradation than men because they are often involved in the collection of common property resources (Davies et al. 1991b). Since women often make a greater contribution to HFS than men (Frankenberger 1985), a decline in women's access to resources may have a significant impact in the consumption status of the household (Frankenberger and Goldstein 1991).

Natural resources can be monitored by periodic visits from government staff, reporting networks established with local communities through NGOs, or satellite imagery. Vegetation monitoring has been facilitated by the NDVI (vegetation index) developed for the NOAA/AVHRR system (FAO 1990a). ARTEMIS is another environmental monitoring system being developed for this purpose. Again, the cost of maintaining these types of monitoring systems on a sustainable basis for some governments may be prohibitive without donor support (Milford 1989). They can serve a complementary role to other types of local monitoring efforts.

A special dimension of natural resources are foods which grow in the wild that in many places are gathered to form a significant part of the diet (Grivetti 1978; FAO 1989). Information is scarce about their actual significance, although it has been estimated that more than 30 percent of the total caloric intake comes from such foods for certain populations (Ogle 1991). Wild foods are often called "survival foods" by outsiders, however, the role that many of them play in the typical traditional diet should be recognized. A methodology is now being tested in some countries for assessing more precisely the degree of dependence on such foods for people in selected areas (Ogle 1991; Brinkman 1989). It should help in pinpointing the need to preserve this part of the local food base and promote its use as an explicit objective in natural resources assessment.

Agricultural Production Data

Data for crop production for the main food crops are normally collected by most countries on the basis of administrative areas (Borton and Shoham 1991). This again demonstrates the emphasis given to food supply factors as the primary determinant of food security (Davies et al. 1991a). Information is often collected on crop harvests

through crop cutting on sample plots as well as crop forecasting. Remote sensing is also being used in a number of countries to monitor crop development (FAO 1990a).

Crop production data can be used for assessing regional baseline vulnerability by calculating the average per capita food production over the previous years (Borton and Shoham 1991). One problem associated with these data is that they are rarely disaggregated by gender. A second problem with these assessments is that crop production figures for crops other than the major staple are not usually available. These alternative crops play a major role in the HFS of rural families and are often grown by women (Frankenberger 1985). In addition, crop production does not equal food access nor does it equal food consumption. Although crop cutting methods are normally used to estimate yield, a recent study in five African countries has raised the possibility that cheaper methods relying on farmer reports may be just as accurate (Verma et al. 1988). This study compared physical measurements of crop production using crop-cut methods with personal estimates of farmers (Ibid. 1988). It found farmer estimates to be remarkably close to actual production figures.

Agro-Ecological Models

To improve the accuracy of crop forecasts, considerable effort has gone into developing models that take into account access to soil and water conditions for specified crops (Davies et al. 1991a). One example of such a model is the FAO Crop Specific Soil Water Balance Model. The predictive value of such models is determined by the data input and the skill level of the people analyzing the information. In many countries, the use of such models may be inappropriate given the resources available.

Food Balance Sheets

Food balance sheets are the principle tools used for calculating national food security (Davies et al. 1991a). A twelve month food balance sheet is constructed assembling information on food supplies and disposals, usually consisting of six essential elements: opening stocks, production, and imports (supplies), domestic utilization, exports and closing stocks (disposals) (FAO 1990b). Food balance sheets are used to determine the expected food deficits or surpluses, the necessary food import requirements, and food aid requirements (Davies et al. 1991a). Presently, forty-five countries in Africa maintain food balance sheets for FAO.

One of the major criticisms of food balance sheets is that they are not usually drawn up on a disaggregated basis to detect differences across districts or regions (Davies et al. 1991a). They tell us nothing about how many people are affected by supply short falls, where, and what type of assistance is needed (Cutler 1984). If the information could be disaggregated, it would provide insights on trends for an area (Baseline vulnerability). Such supply data could provide an important complement to entitlement

information (Attwood 1992). Another weakness is that food balance sheets often under-estimate non-traded crops (e.g. cassava, yams).

Information on Pest Management

Periodic pest attacks on both plants (e.g. locust) or animals can have a devastating effect on production (Borton and Shoham 1991). Vulnerability to attacks is not only determined by the frequency of these attacks over the past several years, but also to the types of government services households have access to for response.

Information on Markets and Institutional Support Structures

The availability of and functioning of rural product, service, and factor markets is extremely important in determining HFS, especially in grain deficit areas (Staatz et al. 1990). The ability of households to obtain income to purchase grain depends upon the functioning of markets for the goods and services these households sell (Ibid. 1990). When distribution markets are vulnerable or unstable, prices tend to be volatile. These price fluctuations hit poor households hardest because they often run out of food early to meet pressing cash needs, and are forced to repurchase grain late in the season (Ibid. 1990). This is especially true for women headed households. Many coping strategies are intimately tied to the functioning of markets.

Considerable debate has arisen concerning the use of price fluctuations for stable food grains and livestock sales as indicators of approaching food crisis (Davies et al. 1991a; Seaman and Holt 1980; Cutler 1984; DeWaal 1988; Buchanan-Smith and Young 1991; Hesse 1987). What appears obvious from this debate is that a good understanding of local market conditions will enable accurate interpretation of price data. Supplemental information that is collected in addition to prices might include levels of market activity, origin of buyers and sellers, mix of goods available for purchase, and volume of exchange (Davies et al. 1991a). For example, a rise in petty trading may be a more reliable indicator of stress than price fluctuations (Cutler 1986; McCorkle 1987; Haddad et al. 1991). Likewise, the increased volume of livestock sales rather than prices may be a good indicator (Cutler 1984). Assessing the differential cultural value of animals within a given region will help improve the sensitivity of monitoring market sales of livestock (Cutler 1986).

The level of infrastructure within a region also will have a big influence on the availability of food to households. Access to all weather roads can ensure stable supply of food from other surplus regions as well as export potential for locally produced goods. Access to government social services such as credit facilities and food-for-work/cash-for-work programs also can influence food availability.

Regional Conflict and Its Consequences

Civil war and local traditional disputes over resources can lead to regional instability in markets, or result in destruction of crops and infrastructure (Downing 1990). Such conflict can drastically affect the food available for households within that region (e.g. Sudan, Angola, Liberia, Ethiopia, Mozambique) (Davies et al. 1991a). In addition, conflicts occurring in adjacent countries or regions can cause a large influx of refugees into the local area, taxing the resources that are regionally available (e.g. Malawi). In both of these cases the region is vulnerable to household food insecurity.

Discussion

Although food supply indicators can provide some useful information regarding regional trends in food availability, they are often too aggregated to detect pockets of vulnerability in a given area (Borton and York 1987). In addition, supply indicators that are valid for one region may not be valid for another (Staatz et al. 1990). For example, differences in regional agricultural production potential were not correlated with differences in household consumption in Northern Mali or Northern Burkina Faso because these areas have more diverse income sources and rely more on the market for food supply (Staatz et al. 1990; Reardon et al. 1988). However, agricultural production potential may be a better predictor in the higher rainfall zones of both countries.

These shortcomings do not mean that we should abandon all supply data in our search for indicators. What is important is understanding how people obtain access to food in relation to its potential availability. This means that food access indicators are needed that are locational specific.

Indicators that Reflect Food Access

The importance of indicators that measure food access became apparent when governments and development agencies realized that household food insecurity and famine conditions were occurring despite the availability of food. Food entitlement and effective demand of households are now seen as crucial to HFS. Socio-economic indicators are sought that represent the degree of stress being experienced by a population as economic and social conditions change and how they are responding to it. Recognizing that households are not passive to stress, a major aspect of vulnerability to HFS is the ability of the household to cope with the stress. Borton and Shoham (1991) refer to these types of indicators as *coping ability* indicators. These types of indicators provide information on the capacity of the population affected by a shock or disaster to withstand its effects (Borton and Shoham 1991).

Coping Strategies

People who live in conditions which put their main source of income at recurrent risk will develop self insurance coping strategies to minimize risks to their HFS and livelihoods (Longhurst 1986; Corbett 1988). Examples of such strategies are dispersed grazing, changes in cropping and planting practices, migration to towns in search of urban employment, increased petty commodity production, collection of wild foods, use of inter-household transfers and loans, use of credit from merchants and money lenders, migration to other rural areas for employment, rationing of current food consumption, sale of possessions (e.g. jewelry), sale of firewood and charcoal, consumption of food distributed through relief programs, sale of productive assets, breakup of the household, and distress migration (Corbett 1988 cited in Frankenberger and Goldstein 1991). Haddad et al. (1991) have provided an excellent summary of these strategies (See Annex 1). In general, coping strategies are pursued by households to ensure future income generating capacity (i.e. livelihood) rather than simply maintaining current levels of food consumption (Corbett 1988; DeWaal 1988; Haddad et al. 1991). These strategies will vary by region, community, social class, ethnic group, household, gender, age, and season (Chambers 1989; Thomas et al. 1989). *Their use as indicators is location specific.* The types of strategies employed by households also will vary depending upon the severity and duration of the potentially disruptive conditions (Thomas et al. 1989).

(1) Assets

In analyzing varieties of coping strategies, it is important to distinguish between two types of *assets* that farmers have at their disposal. Assets that represent stores of value for liquidation (liquid assets) are acquired during non-crisis years as a form of savings and self insurance; these may include small livestock or personal possessions such as jewelry (Corbett 1988; Frankenberger and Goldstein 1991). A second set of assets are those that play a key role in generating income (productive assets). These are less liquid as stores of value, and are much more costly to the farm household in their disposal. Households first will dispose of assets held as stores of value before disposing of productive assets (Corbett 1988). A households access to assets is often a good determinant of its vulnerability (Chambers 1989; Swift 1989a).

Swift (1989) also has identified *claims* as another type of asset used by households to assure their food security. Claims refer to the ability of households to activate community support mechanisms. Claims also may encompass government support mechanisms or the international donor community (Borton and Shoham 1991).

(2) Risk-Minimizing Strategies to Assure Some Level of Production

Most initial responses to actual or potential food shortages are extensions of practices conducted in some measure during normal years to adapt to rainfall variability (Longhurst 1986; Watts 1988). Traditional methods of handling risk can be divided into routine *risk-minimizing practices* and *loss management mechanisms* (Walker and Jodha 1986). Risk-minimizing practices are adjustments to production

and resource use before and during a production season. These involve such practices as diversification of resources and enterprises, and adjustments within cropping systems. Crop centered diversification can include choice of crops with varying maturation periods, different sensitivities to environmental fluctuations, and flexible end use products (Ibid. 1986). Farmers also will reduce production risks by exploiting vertical, horizontal, and temporal dimensions of the natural resource base. Vertical adjustments involve planting at different elevations in a topographical sequence. Spatial risk adjustments include planting in different micro-environments or intercropping. Temporal risk adjustments involve staggering planting times (Ibid. 1986). Adjustments also may include extension of farming to marginal areas or overuse of a particular plot; practices that can have a destructive effect on the natural environment.

(3) Loss Management Strategies

Loss management mechanisms include farmers' responses to lower-than-expected crop production caused by natural hazards (Ibid. 1986). Reductions in crop production can be compensated for through non-farm income, the sale of assets, the management of stocks and reserves, seasonal migration, and reciprocal obligations among households. Over-exploitation of certain resources (forest reserves for example) for market sale also may be part of this loss management strategy.

(4) Community Inequalities

In communities marked by landholding and income inequalities, household responses occur differentially along the lines of wealth and access to resources (Longhurst 1986; Tobert 1985). Identical climatic conditions can affect households of varied economic levels to different degrees. Seasonal shortages for some families produce famine conditions for others. Poorer households, including many women-headed households, having smaller holdings and a weaker resource base, are more vulnerable to stress than are wealthier households, and begin to suffer earlier when food shortages hit (Frankenberger and Goldstein 1990). The poor resort to early sale of livestock, pledge farms, incur debt, sell labor, and borrow grain at higher interest rates (Watts 1988). In essence, crop failures and other shocks reveal rather than cause the fragile nature of HFS among vulnerable rural families. At the same time, prosperous households buy livestock at deflated prices in conditions of oversupply, sell or lend grain to needy farmers, purchase wage labor at depressed rates, and purchase land (Watts 1988). Thus, during a food crisis, a cycle of accumulation and decapitalization can occur simultaneously within a single community, depending on the depth of the current crisis.

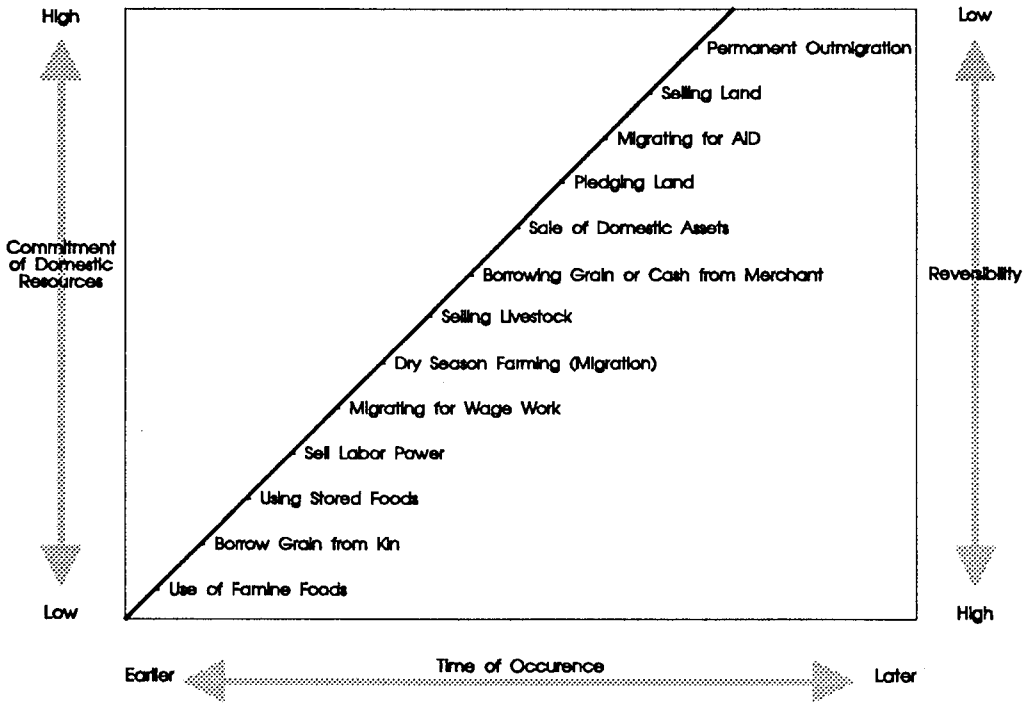
(5) Coping Strategy Patterns

Patterns of coping strategies can be diagramed to show the sequence of responses farm households typically employ when faced with a food crisis (Figure 2.2, Watts 1988). These sequences of response are most frequently divided in the literature into three distinct stages (Corbett 1988). In the earliest stages of crisis (*stage one*), households employ the types of risk-minimizing and loss-management strategies discussed above. These typically involve a low commitment of domestic resources,

enabling speedy recovery once the crisis has eased. As the crisis persists, households are increasingly forced into a greater commitment of resources just to meet subsistence needs (*stage two*). There may be a gradual disposal of key productive assets, making it harder to return to a pre-crisis state. At this stage, a household's vulnerability to food insecurity is extremely high. *Stage three* strategies are signs of failure to cope with the food crisis and usually involve destitution and distress migration (Corbett 1988).

Figure 2.2

A Model of Responses to Food Shortage



(Adapted from Watts, 1988)

The generalized patterns of coping strategies find practical application as tools for food security monitoring (Frankenberger and Goldstein 1991). Building upon the work of the World Food Program (WFP), there are three types of indicators that can be monitored for changing coping responses, thus suggesting worsening conditions and heightened food insecurity. *Leading indicators* (WFP refers to these as early indicators) are changes in conditions and responses prior to the onset of decreased food access. Examples of such indicators include: 1) crop failures (due to inadequate rainfall, poor access to seed and other inputs, pest damage, etc.); 2) sudden deterioration of rangeland conditions or conditions of livestock (e.g. unusual migration movements, unusual number of animal deaths, large numbers of young female animals being offered for sale); 3) significant deterioration in local economic

conditions (e.g. increases in the price of grain, unseasonable disappearance of essential food stuffs, increases in unemployment among laborers and artisans, unusual low levels of household foodstocks); and, 4) significant accumulation of livestock by some households (due to depressed prices caused by oversupply). Leading indicators can provide signs of an impending problem and may call for a detailed situational analysis to determine the extent of the problem, causes and need for monitoring. These indicators are a combination of process indicators dealing with both availability and access vulnerability.

Concurrent indicators (WFP calls these *stress indicators*) occur simultaneously with decreased access to food. Examples of such indicators are: 1) larger than normal able-bodied family members in search for food or work; 2) appearance in the market of unusual amounts of personal and capital goods, such as jewelry, farm implements, livestock (draft animals); 3) unusual increases in land sales or mortgages; 4) increases in the amount of people seeking credit; 5) increased dependence on wild foods; 6) reduction in the number of meals; and, 7) increased reliance on interhousehold exchanges. Concurrent indicators can be assessed while carrying out situational analysis using rapid rural appraisals. These indicators are primarily access/entitlement related. Once the nature and extent of the problems have been confirmed, interventions can be introduced that focus on the causes or mitigate the effects.

Trailing indicators (WFP calls these *late outcome indicators*) occur after food access has declined. They reflect the extent to which the well-being of particular households and communities have been affected. In addition to signs of malnutrition and high rates of morbidity and mortality, trailing indicators include increased land degradation, land sales, consumption of seed stocks and permanent outmigration. All of these indicators are signs that the household has failed to cope with the food crises (Frankenberger and Goldstein 1991).

An understanding of farmer coping strategies can be essential in guiding the design and implementation of interventions to increase HFS. As Figure 2.3 illustrates, the types of coping strategies employed by households not only indicate household vulnerability to food shortage, but also correspond to different types of government and donor responses. Household coping strategies that do not involve divestment normally indicate modest vulnerability, and government/donor response is more appropriately oriented towards longer-term *development* efforts. Such responses can be targeted to enhance the long-term sustainability of HFS, especially in those areas where future vulnerability is likely to increase. In regions where divestment is beginning to occur, household vulnerability becomes high and *mitigation* should be considered the appropriate response. Mitigative interventions are those that: 1) abate the impacts of the current emergency while reducing vulnerability to future emergencies; 2) target the conservation of productive assets at the household level; and, 3) reinforce and build upon existing patterns of coping (Hutchinson 1991). In areas where productive asset sales and permanent outmigration have begun to occur, the local population is extremely vulnerable to famine. Such indices would call for

immediate *relief* action on the part of the government and donors. Thus, an appropriately designed HFS monitoring system could be flexible enough to serve all three purposes. Presently, most Early Warning Systems operating in Africa are only used for food aid planning (i.e. the relief function).

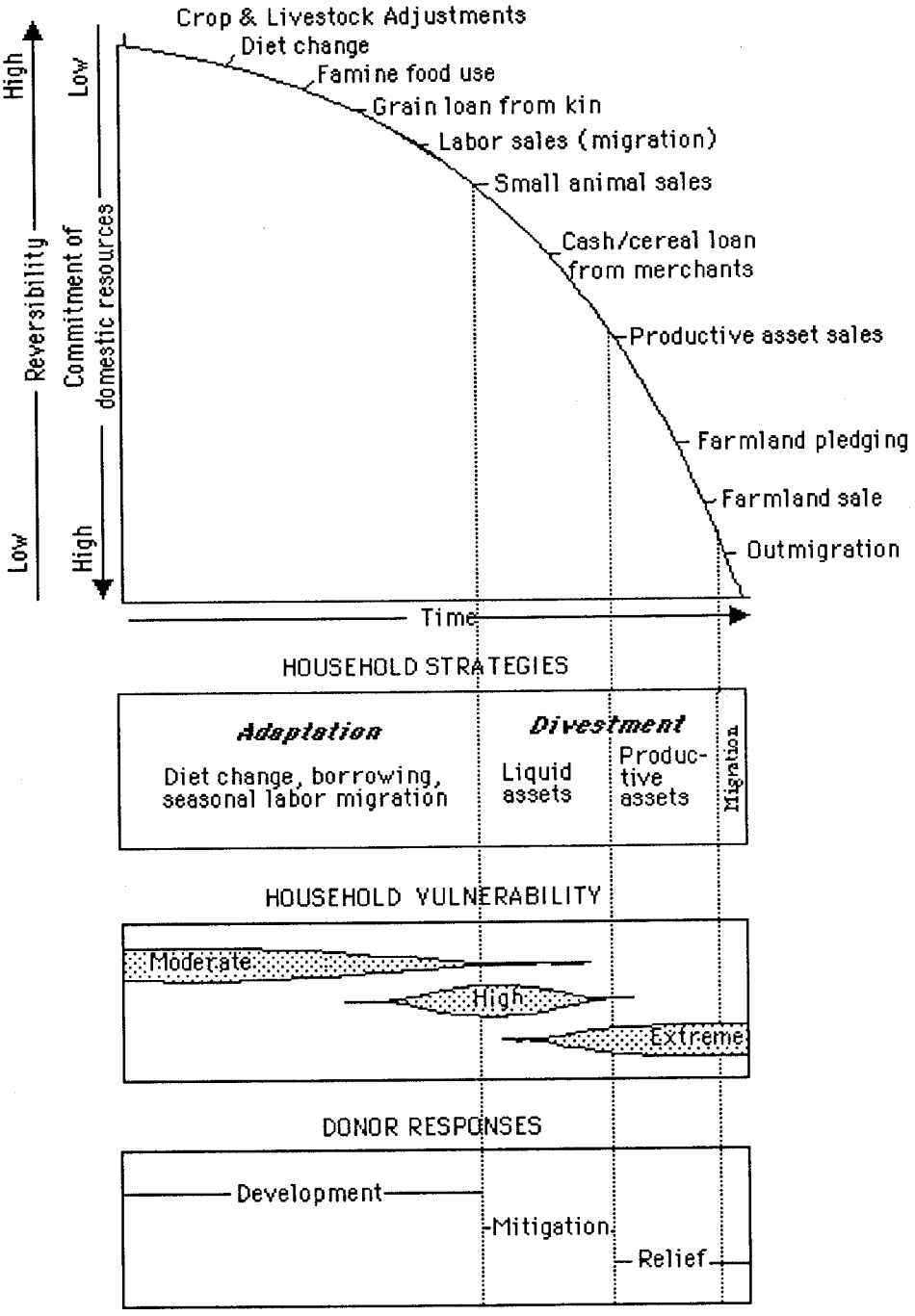
Discussion

Socio-economic indicators are becoming increasingly more important to food information monitoring systems focused on HFS. This is especially true of NGOs working in Africa (Shoham and Clay 1989). For example, the Suivi Alimentaire Delta Seno (SAPS) monitoring system in Mali funded by Save the Children Fund (U.K.) explicitly focuses on coping strategies. A good example of how coping strategies can form the basis for food access indicators is provided in Figure 2.4.

Given their usefulness in identifying vulnerable households, it is important to also recognize their limitations. First, socio-economic variables mean different things in different contexts (Borton and York 1987). Researchers and development practitioners should understand the locational specificity of socio-economic variables so that they are not misinterpreted. Second, the raw data used as indicators can be misleading. Hesse (1987) demonstrated that regional livestock market data from Mali could easily be misunderstood because individuals were buying and selling the same stock repeatedly in the same day. Thus, the quality of the data needs to be properly validated before being incorporated into a monitoring system. Third, without a baseline for determining what is "normal" behavior for a given population, it is difficult to make valid interpretations of trends displayed by indicators (Borton and York 1987). Fourth, given the locational specificity of socio-economic indicators, it is difficult to make comparisons across regions, or to aggregate the data. This remains one of the critical areas of research to be addressed. Because of these limitations, numerous challenges lay ahead for those HFS monitoring systems that incorporate socio-economic data (Haddad et al. 1991).

To minimize inaccuracies derived from the use of socio-economic indicators, multiple indicators should be used whenever possible (Ibid. 1991). The convergence of evidence will instill confidence in those agencies responsible for addressing the food crisis. In addition, attempts should be made to pre-test indicators to determine whether local factors may distort an indicator's validity and reliability (Ibid. 1991). Efforts also should be made to limit food access indicators to a manageable number.

Figure 2.3



Responses to household food shortages (after Watts, 1983)
The types of coping strategies employed by households indicate household vulnerability to food shortage, and correspond to different types of government and donor responses.
Office of Arid Lands Studies. The Universitu of Arizona. 1991.

Outcome Indicators

Given the cost and time involved with collecting individual intake data for households, outcome indicators are usually proxies for adequate food consumption. Selection of proxies should take into account the fact that the indicator may be measuring more than food (e.g. nutritional status). Given the technical methods associated with each proxy, not all are going to be cost effective or feasible to collect for most monitoring systems.

In general, HFS outcome indicators can be grouped into direct and indirect indicators (Ibid. 1988). Direct indicators of food consumption include those indicators which are closest to actual food consumption rather than to marketing channel information or medical status. Indirect indicators are generally used when direct indicators are either unavailable or too costly (in terms of time and money) to collect. Given the technical methods associated with these indicators, not all of them are easily aggregated upward.

Direct Indicators

Household Budget and Consumption Surveys

Data gathered through budget expenditure surveys can be used to determine the money spent on food by an individual or household. Data on food expenditures can be converted to calories using price per unit and calorie per unit conversion factors (Kumar 1989). Given that food is a composite of several different items, aggregation is limited by a choice of common denominators. Two methods are generally used: limit consideration to food grain consumption, or convert all food items to their calorie content (O'Brien-Place and Frankenberger 1988). The major limitations of this indicator are: 1) expenditure surveys tend to underestimate expenditures on food because the value of food produced at home or gathered locally is often not recorded; 2) the time and resource demands of such surveys; 3) data are often only collected every 10 years; and, 4) remote rural areas are generally under represented (Kumar 1989).

Household Perception of Food Security

People's own perception of food needs is an important aspect of HFS. Many households experience seasonal food shortages on a regular basis, and are forced to make behavioral adjustments to compensate for these shortfalls. Even when people have access to food that can meet their nutritional requirements, the food may not be culturally preferred or even be considered food (Eide et al. 1986). The cultural acceptability of food is critical to a households perception of food security. Therefore, inquiries could elicit the opinions of households regarding their food security status. Such responses could be sought during the hungry season, just prior to harvest. One

shortcoming of this approach is that households may deliberately distort their response in order to gain development assistance.

An example of such an indicator called "extent of self-provisioning" has been used in food systems studies (Chattopadhay 1991). Self-provisioning is defined here as household production and receipts in kind, either from labor transactions or claims. It is the number of months of self-provisioning as perceived by the household.

Food Frequency Assessments

Food frequency assessments involve the collection of minimum amounts of food consumption data. Inquiries focus on a limited number of food items (e.g. asking about ten food items which make up 90 percent of the diet), which are aggregated by food groups, and asking for the frequency of consumption of food items rather than the quantity of consumption (O'Brien-Place and Frankenberger 1988). Information is collected through a shortened 24 hour recall survey.

A variation of this type of assessment was used in Mali as part of the research undertaken by Michigan State University funded under the USAID Food Security in Africa Cooperative Agreement (Staatz et al. 1990). Household consumption security rankings were based on the following indicators for each household: number of meals eaten per day; number of meals which include meat or fish, number of ingredients in the sauce served with the main staple (a measure of dietary diversity), and number of times per day a nutrient-poor gruel was prepared as the main meal (Ibid. 1990). Households were then grouped into ranks of high, average, or low consumption security.

Although this method is limited in its level of precision, it is a cost effective simple tool for detecting consumption differences between households (O'Brien-Place and Frankenberger 1988). To ensure that relevant data are collected by this method, the technique must be fine-tuned to the cultural setting for which it is used.

Indirect Indicators

Storage Estimates

Estimates of food in storage during critical times of the year can give some indication of a households food security status, especially in communities that produce much of their own food. However, some people may be reluctant to discuss food in storage due to cultural beliefs, or may obscure how much food is in storage by having food distributed in more than one location (O'Brien-Place and Frankenberger 1988). Indirect questions might be used such as: "Given the amount of your last harvest, how long will the household be able to eat from it?" In Mauritania, female heads of

households were able to estimate the number of months their food stores would last quite easily (Ibid. 1988). Similar findings have been obtained in Malawi.

Subsistence Potential Ratio

This is the ratio of the households' ability to feed itself to its need to feed itself (Whelan 1983). The data needed for calculating this ratio are size of farm, expected yield, and age and sex composition of household. The subsistence potential ratio compares the amount of food (calculated in energy) which a household can produce over a year with the energy requirements of the entire household for the year (Frankenberger 1985). This ratio works best in communities that produce most of their own food.

A similar indicator used in Tanzania is the household food security card (Wagara 1991). The card is mainly an assessment curve that corresponds to individual household food balance, calculated on a monthly basis. From the month of harvest, the food available for the main crop (maize) is compared to the household food requirement. Each household is then classified as good, average, or poor. This is used as a tool by extension personnel for nutrition programming and evaluation.

Nutritional Status Assessments

Anthropometric measures are commonly used proxy indicators for food consumption. Nutritional surveys estimate the prevalence of malnutrition in a population by measuring the nutritional status of a random sample of children under five. Weight for age and height for age are widely used in nutrition surveillance programs. The advantages of anthropometric indicators are: 1) the data can be disaggregated; 2) the relative cost of data collection is not high in comparison to other surveys; and, 3) data may be available from secondary sources (Kumar 1989). Nutritional status information (e.g. heights/weights threshold measures) has been used for targeting relief operations and monitoring the impact of interventions (Mason et al. 1984). Nutritional status data also are used for defining areas of vulnerability (Borton and Shoham 1991).

Although nutritional status has been one of the most popular indicators used for HFS, there are a number of fundamental conceptual problems associated with its use. First, because nutritional status is a result of several factors in addition to food consumption, it does not always correlate directly with food availability and access. For example, there was no correlation between HFS and nutritional status in a study carried out in Mali (Staatz et al. 1990). Factors such as health status (e.g. disease prevalence), sanitation, mother care, and the level of activity of the individual can influence nutritional status outcomes (O'Brien-Place and Frankenberger 1988). Secure access to enough food to meet household food needs is a necessary but not sufficient condition for good nutritional status.

A second problem associated with the use of anthropometric measures is that they are often a late indicator of a food crisis (Borton and York 1987). There is a time lag between food shortages and changes in body size and composition (Galvin 1988). However, Young and Jaspars (1991) counter this argument by pointing out that changes in nutritional status of the population may occur early in the famine process. An early coping strategy followed by people in Ethiopia and Sudan is to deliberately reduce consumption in order to preserve their assets. This data seems to indicate the nutritional status of a community was very sensitive to changes in food security and should be used as an early indicator in food security information systems (Young and Jaspars 1991).

A third problem with nutritional status involved the use of age assessments in anthropometric measures (Galvin 1988). The correct age is critical to interpretation of height for age and weight for age. For this reason, weight for height is often used when age calculations are questionable (Mason et al. 1984).

Fourth, a number of other problems arise with the interpretation of anthropometric measures. For example, outmigration of destitute families or excess mortality may distort nutritional status assessments for a given area (Young and Jaspars 1991). In addition, pastoralists are usually under represented in clinical data (Mason et al. 1984).

Despite these short comings, donor organizations often perceive anthropometric data as hard objective data when compared to socio-economic indicators (Shoham and Borton 1989). High ratios of malnutrition are much more likely to elicit response than distress livestock sales (Ibid. 1989). Recognizing the power of anthropometric data to generate public sympathy and donor interest, some NGOs collect such data despite the problems associated with its use (e.g. Oxfam in Sudan) (Ibid. 1989).

Discussion

One of the major problems associated with HFS outcome measures is that many of the proxies that are appropriate for one area may not be appropriate for another. This makes it difficult to aggregate this information at the regional or national level. HFS status is not difficult to assess for administrators and staff working at or near the community level, because local processes are better understood. At the national level, however, local level circumstances are difficult to assess, so decision makers are more likely to favor indicators that can be aggregated and that allow for comparisons across regions. To ensure limited funds are dispersed correctly, indicators that appear to be objective and can be quantified have greater appeal. This holds true for donors as well. Unfortunately, such indicators are not very effective in identifying food insecure households due to many of the measurement problems previously discussed. For example, considerable emphasis is given to anthropometric measures and national expenditure data because the data are quantitative and can be aggregated.

Given that HFS status assessments will be more effective when they are locational specific, decentralized diagnosis and intervention should be supported whenever possible. A good example of such an approach is being implemented in Indonesia (Brooks et al. 1985) HFS status assessments will continue to be problematic if information and intervention decisions remain totally centralized.

Selection of Indicators

Indicators of household food security are selected for a specific purpose. Whether the goal is to evaluate a project, set up a monitoring system or to develop a HFS strategy for the country will to a large extent dictate the choice of the indicator. The user of the information on indicators also will drive the choice of the indicator (See Section II).

A number of criteria are used in the selection of indicators for use in monitoring HFS. These include resource availability, relevance, accuracy and timeliness. The following section deals with each of these criteria.

Resource Availability

Information on household food security conditions could help in general development planning as well as in early warning of potential food crises (Davies et al. 1991a). Data on both food availability and access will need to be collected. The types of data collected will however depend on what is feasible given existing resources as well as what is desirable (ibid. 1991). The design of any information system oriented to the collection of HFS data cannot ignore the limitations of existing operational capacity if it intends to be sustainable (Davies et al. 1991a). The financial, personal, institutional, and infrastructural resources available will set the boundaries within which such systems should operate. Because donor agencies are reluctant to fund food security agencies when a food crisis does not exist, careful consideration needs to be given to using existing information sources for multiple purposes (Koenig 1988). In cases where the collection of primary data is not feasible, reliance on secondary data collected by multiple agencies may be necessary. Problems may arise in achieving collaboration among agencies in sharing data, especially in a timely fashion. This is especially true if agencies are hierarchical and autonomous. Survey management skills will be the vital and often limiting factor (Casley and Kumar 1988).

Relevance and Accuracy

An appropriate indicator will be sensitive to changing conditions of stress for households in a given area. Relevancy is enhanced when indicators are selected on the basis of a good understanding of the local conditions leading to the food insecure situation (Davies et al. 1991a). Development of location specific food crisis models may help determine the most appropriate indicators for a community or region (Davies et al. 1991a).

Access to resources may seriously limit the ability to collect accurate data. Trade offs will be necessary between cost and level of accuracy (Davies et al. 1991a). The more emphasis that is placed on accuracy (e.g. how close the defined variable is to actual food intake), the more time and money will be necessary. Much of the information collected in surveys has a degree of accuracy that is not necessary (Eklund 1991). Chambers (1990) has described two principles that should be applied under such circumstances. The first principle is *optimal ignorance* (McCracken et al. 1988). Food monitoring systems should not try to find out more than is needed. The second principle is *appropriate imprecision* (Haddad et al. 1991). Information systems should not measure more accurately than is necessary for practical purposes. Both of these principles are commonly used in rapid rural appraisals.

Timeliness

Timeliness applies not only to predicting food shortages and change in entitlement, but also in the response to such change. Information required to help administrators make decisions becomes valueless, however accurate, if it is provided after the decisions are made (Casley and Kumar 1988). *Rapid rural appraisal* (RRA) techniques have been employed in food security monitoring as a way of increasing the speed and coverage of data collection (Frankenberger 1990; Maxwell 1989) (See Section II). They can be effectively used in carrying out pre-harvest surveys, and food systems inquiries in the initial stages of setting up an information system (Davies et al. 1991a). RRAs are extremely useful in determining what data need to be collected in greater detail for use as indicators (Ibid. 1991). Despite their usefulness, two potential problems are associated with the implementation of RRAs: 1) their propensity to focus on current rather than baseline vulnerability; and, 2) their need for multidisciplinary staffing. Such human resources may not be readily accessible to some monitoring units (Borton and Shoham 1991).

Two closely related techniques are currently being tried out that would enhance the timeliness of response to food crises are risk/vulnerability maps and contingency plans. Risk/vulnerability maps are maps representing sets of information which initially identify the areas and sectors of the population that are most vulnerable to food insecurity (Davies et al. 1991a; Borton and Shoham 1991). WFP has been instrumental in supporting the development of this technique in Bangladesh and Sudan (Borton and

Shoham 1991). The maps are intended to: 1) highlight those areas of the country or region that need to be monitored more closely; 2)

allow the weighting of allocations within regular food aid programs; and, 3) stimulate greater consideration of appropriate interventions for designated vulnerable areas (Ibid. 1991) (See Section II).

Another technique developed to improve the link between information and timely response are contingency plans for risk prone areas (Swift 1989a). These plans draw their inspiration from the Indian famine codes used in the 19th Century. Contingency plans are developed for a district or province, and involve formulating a set of actions that are closely tied to predetermined warning stages derived from a locally based food security monitoring system (Buchanan-Smith et al. 1991). The systems currently operating in Turkana, Kenya and Indonesia offer good models upon which to build in other countries (Swift 1989b; Brooks et al. 1985).

Summary

Food availability and stable access are both critical to HFS. For this reason, information should be collected on factors that play a role in limiting food availability and the options that households have for food access. A households' stable access to food will be determined by its means for procuring food (produced, purchased, gathered) and the social mechanisms that buffer households from periodic shocks. Vulnerability to food insecurity is location specific, so indicators are needed that measure supply and food entitlement changes at the local level. The types of indicators and their characteristics are summarized in Figure 2.5. The indicators that are used will depend upon the financial, human, institutional and infrastructural resources available.

To date, few information systems are presently in place that adequately incorporate both food supply/production data and access/entitlement data in the same indicator set. A food supply orientation focusing on production data and nutritional status persists primarily because these data are easiest to obtain and are well-suited to aggregated analysis. Few donors or governments are willing to commit the time or resources necessary to obtain information on socio-economic indicators that are sensitive to the vulnerability of different local groups. Decentralized HFS monitoring systems would be the best means for obtaining such information. Centralized HFS monitoring systems are likely to experience more difficulties in adequately assessing the HFS status of local populations.

The fact remains that donors and governments have to make difficult decisions regarding the allocation of resources across regions. These decisions often require different data needs and methods than what may be appropriate at the local level. A balance must be struck between the need for data for central decisions on the

Table 2.4

Indicators for Timely Warning and Coping Mechanisms of Communities

Community mechanism to deal with food crises	Potential indicators	Possible sources of data
Change of food source	Number of households dependent on reserve	Agricultural workers, health centres
Attempt to find employment	Unusual movement of adult males: change in wage rates or application for jobs	Chiefs, administrators, recruiting agencies, extension workers
Sell off livestock	Increase in sales, decline of livestock prices	Extension workers, cattle auctions, abattoirs
Attempt to purchase food in local markets	Increase in crop sales, Increase in crop prices	Marketing agencies, local price reporters
Request assistance from government	Number requesting assistance, applying	Records of assistance programmes, NGOs
Seek assistance from relatives	Change in school enrollment, changes in clinic attendance, increase in remittances	School, clinic records, books, post offices, (flow of remittances)
Migrate to areas not affected	Unusual movements of people	District and area administrators

Source: FGS 1990 and Eele 1987. (Taken from Davies et al. 1991)

allocation of resources and a need for information appropriate for decentralized HFS monitoring and interventions. Section II addresses these differential needs and identifies an approach that takes both of these concerns into account.

Figure 2.5

Household Food Security Indicators

Indicator	Availability	Sources of Information and Collection Method	Measurement	Level of Aggregation	Limitation
Food Supply Indicators					
Meteorological Data (rainfall)	readily available	government reports monitoring stations satellite remote sensing	cumulative amount/average change from average onset	national regional district	number of stations timing of rains may be false indicator
Information on Natural Resources (includes grazing resources)	readily available	periodic assessments government, NGOs satellite imagery government and donor studies	dekedal values dekadal value/previous dekadal dekadal average/long-term dekadal average	national regional district	access to remote sensing
Agricultural Production Data (crops and animals)	readily available	government reports crop cutting on sample plots remote sensing farmer reports	seasonal kg/capita departure from average kg/capita % change from past years	national regional district	limited information on other crops besides staple
Agroecological Models	not readily available	monitoring stations soil assessments	FAO Crop Specific Soil Water Balance Model	national regional district	computer capability for analysis
Food Balance Sheets	readily available	secondary sources government reports	production-consumption requirements (opening stocks, production, imports, domestic per capita requirements, exports and closing stocks)	national regional	underestimate nontraditional crops
Information on Pest Damage	moderately available	field assessments government reports	seasonal kg/capita for crops % of change from last year	national regional	frequency of assessment

Figure 2.5 (continued): Household Food Security Indicators

Indicator	Availability	Sources of Information and Collection Method	Measurement	Level of Aggregation	Limitation
Food Supply Indicators (continued)					
Market Information (prices)	readily available	price data market surveys	value of crop prices, livestock prices monthly value/average monthly value for previous year	national regional local	interpretation of sales and price
Regional Conflict	not readily available	key informants NGOs	# of incidents influx of refugees	regional local	collection of data in conflict zone

Figure 2.5 (continued): Household Food Security Indicators

Indicator	Availability	Sources of Information and Collection Method	Measurement	Level of Aggregation	Limitation
Food Access (Effective Demand or Entitlement)					
Risk Minimizing Strategies					
land use practices	limited	RRA formal surveys	changes in crop mix changes in time of planting	HH/village	location specific
diversification of livestock	limited	RRA formal surveys	changes in livestock mix early movement to alternative range # animal deaths	HH/village	location specific
Loss Management Strategies					
dietary change (both quantitative and qualitative)	limited	RRA HH surveys in-depth interviews	reduction in # of meals decreased dietary diversity shifts from preferred to lower status food	HH/village	location specific
change of food source	limited	RRA HH surveys	increased dependence on wild foods # of HH dependent on reserves grain price increases	HH/village	location specific
diversification of income sources	limited	RRA HH surveys	changes in petty marketing patterns changes in wage rates increase # of HH seeking off-farm employment	HH/village	location specific
access to loans/credit	limited	RRA HH surveys	increase # of people seeking assistance from relatives # of people seeking credit	HH/village	location specific
livestock sales	available	market surveys secondary data	increase sale of livestock/season decline of livestock prices	national regional local	location specific
seasonal migration	limited	RRA HH surveys	large # of people migrating for work	village HH	location specific

Figure 2.5 (continued): Household Food Security Indicators

Indicator	Availability	Sources of Information and Collection Method	Measurement	Level of Aggregation	Limitation
Food Access (Effective Demand or Entitlement) Loss Management Strategies (continued)					
sale of production assets	limited	RRA HH surveys	appearance in market of unusual amounts of personal and capital goods (jewelry, farm implements, draft animals) sale of young female animals	village HH	location specific
distress migration	limited	RRA HH surveys government records NGOs	# of whole families moving out of area	regional village HH	location specific

Figure 2.5 (continued): Household Food Security Indicators

Indicator	Availability	Sources of Information and Collection Method	Measurement	Level of Aggregation	Limitation
Outcome Indicators					
Direct Indicators					
household budget and consumption surveys	limited	national surveys	price per unit of food or caloric per unit of food conversion factors/capita	national regional district	high cost
household perception of food insecurity	limited	RRA in-depth interviews	# of months of self provisioning from household production and receipt of in-kind as perceived by the household	village HH	local population may distort data
food frequency assessments	limited	HH surveys 24-hr recall	# of meals per day # and types of ingredients in meals # of times per day a nutrient-poor gruel was served as main meal	village HH	difficult to aggregate at regional or national level limited level of precision culturally specific
Indirect Indicators					
storage estimates	limited	HH surveys RRA	# of months food stores will last as perceived by the HH	village HH	difficult to obtain due to cultural beliefs difficult to aggregate
subsistence potential ratio	readily available	HH surveys	size of farm, expected yield and age and sex composition of household Amount of food produced/food required	village HH	difficult to aggregate assumes all farm land used for food production
household food security card	limited	HH surveys	food available from main crop compared to HH requirements on monthly basis	village HH	only useful in areas where most food is grown by the household
nutritional status assessments	readily available	government health department formal surveys anthropometric measures	weight/age height/age weight/height arm circumference	national regional local	nutritional status influenced by sanitary conditions, care age assessment question

Section II:

Data Collection Methods for Using Household Food Security Indicators

Introduction

Household food security indicators are used by a number of different groups and organizational entities. The users include donors, national governments, local governments, NGOs and local communities. Each user group may have different data needs for the decisions they are going to make, requiring different types of collection methods. In designing HFS information systems and selecting the array of indicators to be used, the key questions to ask are: 1) who will be using the data; 2) what types of data will be needed; 3) what types of data already exist or are being collected by other agencies or organizations; 4) what methods are required to collect data that does not exist; 5) what resources (financial, personal, institutional) are available for collecting and analyzing the information; and, 6) what interventions are possible given the availability of resources.

This section begins with a discussion of the different user groups of HFS indicators and their data needs. This is followed by a discussion of the different types of data and collection methods that are used to meet these various needs. The section then addresses the various types of food security monitoring systems that presently exist, ranging from global and national systems to local systems implemented by NGOs. The section concludes with a discussion of a household food security monitoring approach that draws from the strengths of the various systems under review.

User Groups of Household Food Security Indicators

User groups requiring information on household food security operate at both the macro and micro levels. National governments and donors require such information to make informed planning and policy decisions, especially if limited resources have to be shared across regions. At the micro level, local governments, NGOs and local communities require information to identify vulnerable groups and appropriate interventions to improve HFS. Although there is considerable overlap in the decisions

and data that are used by different groups, some key differences do exist which have bearing on the types of data that are required.

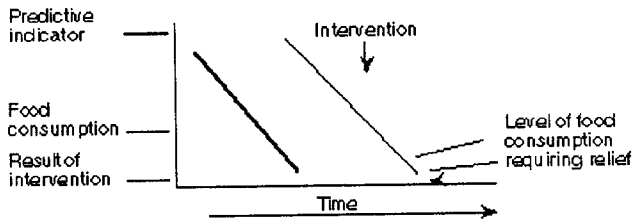
At the macro level (national or regional level), governments and donors seek a small range of indicators that can be aggregated and lend themselves for comparison across areas (Davies et al. 1991). This will allow for "objective" decisions to be made about the allocation of resources across regions. High quality, quantitative statistical data are required that are representative of the various regions under consideration. Supply indicators are well suited for this aggregate level of analysis (e.g. production, rainfall, food balance sheets), as well as anthropometric measures. Socio-economic data relevant to local populations are rarely used because of limitations on time, resources and knowledge, and the low potential for aggregation.

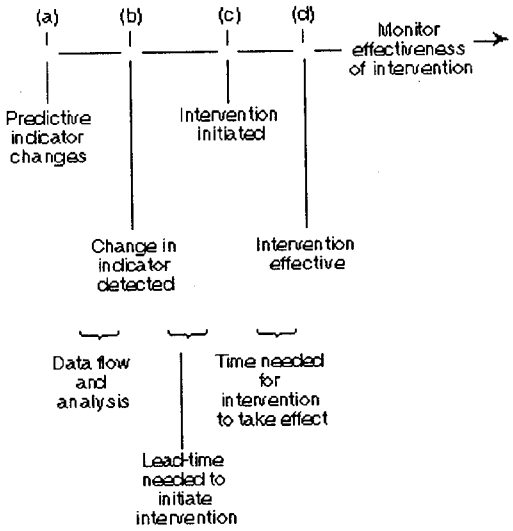
At the micro level, local governments, NGOs and local communities seek locational specific information that will enable them to detect food insecure groups and to identify appropriate interventions. Qualitative data that reveal the local processes at work are best suited for these types of decisions. Working close to the community, targeting errors regarding vulnerable households are less likely. Socio-economic data are often incorporated in the set of indicators used for monitoring at the local level. Locally relevant predictive HFS indicators are easier to incorporate into these decentralized monitoring systems. This is especially true for community based food security monitoring systems.

The differences in data needs have implications for detecting HFS problems and intervening in a timely manner. In countries where centralized decision makers are primarily responsible for identifying food insecure groups and interventions, problems may arise in detecting pockets of vulnerability in a given area due to the types of indicators used. The more remote the decision is from the problem, the greater the time lag in initiating appropriate action (Mason et al 1984) (See Figure 2.6). Location specific predictive indicators are difficult to incorporate into centralized decisions.

The time lag between detection of household food insecurity and appropriate action is decreased through decentralized diagnosis and response (Davies et al. 1991). Local food security monitoring systems can incorporate locally relevant socio-economic indicators to improve detection and response time. Examples of such decentralized monitoring systems are found in Indonesia (Brooks et al. 1985) and Botswana (Davies et al. 1991).

Figure 2.6





(Mason et al 1984)

Types of Data and Collection Methods

The information needs of different user groups entail the collection of different types of data using different kinds of methods. Data and collection methods can be classified into two general types: quantitative and qualitative. Quantitative methods produce numerical data usually through structured surveys (Casley and Kumar 1988) (See Figure 2.7). Quantitative data are collected when a number, ratio, or proportion related to the target population must be estimated or a variable such as crop production must be measured (Ibid. 1988). The major advantages of quantitative methods are: 1) the questionnaire can be standardized to remove interviewer biases; and 2) a sample of the population can be drawn to derive estimates about the whole population within known margins of probable error. The major disadvantages usually associated with

quantitative methods are: 1) the time lag required to produce results; 2) the high cost associated with administering the survey; and 3) the non-sampling errors associated with the wording of the questions and the lack of consideration of local context (Molnar 1989).

Table Figure 2.7

Selection Criteria for Methods

Criteria	Classification		
	A	B	C
1. Scale of Inquiry	Phenomena of interest are rare and clustered	Village or community level Specific site or institution	Phenomenon of interest widely distributed throughout area
2. Interview Type	Free ranging: Unstructured	Open-ended questions: Attitudinal studies	Closed or structured questionnaire
3. Observations and Measurement	Technical requiring professional skill	Accurate and detailed	Simple counts or measures
4. Frequency	Continuous or very frequent	Multi-visit over year	Single visit

Source: Casley and Lury, 1982.

Case Studies — Enquiries involving one or more A types. These include rare phenomena, free ranging interviews, professional encounters, and continuous observation. These are not conducive to large sample surveys due to the demanding nature of the inquiry in terms of identification of respondents and the time and skill needed for the investigation. Case study approaches are also best used when the inquiry is focused on villages or at the community level (1B) and when the questions are open-ended or attitudinal in nature (1B). (Classic sociological case studies)

Sample Surveys — Are well-suited for inquiry about phenomena widely distributed throughout the area (1C) and when the questionnaire is closed or structured (2C). Sample surveys are also used when observations and measurements are accurate and detailed (3B), simple counts and measures (3C), multi-visit over a year (4B), and single visit (4C). (A nutritional survey involving anthropometric measures of children, regular but simple price collection)

Qualitative methods produce descriptions of situations, events, people and systems interactions (Casley and Kumar 1988). Methods used include in-depth interviews with key informants, group interviews, focus groups and participant observation. Qualitative data are collected when the attitudes, beliefs, knowledge and perceptions of the target population must be known (Ibid. 1988). These types of methods are best used in case studies with small numbers of individuals or groups, where selecting is done deliberately according to specified characteristics rather than at random from the population. The major disadvantage associated with qualitative methods is that they do not generate information that is generalizable to a larger population.

Most information systems require collection of both quantitative and qualitative data. However, nationally based systems rely more on quantitative data that can be aggregated and compared across regions, while local level HFS information systems may operate with limited numerical information. Decentralized diagnosis may identify vulnerable groups through qualitative informal discussion. Thus, the types of data collected will depend upon the user of the information and resources available for obtaining it.

Sampling

One of the most controversial areas in sound use of HFS indicators is the selection of households and sampling. Qualitative techniques are criticized because they do not generate statistically sound survey data (Molnar 1989). Structured surveys using formal sampling techniques are criticized because many feel that what is gained in the reductions of random sampling error is lost through non-sampling error. As Molnar (1989) states, "random sampling gains the researcher nothing if the interviews selected through the random process are poorly conducted."

It is important to recognize that both quantitative and qualitative techniques are tools that play a useful and complementary role in improving our understanding of the HFS situation in a given area. Qualitative methods are useful for improving the depth of our understanding of the local circumstances that households operate in while quantitative tools help us determine the breadth to which observed behavioral practices, resources, or problems are distributed within a population. Although quantitative methods are very much concerned with representative probability sampling, sampling considerations also apply to qualitative information.

There are at least seven kinds of sampling procedures (Bernard 1988). These can be divided into probability based sampling and non-probability sampling techniques. Probability based samples are representative of a larger population and include simple random, stratified random and cluster samples. Simple random samples are samples where each individual within the population has an equal chance of being selected (Bernard 1988). Stratified random samples are done when it is likely that an important sub-population will be under represented in the simple random sample. Cluster samples narrow the sampling field down from large heterogeneous groups to small

homogeneous groups that are relatively easy to sample directly (Ibid. 1988). Cluster samples involve a multistaged process, such as sampling a geographical area then random sampling each cluster.

Population inferences are more difficult to draw from non-probability sampling, such as quota, purposive, snowball and haphazard sampling (Bernard 1988). The major disadvantage of these techniques is that studies based on them have very low external validity. Quota sampling involves identifying a number of sub-populations of interest and selecting proportions of those sub-populations for a sample. Purposive sampling, a technique commonly used in RRA and other qualitative methods, involves selecting a few cases (e.g. villages) for intensive study. Snowball sampling, commonly used in social network studies, involves asking a few key individuals to name others with similar interests, backgrounds or some other desirable characteristic. Haphazard or convenience sampling, involves selecting cases as they come along. It is an approach used in exploratory research (Ibid. 1988).

To draw a good sample, the first thing required is a good sampling frame. Unfortunately, in many rural areas where HFS problems exist, sampling frames are not easy to come by. Bernard (1988) recommends that whenever there is not a sampling frame (e.g. census) for a general population, a multi-staged cluster sample should be used. Sampling should be heavier at the higher levels in a multistaged sample and lighter at the lower stages. This is because as clusters get smaller, the homogeneity of the units of analysis within the cluster gets greater and greater. This means that when quantitative data on HFS indicators is being collected, the survey should attempt to cover more villages in the sample with fewer households per village, rather than many households in a few randomly chosen communities (Bernard 1988). A two-staged cluster sample design also will help save on transportation costs (Eklund 1991). However, cluster sampling also can increase the sampling error compared to simple random sampling, so the necessary sample size will increase (Eklund 1991). This may cancel out the cost savings.

Decisions on sample size are influenced as much by cost and time considerations as by the required precision in estimators (Eklund 1991). Other factors to take into account are the size of the population to which one wants to generalize, the heterogeneity of the population, the numbers of subgroups within the population, and how accurate one wants the sample statistics to be (Bernard 1988). There will always be a trade-off between greater accuracy and greater economy in sampling. Although the degree of accuracy may be reduced, smaller, more cost-effective samples will still provide administrators some notion of the trends that are occurring in the area (Eklund 1991).

Rapid Rural Appraisals

As stated in Section I, RRAs have been employed in food security monitoring as a way of increasing the speed of coverage of data collection. They bridge the gap between formal surveys and non-structured interviewing (Molnar 1989). RRAs are used to collect data on values, opinions, and objectives as well as on biophysical and economic factors. They neither generate statistically sound survey information nor provide an in-depth understanding comparable to long-term qualitative research methods used by anthropologists (Molnar 1989).

The major objective of RRAs is to gain maximum knowledge of the target area with a minimum amount of time and resources (Eklund 1991). They have gained in popularity in recent years because of the time and cost associated with more formal surveys.

In terms of sampling, RRAs normally use purposive sampling techniques in the selection of villages to interview people of different classes, ethnicity, age, gender and with different access to resources (Molnar 1989). Random sampling is then sometimes used (but not always) in selecting individual households (Eklund 1991). A minimum number of randomly selected observations will permit statistical inference to the agriculturalists in the village, even though the sample will not be representative of the population in the area (Ibid. 1991). This will allow for some exploration of relationships between variables upon which data are collected. Random sampling is not applicable to group interviews.

To correct the bias of purposive sampling, some researchers follow up informal RRAs with small formal surveys to test the hypothesis emerging from the RRA (Molnar 1989). Other ways that bias is reduced is through stratification, to ensure that less visible target groups are represented and that more remote agro-ecological zones are visited.

RRAs are well suited to decentralized food security monitoring systems. Such methods help local administrators and NGOs determine the constraints that impact the HFS of local populations, and help identify the key indicators that should be monitored in follow-up surveys. Because these data and their interpretation are location specific, it is often difficult to aggregate at the national level.

Discussion

Ways should be sought to strengthen the communication links between local and national decision makers. This could be done in three ways. First, more responsibility could be delegated to local governments in the collection of HFS information and response. Given the locational specificity of problems, this would improve considerably the detection of household food insecurity and the timing of interventions. Second, locally relevant socio-economic data need to be better reflected

in national government and donor decisions. Third, local government and NGOs could attempt to collect data that can be aggregated more easily to address the data requirements of donors and national government decision makers in allocating resources. They should also aid in the interpretation of supply data and anthropometric measures.

Given that the decision requirements of different user groups require different types of HFS data and collection methods, the next section reviews the different types of information systems that have some relation to HFS monitoring.

Food Security Monitoring Systems

Early Warning Systems — National and Global Systems

Early warning systems (EWS) are systems of data collection established to monitor a populations' access to food in order to provide timely warning of impending crises and to elicit the appropriate response (Davies et al. 1991). As stated in Section I, the impetus for setting up such systems was directly related to the food crises that occurred in Africa in the 1970s and 1980s. The Global Early Warning System (GIEWS) was established by FAO following the 1974 World Food Conference to monitor aggregate food production and food supply both globally and on a national basis (Buchanan-Smith et al. 1991). Since then, a large number of different organizations and agencies have become involved in early warning, including multilateral and bilateral donors, national and local governments, NGOs and local communities. All countries in the Sahel and the Horn of Africa now have some kind of formal early warning system (except Senegal) (Ibid. 1991).

Most of the national EWS were established after 1985 as a response to the last major famine. This accounts for why many of these systems are famine focused, donor supported and located in country capitals (Buchanan-Smith et al. 1991). Until recently, very few systems were oriented towards household food security monitoring.

National and regional EWS were primarily created to monitor food supply indicators. Production data, rainfall and food balance sheets made up the basis of these information systems. Nutrition surveillance programs set up simultaneously in many of the same countries monitored nutritional status (Mason et al. 1984). Recently, some information systems such as the Famine Early Warning System (FEWS), have attempted to incorporate socio-economic indicators to assess vulnerability (Downing 1990). Geographic information systems and other computer software are being used to integrate multiple sources of data (Buchanan-Smith et al. 1991). GIEWS and the

Southern Africa Development Coordination Conference (SADCC) are also attempting to incorporate socio-economic information into their assessments.

Despite these ground breaking attempts, most of these EWS are still primarily using supply type process indicators and food balance sheet analysis. Few systems have been able to integrate local access/entitlement data because of the difficulty of aggregating this information at the national level.

Local Early Warning Systems

There are few EWS that have been established at the sub-national level. EWS run by local governments have been established in Darfur, Sudan, Turkana, Kenya and Lombok, Indonesia (Buchanan-Smith et al. 1991; Brooks et al. 1985). The regional EWS in Darfur is based in the Agricultural Planning Unit, and coordinates its efforts with a number of other government institutions, donor-funded projects and NGOs (Buchanan-Smith et al. 1991). This decentralized system uses both qualitative and quantitative data to identify vulnerable groups (Ibid. 1991). Information related to coping strategies is collected during pre-harvest surveys using RRAs. Nutritional data also are collected through community-based nutrition monitoring carried out by an NGO (Oxfam). Vulnerable groups are identified on a geographic basis rather than by socio-economic criteria.

The major problem associated with this system is that information and response are not formally linked. This is primarily due to the limited resources the regional government has been able to secure from the national government (Buchanan-Smith et al. 1991).

The EWS set up in Turkana, Kenya in 1987 also operates at the sub-national level (Swift 1989). Run by the Turkana Drought Contingency Planning Unit, this system alerts authorities of deteriorating food insecurity by monitoring local coping strategies as well as quantifiable data provided by other government departments (Buchanan-Smith et al. 1991). Vulnerability is determined on a geographical basis. Data are collected on livestock, crops, diet, income generating activities, attendance in school, aerial surveys, rainfall and through remote sensing (Ibid. 1991).

The major feature of this system is that it operates on the basis of a predetermined *drought contingency plan* (Swift 1989). Similar to the Indian Famine Codes, this plan consists of a district drought policy, an EWS, and a set of pre-determined responses should a drought occur to ensure food availability (Borton and York 1987). Warning stages of the information system correspond to specific actions.

The food security information system was designed in two stages. The first stage involved a qualitative analysis to identify key indicators that could be monitored quantitatively in the second stage (Buchanan-Smith et al. 1991).

A third example of a successful decentralized food security monitoring system operated by local government is found in Lombok, Indonesia (Davies et al. 1991). The Timely Warning and Intervention Information System (TWIIS) is a nutrition surveillance system set up at the district level (Brooks et al. 1985). It relies on villagers to collect food consumption data, and has developed a number of HFS indicators that are locally monitored. Operated at the District level, this system effectively links information to response in a cost efficient manner because the national government has delegated responsibility to the District.

NGOs also have been involved in establishing local level HFS early warning systems. For example, the Sudanese Red Crescent Society Drought Monitoring Program in Darfur, Sudan is a community-based EWS (Buchanan-Smith et al. 1991). Local level monitoring was carried out using participatory methods, collecting qualitative information on grain and livestock prices, migration, labor wages and availability and consumption patterns (Ibid. 1991). The key problem associated with this system was that information was not adequately linked to response.

A more effective decentralized food security monitoring system set up by an NGO is the Suivi Alimentaire Delta Sent (SADS) established by Save the Children Fund (U.K.) in Mali (Davies 1989). Set up in 1987, SADS is a food monitoring system based on village and household inquiries in the Fifth Region of Mali. This is a people-centered system that focuses on how people feed themselves (Buchanan-Smith et al. 1991). It collects both qualitative and quantitative information from local producers, key informants and local markets. Village level surveys (RRA) are carried out on a quarterly basis, collecting information on entitlement indicators such as availability of off-farm employment, access to wild foods, migration, available stocks, and crop production (Ibid. 1991). The data are collected on the basis of production systems to stress the HFS differences that exist within and between agro-ecological zones (Davies 1989). "Listening posts" also were established to monitor the situation on a monthly basis (Ibid. 1989). These are staffed by people recruited locally.

Similar to the system established in Turkana, SADS carried out qualitative surveys in the first year to understand the local HFS constraints in order to identify appropriate indicators (Davies 1989). Quantitative surveys were carried out the second year on these key indicators of access to food.

SADS also effectively links information with response. These interventions are intended to reinforce non-degrading food entitlements for well-defined target groups (Davies 1989). Interventions are initiated through NGOs and existing local structures such as village associations and local cooperatives. Potential interventions include seed banks, subsidized transport, small-scale credit and the replacement of productive assets (Ibid. 1989).

Vulnerability Mapping (Risk Mapping)

As stated in Section I, pioneering efforts in vulnerability/risk mapping have been carried out in Bangladesh and Sudan under WFP support (Borton and Shoham 1991). The USAID-funded Famine Early Warning Systems Project also has contributed significantly to this conceptual development (Downing 1990). Vulnerability maps are maps which identify the areas and sectors of the population which are most vulnerable to food insecurity. These maps highlight the regions that need to be monitored more closely, help governments and NGOs to target food aid more effectively and identify factors to take into consideration in designing interventions for vulnerable areas (Borton and Shoham 1991). An earlier version of vulnerability mapping used in the 1970s was "functional classification" of under-nourished populations as a basis for food and nutrition planning (Joy 1973).

Vulnerability to food insecurity, as explained in Section I, is an aggregate measure for a given population of the risk of exposure to different types of shocks or disaster events (primarily supply indicators) and the ability to cope with these events (primarily access/entitlement indicators) (See Figure 2.1). Mapping vulnerability involves assessing the *baseline vulnerability* (the contextual factors encompassing food insecurity events over the previous years), *current vulnerability* (the shocks overlaying the baseline) and *future vulnerability* (trends associated with long-term food security risks).

A number of different approaches have been used in mapping food-related vulnerability. These include: 1) disaggregating existing data on socio-economic groups; 2) surveys that collect information directly relevant to vulnerability; 3) using existing data on key indicators of vulnerability; and 4) conducting rapid rural appraisals (Borton and Shoham 1991). Combining approaches may be necessary due to quality differences in the data. Geographic Information Systems are now being used for combining different data sets (Hutchinson et al. 1992).

The types of information that can be used as indicators of vulnerability to food insecurity will vary considerably between countries and regions within a country. Some indicators may be more important than others in determining vulnerability, so subjective weighting of indicators is often necessary (Borton and Shoham 1991). If weighting must be done, it is important to rely on individuals who have local knowledge and experience in the areas to assign these weights.

Vulnerability maps drawn up for arid and/or semiarid regions should take into account the location of ecologically favorable areas that serve as refuge points during drought conditions (Susanna Davies, Personal Communication). The over-utilization of the resources in such areas by multiple users during times of stress can increase the future vulnerability of the local population. Monitoring posts or sentinel sites (Mason et al. 1984) could be established in these areas of convergence to assess the regional impact of droughts.

Vulnerability maps have great potential for donors and national governments in assisting with decisions regarding the allocation of resources across regions. The development of such maps could ideally be a first step in identifying districts or subregions where more location specific HFS information is necessary to collect for designing appropriate interventions. Decentralized HFS monitoring systems could then be developed in these designated areas.

A Systematic Approach to Identifying Food Insecure Households

To strike a balance between the need for data for allocation decisions and the need for information appropriate for decentralized HFS monitoring and interventions, a staged approach can be adapted that builds upon the strengths of the various information systems previously described. In countries where national early warning systems already exist (e.g. crop forecasting, food balance sheets, nutrition surveillance), information supplied by these systems can help develop vulnerability maps for various regions. Existing data should be used to formulate these maps as much as possible to cut down on costs. These vulnerability maps should be based on both supply-type indicators and access/entitlement indicators as much as possible to avoid designating an area as vulnerable which may not be. These maps should be fine-tuned as more information becomes available.

The vulnerability maps can then be used to designate areas where more location specific HFS information can be gathered. If such information does not already exist, RRAs can be used to understand the local socio-economic context and identify HFS constraints and key indicators to be used in decentralized food security monitoring systems. This information will feed directly into the development of a district or sub-regional contingency plan, consisting of the HFS monitoring system and a set of pre-determined responses that would be implemented if and when food security conditions change. These responses would be designed in non-crisis years, and would encompass *development-type* interventions that enhance the long-term sustainability of HFS, *mitigation-type* interventions that enable households to retain their productive assets and existing entitlement, and *relief-type* responses if immediate food aid distribution is warranted. Responsibilities for these various actions will be negotiated and assigned to government agencies, donors and local NGOs prior to the onset of food crises to improve response timing.

Whenever possible, participation of local communities in information gathering and response should be encouraged. People-centered systems like SADS in Mali provide a good model to follow for community-based food security monitoring. Participatory rural appraisal approaches can provide guidance for community-based interventions.

In situations where areas of chronic food insecurity have already been designated for project activities, location specific HFS information will be needed for identifying vulnerable groups in the area and appropriate interventions. Monitoring systems should incorporate process indicators as well as outcome indicators in order to detect changes in entitlement and food supply. Such changes can drastically affect the success of interventions, and may call for modifications or adjustments in the intervention mix being promoted by the project. For example, drought conditions may force some households to sell assets, diminishing their ability to take advantage of project inputs. Contingency plans may be necessary to provide income transfers through food for work/cash for work during stress periods to prevent project beneficiaries from selling off productive assets. Such plans can be built into the project design, and should be based on improvements in infrastructure and/or natural resource management that will enhance the long-term food security of the local area. To ensure such plans are appropriate, participation of local communities in identifying options will be necessary.

Summary

The information needs of different user groups will influence the selection of HFS indicators and the data collection methods to be used. National governments and donors require quantitative information to help make informed planning and policy decisions regarding the sharing of limited resources across regions. Local governments, NGOs and local communities require qualitative location specific information to design appropriate interventions.

HFS information systems can be designed to take both of these concerns into account. Using a staged process, vulnerability maps can help determine in a cost-effective manner where the decentralized food security monitoring systems should be located. Contingency plans can then be developed to link information to response.

For projects already established, monitoring systems should incorporate HFS process indicators as well as outcome indicators in order to detect changes in entitlement and food availability. Such changes may require modifications in the intervention mix presented by the project in the course of the project life. Contingency plans could also allow for income transfers during stress periods to protect the asset base of the project beneficiaries.

Conclusion

A number of conclusions can be drawn from this review of household food security indicators. First, it is apparent that much intellectual progress has been made in our understanding of the processes that lead to food insecure situations for households. Food availability and stable access are both critical to HFS. Thus, any particular monitoring system used for assessing HFS must incorporate both food supply/production data and access entitlement data as part of their indicator set.

Second, household food security indicators are used by a number of different groups in making a variety of decisions regarding the allocation of resources, intervention design, and the timing of response. These user groups include donors, national governments, local governments, NGOs, and local communities. Each user group may have different data needs for the decisions they are going to make requiring different types of indicators and data collection methods. The subset of indicators that are used by a particular user group will be determined by the specific data needs and the resources that are available to collect this information.

Third, vulnerability to food insecurity can be mapped for a country or region to assist national governments and donors in making decisions regarding the allocation of resources across regions. Vulnerability to food insecurity is an aggregate measure for a given population of the risk of exposure to different types of shocks or disaster events and the ability to cope with these events. The types of information that can be used as indicators of vulnerability to food insecurity will vary considerably between countries and regions within a country. The development of vulnerability maps could be a first step in identifying districts or subregions where more location specific HFS information is necessary to collect. This information could then be used for targeting development initiatives and for setting up decentralized HFS monitoring systems. Such systematic approaches for targeting development should be encouraged.

Fourth, development projects and programs should be designed in such a way to take into account periodic shocks that may negatively impact the food security situation of households. To prevent households from selling off their assets and diminishing their ability to take advantage of project inputs, project designs should incorporate: 1) a monitoring system with indicators that can detect changes in entitlement and food supply; and, 2) contingency plans that protect the asset base of the project beneficiaries during periods of stress through income transfers such as food-for-work/cash-for-work. Through local community participation, these contingency plans can be designed to focus on improvements in infrastructure and/or natural resource management that will enhance the long term food security of the local area.

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Annex I:

Potential Indicators of Household Food Security from the Broader Literature

(Socio-Economic Indicators Related to Food Access)*

Household	Indicator	Comments
Demographic	Household size/composition	Household's size/composition is not static, but changes with household biological life cycle (Caldwell, Reddy, and Caldwell 1986). Adjustment of household size/composition to recurrent food insecurity is a common strategy (Messer 1989a; Norris 1988: Nabarro, Cassels, and Pant 1989; von Braun and Pandya-Lorch 1991). During prolonged economic crisis the trend is toward smaller consumption units (Seaman and Holt 1980; Taal 1989; Shipton 1990; Chambers 1989). Larger/extended households are more likely than smaller/nuclear households to be associated with greater diversification of assets, income sources and crop cultivation (Toulmin 1986; Taal 1989; Nabarro, Cassels, and Pant 1989), and less vulnerable to illness/death of breadwinners (Toulmin 1986; Lipton 1983a; Caldwell, Reddy, and Caldwell 1986). However, the poorest households tend to have large young families (Lipton 1983b). Households with female heads are often, but not always, disadvantaged (Peters and Herrera 1989; Kennedy and Haadad 1991; Louat, Grosh, and van der Gaag 1991).
	Migration	Distinguish between seasonal migration of able-bodied adults prior to/during peak agricultural labor periods and migration during dry season (de Waal 1988; Campbell and Trechter 1982; Autier et al. 1989). Rural Ethiopians could predict six months in advance whether household members would have to migrate in search of wage labor (de Waal 1988). Distress migration of whole families is usually the last in a sequence of household responses and a clear indication that other coping strategies failed (Corbett 1988; Watts 1983).
	Ethnicity/region	Certain ethnic or caste groups may be historically or geographically more vulnerable to seasonal or chronic food insecurity (O'Brien-Place 1988). Welfare levels often vary distinctly by region (Haddad 1991).

* Taken from: Haddad et al. 1991.

Household	Indicator	Comments
Factor Market	Income sources	Smallholders spread risks through diversification of income sources most notably off-farm employment (Downing 1988; Shipton 1990; Caldwell, Reddy, and Caldwell 1985: Merryman 1984; Reutlinger 1987). The riskier the environment, the more diverse the economic activities relied upon will be (Reardon, Matlon and Delgado 1988; Staatz, D'Agostino and Sundberg 1990). The distribution of income sources within a given community may be U-shaped implying that income diversification has different purposes and consequences for the most and least vulnerable households (Castro, Hakansson, and Brokensha 1981: von Braun and Pandya-Lorch 1991). The source and/or control of income may be more important than total income in influencing household-level food security (Kennedy 1989).
	Changes in income/ income sources	Changes in petty marketing patterns of rural households may indicate anticipated food insecurity (McCorkle 1987; Cutler 1984). Increasing income within communities is associated with different diets but not necessarily improved nutrition (DeWalt et al. 1990; Behrman and Deolalikar 1987). The transition from subsistence to cash-cropping has been associated with increased vulnerability and increased malnutrition among children (Dewy 1981; Thomas, Paine, and Brenton 1989) and with increased household caloric intake (Kennedy 1989) or increased food expenditures (von Braun Hotchkiss and Immink 1989; von Braun de Haen and Blanken 1991). The effect of commercialization of semi-subsistence agriculture on food consumption and nutritional status of vulnerable groups has shown mixed results (von Braun and Kennedy 1986).
	Income flow	Income received seasonally in large sums will more likely be spent on lump-sum expenditures or consumer goods than on improved diets and other nutrition-related investments (Alderman 1986; Guyer 1980: Dewey 1979).
	Access to loans/credit	Nearly half of rural South Indian households took loans during a recent drought, and most felt these had been a considerable factor in maintaining minimum living conditions (Caldwell, Reddy, and Caldwell 1986). Access to traditional lines of credit through merchants collapses as collateral (for example. livestock) disappears during drought (Cutler 1986).
	Land ownership/ control	Number of different plots may be a more sensitive indicator than total acreage since households with fragmented landholdings can take advantage of different micro-climates more than households with larger but often less diverse landholdings (Dei 1990; Colson 1979; Paterson cited in Castro, Hakansson, and Brokensha 1981; Dewey 1981; Downs 1988, cited in Shipton 1990). Access to seasonally flooded lowlands is an important buffering mechanism in drought-prone areas (Longhurst 1986).

Household	Indicator	Comments
	Land use practices	Intensification of land-use practices is one of the earliest responses in a sequence of adjustments to stress by Indian farmers (Jodha 1975, 1978). Intercropping, multiple seed strains with different maturation periods/resistance to disease, and braced mixtures of available cultivars are important diversification strategies of African farmers to minimize the risk of crop failure and enhance food security (Shipton 1990; Taal 1989; Smith 1986). Access to good-quality land and alternative employment sources may be more important in determining nutritional status of rural populations than choice of crop (DeWalt et al. 1990).
	Sales of land	Distress sales of land is a desperate measure and tends to occur much later in the belt-tightening process (Caldwell, Ready, and Caldwell 1986; Corbett 1988). If land is a household's only asset, it will only be sold if there is no other way to survive; often the land is first mortgaged (Nabarro, Cassels, and Pant 1989). One of the more common reasons for land to come into markets in India was wedding and/or funeral expenditures (Srinivasan 1975 cited in Castro, Hakansson, and Brokensha 1981).
	Trees	Access to communal or private reserves of trees can significantly decrease the poor's vulnerability to contingencies (Chambers and Leach 1989; Chambers and Longhurst 1986). The percentage of cultivated land planted to tree crops can be used as a proxy for agro-climatic conditions, and was positively associated with child's height in Cote d'Ivoire (Strauss 1988).
	Livestock	Diversified herds with different pasture needs are less vulnerable to drought and infection than more homogenous herds that may produce more meat or milk (Colson 1979; Cutler 1986). The importance is not between small versus large herds, but between owning no animals at all and having at least some (de Waal 1988). Access to milk is indicated by having a female animal (de Waal 1988). Donkeys and mules are highly valued during famine because they help travel (Shipton 1990). Lack of access to resources, primarily oxen, makes women particularly vulnerable to drought in Ethiopia (McCann 1987).
	Sales of livestock	The ability to market livestock for grain commonly determines who will survive a famine and who will not (Shipton 1990). The sale of male animals before their optimum weight or of females before the end of their reproductive period is an indicator of insecurity (White 1986). Livestock sales occur normally, and do not necessarily imply a reduction of future productivity (Swinton 1988). Indicators related to livestock sales, prices or market demand/supply are difficult to interpret, and reliable data are hard to obtain in Chad and Mali (Autier et al. 1989).
Household	Indicator	Comments

Household	Indicator	Comments
	Sales of assets	Important to distinguish sales of key productive assets from sales of assets which are primarily forms of insurance/saving (Corbett 1988). Successfully surviving drought depends upon a household's ability to retain intact all its productive assets (including family labor supply) solely by cutting back on ceremonial forms of consumption and by liquidating nonproductive assets (Jodha 1978). Poor people become poorer by disposing of productive assets (Chambers 1989). The income and assets owned by the richest and poorest quintiles is one of 20 suggested indicators of human welfare (Anderson 1990).
	Sales of food	The conversion of surplus food into durable valuables which can be stored and traded for food in emergencies is an important strategy for reducing vulnerability to risk (Colson 1979). The very poor in India cannot afford to consume their own home products and must sell them to obtain cash (Bhattacharya et al. 1991).
	Capital equipment	The number or diversity of assets may be a more useful indicator than net-worth of assets; households with low number and diversity of productive assets may be more vulnerable to external shocks and contingencies (Chambers 1989: Swift 1989). But low asset status is not necessarily synonymous with greatest poverty (Swift 1989). Some landless peasants in Tanzania actually owned tractors (which they hired out) and sewing machines (Pipping 1976, cited in Castro, Hakansson, and Brokenska 1981). Wells have become crucially important assets to Malian farmers for producing a regular grain surplus (Toulmin 1986).
	Consumer durables/semi-durables	Determine whether household owns enough cooking utensils to avoid borrowing plates or pots from relatives or neighbors (Lewis 1951). Determine whether Indian women own more than one sari or blouse (Bhattacharya et al. 1991).
Proximate	Ill health	The main asset of most poor people is their bodies (Chambers 1989). All producers are vulnerable to sickness and disability (Toulmin 1986). Work-disabling accidents and/or morbidity of household's breadwinners are often the pivotal events which impoverish households, making them useful indicators (Corbett 1989; Pryer 1989).
	Education	Few households with at least one educated member starve (Swift 1989). Women's schooling, even after adjusting for income, has a higher elasticity of nutrient demand than those for household size or income (Behrman and Wolfe 1984). Years of child schooling could be used as an easily-measured proxy for household's living standards (Birdsall 1982; Anderson 1990).

Household	Indicator	Comments
	Food stores	Ability to store food post-harvest and availability of stored food pre-harvest are important indicators to monitor (Chambers 1989; Thomas, Paine, and Brenton 1989). Having two years household consumption requirements in store is seen as desirable in Sudan (Maxwell, Swift, and Buchanan-Smith 1990). Estimates of number of months stored grain will last are usually more accurate and culturally sensitive than asking farmers for volume estimates of stored quantity (Frankenberger 1985; O'Brien-Place 1988).
	Qualitative dietary changes	Shifts from preferred to lower status foods (starchy tubers or grain ground with stalks/ husks/bran) and unconventional foods (wild foods, insects or game: poorer products, e.g., broken rice grains) are a normal occurrence in areas facing seasonal food deficits, but may also indicate anticipated stress (Ogbu 1973; Colson 1579: Cutler 1986: Caldwell, Ready, and Caldwell 1986; Corbett 1988: Shipton 1990). Local sharing between families or households often intensifies when food is scarce (Shipton 1990; Maxwell, Swift and Buchanan-Smith 1990). The importance and intensity of wild food use depends upon severity and length of food shortages, the location of households with respect to wild food areas, and available household labor to collect them (Dewalt 1983; Zinyama, Matiza, and Campbell 1990). Households producing for auto-consumption are more likely to have greater dietary diversity than households producing primarily for the market (Fleuret and Fleuret 1980: Dewey 1979: Smith 1986). The correlation between dietary diversity and socioeconomic status is positive (Bentley 1987; DeWalt 1983; Schiff and Valdes 1990 b).
	Quantitative dietary changes	Fluctuation in consumption of main staple (Bhattacharya et al. 1991) or in meal patterns are indicative of food insecurity (Beck 1989; Taal 1989; Campbell and Trechter 1982; Oshaug and Wandel 1989; Galvin 1988). Food consumption reduction is part of a deliberate and early strategic household's response (Corbett 1988; Cutler 1984; Shipton 1990). The number of meals per day was not found to be a useful indicator in Chad and Mali (Autier et al. 1989), and missed meals did not necessarily imply food unavailability in India due to frequent eating outside the home or at work (Bhattacharya et al. 1991). Most agrarians derive the bulk of calories from one to three grain staples which could easily be monitored (de Garine 1988, cited in Shipton 1990). There was a drastic reduction in consumption of pulses in India during the 1967 drought (Rao 1989). Determine if household has recently participated in food aid programs (Cutler 1986; Beck 1989; O'Brien-Place and Frankenberger 1988).