AN ANALYTICAL REVIEW AND SYNTHESIS OF PREFERRED RESEARCH METHODS IN THE MSU FOOD SECURITY PROJECT

By

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ABSTRACT

AN ANALYTICAL REVIEW AND SYNTHESIS OF PREFERRED RESEARCH METHODS IN THE MSU FOOD SECURITY PROJECT

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The purpose of this study was to review the design and implementation of food security research in Mali, Rwanda, Senegal, Somalia, Zimbabwe during the first and selected later phases of the Food Security in Africa Cooperative Agreement between Michigan State University and the U.S. Agency for International Development. This paper discusses principles and techniques for designing research, formulating questions and developing questionnaires, conducting the field work, and disseminating the findings. The primary objective was to learn from the experiences of prior researchers and to synthesize the research methods that this project has found to be effective and which may be useful to future researchers in the development and execution of policy-relevant field research.

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CHAPTER I

INTRODUCTION AND RESEARCH CONTEXT

1.1 BACKGROUND PROBLEM STATEMENT

Hunger and declining per capita food production continue to persist at the forefront of problems confronting many countries in sub-Saharan Africa (Eicher, 1984; Humphreys and Jaeger, 1988; Pinstrup-Anderson, 1987). Poverty lies at the root of the hunger problem, closely related to the lack of effective demand or "entitlement" to food. The gap between the supply and demand for food, however, has been attributed to many factors, including environmental conditions, rapid population growth, institutions developed during the colonial era, commodity prices, and macroeconomic and agricultural policies. Since the mid 1970s, the interrelated supply and demand components of the food and hunger issue have become analyzed increasingly under the rubric of "food security", a term embracing in its definition the access to and the availability of food. Food security has been defined specifically as "the ability of a country or region to assure, on a continuous long-term basis, that its food system provides the total population access to a timely, reliable, and nutritionally adequate supply of food" (Eicher and Staatz, 1985, p.1).

Over the last ten years, international donors and African governments have singled out 'inappropriate policies' as a major factor influencing the poor performance of the agricultural sector and the chronic problem of human hunger (Eicher 1982; Berry, 1984; World Bank, 1981). Faced with increasing budget deficits, declining export earnings, and diminishing access to sources of capital, African governments, as a condition for receiving debt relief, have been compelled to implement macroeconomic and sectoral policy reforms - structural adjustments - aimed at rectifying the disincentive

policies and improving the external and domestic public accounts (Humphreys and Jaeger, 1988; Staatz, 1988; Demery and Addison, 1987). A general reform theme has been to reduce the direct role of the state in favor of a more market-oriented economy in which exports serve as a major engine of economic growth. The reorientation of reforms in the agricultural sector has centered on improving agricultural incentives through liberalization of input and output markets and decontrolling prices, which are considered by many 'experts' to be more theoretically appropriate policies.

The public response to these reforms has been most visible in urban protests over food price increases in several African countries (Weber et al., 1988). From the standpoint of policymakers, however, considerable concern, if on a less visible level, has arisen not only about the adverse short-run welfare effects of higher food prices, cuts in social service programs and civil service employment, but also about the sufficiency of the reforms to furnish food system participants - members of farm households, merchants, consumers - with the incentives and resources necessary to respond in a manner consistent with the defined food security objectives. The ability of policymakers to assess the coherence of the design, incidence, impact, and effectiveness of the reforms has been hindered by a lack of relevant, empirical information.

In particular, the capacity of international donors and African governments to implement effectively the reforms as well as to protect or strengthen national food security objectives in the face of a changing policy environment depends on their knowledge of how the ongoing and planned policies and programs affect the "constraints and incentives facing various groups in the economy" and what variables influence behavioral responses (Weber et al., 1988). Empirical research thus serves as the basis upon which the most cost-effective combination of policies and programs can be

identified, iteratively reviewed and redesigned, and the barriers and adverse consequences anticipated and reconciled in the context of a given set of food security policy objectives.

As confirmed by the continued presence of hunger and insufficient food production following 30 years of agricultural research programs, simply generating information under the assumption that it will be used and will help solve some specified problem is not sufficient to improve the situation. The policymaking process is influenced by a complex set of political and social factors and interest groups, developed over the last century, apart from which it is difficult to understand the interest in and the demand for empirical information. Analogously, these forces have affected the development (or lack thereof) of a local capacity to produce and disseminate timely, policy-relevant information. Together, the factors restraining the demand for and supply of information combine to reduce the feasibility of addressing these issues.

The long-term demand for empirical information required to research food security issues has been influenced by several developments. First, policymakers with strong ideological predispositions have often ignored research recommendations that do not fit stated political goals or ideals, claiming that they already know the prescription. Second, some countries have historically relied on multi-year plans, which have precluded the need for continual, iterative policy analysis. Third, policymakers have been dissatisfied with previous policy research conducted by foreign academics and consultants.

Conversely, on the supply side, there has been minimal interest and investment in training local policy analysts and developing the local institutional capacity that is capable of elucidating available policy options and continually delivering useful information on a

long-term basis (Weber et al, 1988). Rather, the government and donor focus on short-term information needs has led to the use of expatriate consultants who have minimal time to work with local analysts.

Early food security research in the late 1970s/early 1980s focused essentially on the international and national aspects of the problem - compensatory financing schemes, international grain reserves, and domestic infrastructure - with less attention given to the issue at the microeconomic level (Siamwalla and Valdes, 1984). In the last half of the 1980s, increasing attention was directed to transitory and chronic food security problems in rural and urban settings. Given the ongoing nature of the structural adjustment programs and continued interest in efforts to design, implement and evaluate reforms more effectively, it was clear that there was need for more information on the incidence of negative impacts as well as on the responses of certain groups of food system participants on which the hopes of improving chronic food security are placed.

It was this concern, to investigate the conditions (resources, constraints) and behavior of food system participants and their relationship to macroeconomic policies, that led graduate students and faculty in the Department of Agricultural Economics at Michigan State University (MSU) in 1984 to undertake a long-term, food security research project. The major objectives of the project are to assist African governments in the identification of food security problems, the analysis of policy options, the development of alternative institutions and management processes, and the preparation of consistent short- and long-term strategies to improve food security. Under the "Food Security in Africa Cooperative Agreement" (henceforth, FSA) funded by the United

States Agency for International Development (USAID),[1] MSU faculty and graduate students have undertaken field research studies in collaboration with universities, ministries, and research institutes in Mali, Rwanda, Senegal, Somalia, and Zimbabwe. The project expanded in 1988 to begin regional work in Southern Africa and in 1990 to begin regional work in the Sahel. One secondary objective of FSA has been to improve the knowledge of effective methods of data collection, analysis and research management. It is toward this end that this paper is written.

1.2 STUDY OBJECTIVES AND SOURCES OF INFORMATION

The purpose of this paper is to synthesize and compile a statement of the methods that FSA researchers and faculty have found useful to design and implement food security research during the first phase of the project. This paper is neither a comprehensive review nor a critique but a discussion of preferred methods that have evolved from the project experience. It examines the conceptual context and process used by researchers to design and plan their studies and discusses a number of research principles and tools that the FSA project has found to be effective and which may be useful to others.

The information presented in this paper is based on extensive interviews with the five principal researchers of the first phase FSA projects in Mali, Rwanda, Senegal, Somalia, and Zimbabwe after they had completed their field research. Using an interview guide outlining the topics covered in this paper, a series of discussions were held with each researcher. The depth and breadth of the discussions were determined in

[1] Project funding has been provided by the Bureau for Science and Technology (S/T), Office of Rural and Institutional Development, Africa Bureau, Office of Technical Resources, with more recent amendments involving S/T Office of Nutrition, and Africa Bureau, Sahel West Africa Office, United States Agency for International Development.

large part by the stage of the field research and dissertation. One researcher had completely finished his dissertation at the time of the interview. Others were just beginning on-campus work. Some researchers had thus spent more time reflecting on their research experience and had more time available to talk about it, whereas others were limited by the demands of writing research reports and dissertations. Additional discussions were held with FSA faculty members who supported researchers throughout the design and implementation. Project documents and working papers were consulted in addition to the relevant literature on food security, food policy analysis, sampling, survey design, and information systems.

The issues discussed in this paper are also influenced by the author's participation in the second phase of the project working with FSA researchers in Southern Africa to design and implement food security research. In many ways, what is presented in this paper is the result of the synthesis of information gathered from discussions with researchers and faculty, the application of the summarized principles and techniques in the work with FSA researchers in Southern Africa, followed by additional review and modification. As the reader will discover, this paper is by no means a "cookbook"; rather, it emphasizes how local factors and the individual researcher influence the decisions made throughout the length of the entire project.

1.3 ORGANIZATION OF THE PAPER

This paper is divided into six chapters. The remainder of this chapter outlines the general themes of the project. Chapter 2 discusses the conceptual framework that influenced the choice and elaboration of a specific research topic in each country and the sampling designs. Chapter 3 synthesizes the steps undertaken to define research questions and data needs, and the use of rapid reconnaissance surveys and planning tools

to coordinate questionnaire development with data management and analysis. Chapter 4 focuses on issues related to research implementation. It examines enumerator hiring, training and supervision, interviewing, and the use of qualitative research methods. Although issues related to data entry and analysis are discussed in Chapter 3, the last sections of Chapter 4 examine the data processing tasks following data collection. Chapter 5 discusses approaches to data analysis as it relates to reporting research findings and examines the strategies used to disseminate information. Chapter 6 summarizes the main issues of the paper.

Sufficient emphasis cannot be placed on the need for researchers to examine continually the effect of a particular design decision on other aspects of the project. As such, certain sections of the paper make reference to the linkages to other components. Whole books have been devoted to each of these topics. Readers interested in a particular issue should consult some of the specialized books and articles dealing with a particular topic as well as more general syntheses and compilations similar to the outline of this paper.[2]

Quantified data play an instrumental role in agricultural and food policy analysis.[3] Amenable to a vast array of statistical techniques, quantified variables related to production, consumption, and marketing - to name a few - serve as the foundation of analyses of food security problems. Correspondingly, the design of the primary methods

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[2] In particular, see Kearl et al., 1975; Bulmer and Warwick, 1983; Casley and Lury, 1981; Casley and Kumar, 1988.

[3] Data is defined by the Dictionary of Modern Economics as "observations on the numerical magnitude of economic phenomena" (1984, p.100). This paper discusses data in a broader context, referring to words, letters, or quantities that represent some entity or category of experiential phenomena. Riemenschneider and Bonnen state that "to become information, data require analysis and interpretation to place them in a decision-making context" (1979, p.149).

used in FSA research has been oriented to the generation of quantified data. Specifically, questionnaires were the primary data collection instrument used to collect data in FSA research, implemented in an integrated multiple-visit survey over a period of one to two years. A major focus of this paper is therefore directed to a discussion of the issues relevant to their design and implementation.

The importance placed on using quantified data for agricultural policy analysis, and correspondingly the methods employed to collect it, do not in any way imply that other kinds of data and different methods are not useful or effective. The question of method used is a function of need. The use of the information, the analysis required, and type of data influence the choice of method. As will be apparent throughout the paper, the emphasis on collecting quantified data in structured questionnaires did not preclude the use of qualitative research methods. In fact, qualitative data were collected in several situations using a variety of instruments: informal conversational interviews during the reconnaissance work, semi-structured open-ended interviews, and in-depth probes of selected respondents. Often such qualitative data are necessary for the interpretation of quantitative data.

1.4 FSA RESEARCH THEMES AND OBJECTIVES

The central theme of the entire FSA project is to examine the interactions between government policies, technological change, and institutional reform as they affect the behavior of food system participants and the development of agricultural production and marketing. The emphasis in this framework attempts to move beyond the debates about price incentives and structural change by recognizing the complex and dynamic interactions occurring among the 'prime movers' in the food system - technology, institutions, policies, human capital - and their relationship to external factors

in the international and national economies (Delgado and Mellor, 1984; Schiff, 1984; Weber and Jayne, 1988). This analytical focus of FSA emphasizes not only the importance of improving technological packages available to producers, but also the role played by the requisite institutional mechanisms which both facilitate technology development - including the prior human capital investments - and in combination with a variety of government policies, structure its demand, accessibility, and distribution.

Rather than viewing the market as the primary impetus behind technological and institutional change - as do Hayami and Ruttan in their theory on institutional innovation - FSA researchers and faculty recognize the prior "institutional decisions regarding the distribution of rights and resources in society" as a critical factor affecting the ability of the market to function in its role as the engine of the development process (Staatz, 1988, p.10). There is a reciprocal influence between institutions and markets rather than just the singular effect of markets on institutions as Hayami and Ruttan suggest. The structure of institutions, for example, influence the functioning of markets. Any effective effort to improve food security requires understanding the type, magnitude, and incidence of change resulting from dynamic interactions of the "prime movers" in the food system (Weber and Jayne, 1988).

The process in which a study is designed and implemented, and through which information is produced and disseminated is arguably as important to its effective use as the information itself. This is especially true in light of the minimal interest historically accorded in many African countries to using empirical information for agricultural policy analysis. As stated earlier, FSA has been premised on the belief that policymakers and planners are in a better position to make decisions if they have diagnostic, empirical information on which to base them. Understanding the food system and its

interrelationships is a prerequisite to effective planning, management and improved design of policy reforms and food security measures.

The low demand for policy-relevant information is partially the result of the lack of timeliness and relevance of previous agricultural economic research and often unfamiliarity with the use of microeconomic information in policy analysis. Howes argues that the majority of previous agricultural research undertaken by academics has been "insulated from the demand to produce results within the limited and pre-determined periods of time" that policymakers must make decisions (Howes, 1981, p.41). Research can be academically excellent but useless to policymakers if it is not timely and relevant (Chambers, 1983).

To generate demand for socioeconomic data, FSA has made a concerted effort to cultivate policymakers' interest by demonstrating how the information can contribute effectively to the decision making process. Researchers begin by determining the research focus and information needs in a collaborative, interactive effort with participating institutions and policymakers who will use the information. Research findings are produced sequentially, beginning with intermediate working papers based on descriptive/diagnostic analysis of topics in which policymakers are particularly interested. This initial analysis provides a basis for discussion between researchers and policymakers, establishing a precedent from which they can discuss additional, more refined analyses of issues of mutual interest such as the effects of alternative policies on food security objectives. Over time, FSA aims to increase demand for empirical food security research. This objective, however, demands that the project work to assure that there is a supply of researchers capable of generating this information.

The corresponding information supply side of the FSA project is based on the conviction that local research and policy analysis capacity will be improved if researchers participate in a well-managed and structured research program that provides an opportunity to develop skills in data collection, research management, analysis, and policy extension. The first phase of the FSA project has used effectively a Ph.D candidate working on their dissertation matched with at least two host country analysts to carry out the research. Local researchers participate with the FSA researcher and faculty in all phases of the project, including the research design, field management, data entry and analysis, and writing working papers. FSA campus-based faculty assisted researchers in all phases of the study through quarterly visits to the field. These trips were generally scheduled to coincide with particular tasks, such as research conceptualization, sample design, questionnaire development, data analysis and report writing. In addition, campus-based or the local institution's computer personnel provided critical support for data entry and analysis tasks (Holtzman, 1987; Weber et al., 1988).

This approach could be viewed as complementary to an institution-building project in that local researchers receive in-service training that their formal academic studies did not provide. Participation in a structured research project contributes to the further development of the institutional capacity to manage and conduct applied, policy-relevant research. In a resource-constrained research environment, where there is little experience in systematic application of empirical information to the analysis of policy issues, investing scarce assets in the development of a large data base may not be the most cost-effective decision. FSA has recognized the importance of serving short-term policy needs and building a precedent on which a country can begin institutionalizing their local capacity. By generating policy-relevant information, institutions gain

credibility and improve their chances of receiving sustained support for analysis efforts and the long-term development of a larger data base.

FSA faculty have argued that it is only recently that African governments and donors have begun to invest in the development of a local policy analysis capability (Weber et al., 1988). A lot of policy research that has been conducted has depended on the skills of short-term, expatriate consultants who, while contributing with their technical skills, have limited time to contribute to the development of local institutional capacity that can assure a continuous flow of information. Moreover, familiarity with a project approach based heavily on short-term consultant input also adds to the difficulty of thinking about a sustainable system of applied research and policy analysis. The long-term sustainability of food security research and policy analysis depends on the creation of the relevant technical expertise within the local institutions and ensuring its integration into the policy-making process. It also requires convincing local officials that it is important and valuable enough to fund out of local resources.

CHAPTER II

DESIGNING THE RESEARCH

2.1 CHOICE OF RESEARCH TOPIC

The importance of defining clearly the research topic cannot be emphasized too strongly because all subsequent tasks flow from the terms of reference and an understanding of what the study is expected to accomplish. Each FSA researcher, in coordination with MSU faculty, counterparts with collaborating local institutions, USAID missions, and government policymakers was responsible for identifying local food security problems that were relevant to current government policy interests and the central research theme. Researchers sought to incorporate current "natural experiments" in policy and institutional reform into the research design as well as focus attention on successful examples of improved food system performance. This section discusses these research interests and then synthesizes the steps taken by researchers to determine the research focus.

2.1.1 Natural Experiments and Success Stories

In 1963, Campbell and Stanley, both experimental psychologists, alerted researchers to the many opportunities in natural social settings "to introduce something like experimental design into scheduling of data collection procedures" (Campbell and Stanley, 1963, p.34). In a natural experiment, the researcher neither introduces the experimental stimuli (intervention) - including the level of the treatment - nor controls its assignment to experimental units (individuals) in the social setting. They cannot orchestrate "the when and to whom of exposure and the ability to randomize" (Campbell and Stanley, 1963, p.34). Nevertheless, natural experiments provide an occasion to study the effects of some intervention or treatment on people's behavior. In this research

context, the natural experiment consists of studying the effect of the changes in policies, institutions, and technology - which represent the treatment - on human behavior. The challenge lies in distinguishing the effect of certain experimental factors from others present in the social setting.

FSA faculty and researchers found this framework to be useful in designing food security studies because it helped focus research attention on 1) variables that are thought to lead to effective agricultural reforms; and 2) the environmental, institutional, and socioeconomic factors that seemingly influence the differential effect of the reforms on food system participants, and their subsequent responses. As summarized in Figure 2-1, the general scope of FSA research in each country centered on the study of the impact of changes in policy, institutions, and technology on farm households and traders.

FIGURE 2-1: RESEARCH TOPICS

COUNTRY	TOPIC
Mali	Analysis of the effects of reforms in the markets for millet, maize, and sorghum on the willingness and capacity of participants to invest in improving the food system.
Rwanda	Analysis of the effects of existing and alternative price information processes on market performance and food security.
Senegal	Analysis of the response of cereals producers and market participants to privatization of input and output marketing: a micro-macro level analysis.
Somalia	Analysis of the effects of selected market, institutional, and technological variables on the investment and production of maize and sesame producers and the implications of these decisions for food security.
Zimbabwe	Analysis of the factors underlying the post-independence increase in communal sector maize production and sales.

Dioné concluded in Mali that due to the lack of information on the pre-reform period and thus the difficulty of studying farm household/traders' situation before and after the implementation of the cereals market reform program, it would be more effective to study what is likely to happen, given the specific characteristics of the farmer and merchant. More specifically, what characteristics of farm households and traders provide an indication of the direction of their behavior as influenced by the reforms and what is their capacity to take advantage of the eventual market opportunities (Dioné, 1988). As this example illustrates, the objective of the research was not to measure the treatment effects of the natural experiment per se - the impact of changes in cereal marketing policy; instead, the researcher recognized the importance and potential consequences of these changes and attempted to learn from them. Sample designs were subsequently conceived and implemented - as will be seen in Section 2.3 - in order to most examine effectively the full range of behavioral responses.

A second interest of FSA research has been to identify and analyze "success stories," where changes in policies or institutions or the introduction of new technology have improved the performance of the food system (Crawford et al., 1988). Researchers have attempted to gain insights into why certain policies work instead of following the path of "negative academics" in stating why the system performs poorly (Chambers, 1983). This emphasis is clearly evident in the design of the Zimbabwe study, which centered on explaining the factors that influenced a 25 percent increase in cereal production during the five-year period following independence.

The commodity focus was generally determined according to the importance of the crop(s) to national food security objectives. In Rwanda, the decision to collect data on beans and sorghum was based on their caloric importance in the Rwandan diet. They

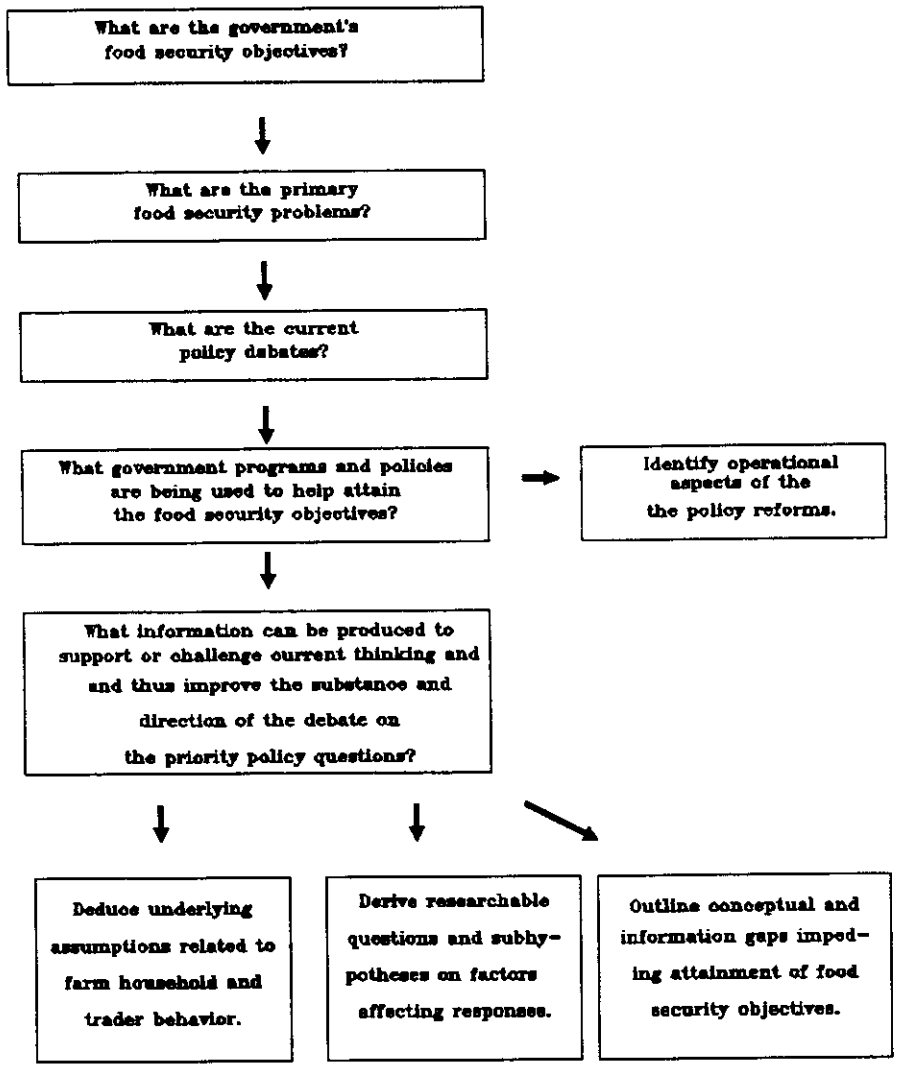
also comprise the bulk of national food security stocks and are officially marketed by a government agency. Researchers in Mali and Senegal discovered, however, that it is often difficult to understand completely a farm household's production and marketing strategies without considering all of the crops grown on farms, especially cash crops. Cotton or groundnuts may provide a badly needed source of cash at certain times of the year, allowing farmers to store grain until the price rises later in the year. In other words, researchers focused on specific commodities but not to the point of losing perspective on the whole farm environment, including the role of livestock.

2.1.2 Narrowing the Topic

Every FSA researcher undertook a slightly different approach to determine the research topic in terms of the timing and place of literature reviews, gathering secondary data, discussions with USAID officials in the United States and in-country, and interaction with local institution counterparts and government policymakers. In most cases, these findings and discussions resulted in a preliminary proposal. Once in-country, researchers used the proposal as the basis for discussion and amendments with government policy makers and USAID officials. Spending time in the country during this phase allowed researchers to learn about current agricultural research and possibilities for collaboration and in the process, become sensitized to "turf" boundaries of other researchers and institutions. This section outlines the major conceptual issues which have helped researchers.

Assuming the researcher has defined broadly some general area of interest within the parameters of the food security project and the country in which the research will be conducted, narrowing down the subject to a researchable, policy-relevant topic can be directed by several questions (Figure 2-2). First, what are the government's food

FIGURE 2-2: QUESTIONS TO GUIDE TOPIC SELECTION



security objectives? Second, what are the primary food security problems? Related to both issues, what are the current policy debates being discussed by the government and donors? What government interventions are being made to attain these objectives? Given the available time and resources, what information could be produced by the research to support or challenge current thinking and thus improve the substance and the direction of the debate on the priority policy questions? In short, researchers sought

to identify the operational aspects of current policy reforms, to deduce their underlying and often unrecognized assumptions pertaining to farm household/trader behavior, and thus to outline the major conceptual and information gaps that could potentially impede the attainment of the country's food security objectives.

Asking policymakers to participate in the selection of the topic and research design is based on several assumptions. First, policymakers have valuable information that is useful in defining the problem and understanding the system's constraints. Second, the potential use of the research findings is enhanced if users understand and have a stake in the study. Instead of specifying a priori the research topic and precise information needs of the policymakers, researchers attempted to involve potential users in the painstaking process of defining the questions which are of greatest interest and most relevant to current food security issues (Patton, 1986; Weber et al., 1988).

Eliciting policymakers' and the USAID missions' interests, ideas, and information needs often proved to be a difficult task due to their unfamiliarity with the FSA research approach. Designing research to generate and disseminate policy-relevant information on a continuing basis may seem foreign to some donors and policymakers who may be used to project-oriented evaluation research and their related information demands. These officials may also be influenced by previous interaction with consultants whose frame of reference is limited to a specific problem.

Additionally, local policymakers may have developed alternative sources from which they can receive information in light of the historical inability of statistical or policy analysis units to generate the necessary information to fulfill their short-term needs (Eele, 1987). As was alluded to earlier, policymakers may believe that whatever academic research will be produced will be irrelevant or too late. Some FSA researchers

also felt that policymakers perceived the FSA project as just the next trend in donor interests, to be eventually supplanted by a new topic and thus were not interested in participating in the decision-making process.

In a few situations, researchers, faculty and collaborating institution researchers were forced to make choices about those parts of the system on which to focus the research with limited input from potential users of the information. This lack of interaction with policymakers made it more difficult to later disseminate intermediate research results and demonstrate the utility of timely, policy-relevant information to the decision-making process.

2.2 THEORETICAL AND PRAGMATIC COMPONENTS OF THE RESEARCH TOPIC

The starting point for thinking about the substantive components of the priority research questions is with theoretical knowledge on the topic. What does current economic theory postulate about the problem (e.g., the behavior of producers, traders, prices; the characteristics of an efficient market system)? The aim of this first step is to outline the aspects of the research topic that will need to be addressed in order to satisfy the study objectives. Practical research needs a sound theoretical base; that is why researchers outline the theoretical components of the primary research questions as a first step in the process. If the research lacks a theoretical foundation, it often becomes ad hoc and not generalizable.

A research planning matrix (RPM) is a tool designed by FSA faculty and researchers to assist in breaking down research questions into conceptually related but separate analytical components. As Figure 2-3 depicts, the RPM provides a framework to systematically think through the format of research questions, the reason for studying them, their specific data needs, and structure of variables.

FIGURE 2-3: RESEARCH PLANNING MATRIX

PRIMARY RESEARCH QUESTIONS	QUESTION COMPONENTS	QUESTION SUBCOMPONENTS	SPECIFIC QUESTIONS	REASON FOR THE QUESTION	DATA NEEDED	DATA LEVEL	REPORTING UNIT	REFERENCE PERIOD	FREQUENCY OF COLLECTION	DATA SOURCES	
										QUESTIONNAIRE NAME	SECONDARY DATA

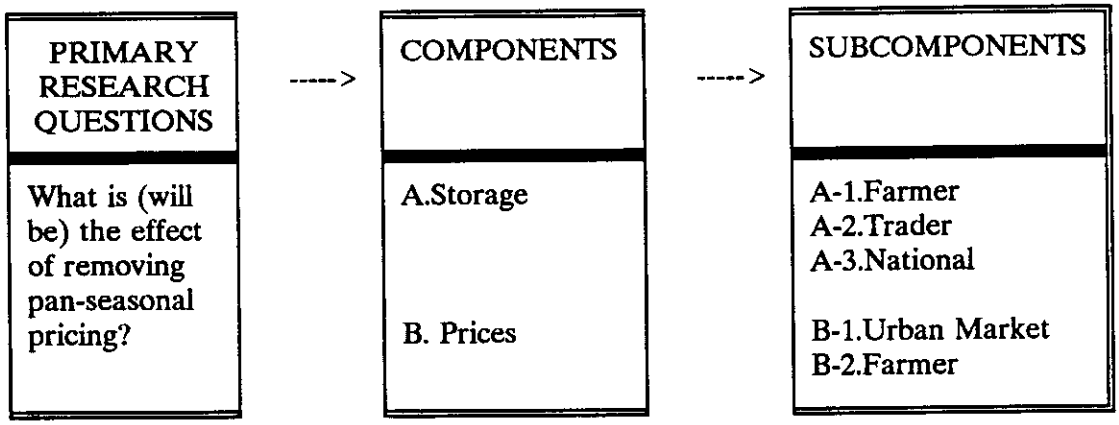
Thinking about these research questions and their theoretical components includes implicitly an initial consideration of analysis plans. What kind of analysis should be undertaken to accomplish the research objectives? What components of the relevant theoretical models need to be addressed? As will be explained later, FSA has advocated the use of different types of analysis for different audiences, produced in a sequential format. At this stage of the design, however, thinking of analysis is focused on how and in what form the components of the primary research questions will be put together to inform policymakers about the specified issues.

Assume, for example, that a researcher intends to study the effects of pan-seasonal pricing. Current economic theory posits that a uniform price throughout the entire year will be a disincentive to store cereals for all food system participants desiring to make transactions. Prices must rise throughout the season to cover at the minimum the costs of storage. Without a progressively higher price, marketing participants will not have any incentive to carry inventory. A researcher makes the first iteration of the components of the pan-seasonal question (e.g., price, storage, sales behavior) - the second column in the RPM - that must be addressed, emphasizing the theoretical knowledge of the primary questions.

Within each of these theoretically-defined components, there are questions which must be addressed at different levels of the system (microeconomic/macroeconomic) and by different actors or institutions (traders, farm households, marketing board that maintains national stocks). Each subcomponent represents a different part of the food system at which questions must be directed. Within the storage component of the pan-seasonal question, a researcher may wish to examine the cost structure of storing coarse

grain for traders, farmers, and the national marketing board (each a subcomponent). If the removal of pan-seasonal prices is the focus of the policy reform, a researcher may decide to study the price component by examining behavior at the farmer and urban market level (subcomponents). Figure 2-4 illustrates the initial sections of the planning matrix outlining the key research questions and constituent components and subcomponents.

FIGURE 2-4: SPECIFYING QUESTION COMPONENTS AND SUBCOMPONENTS



The choice of subcomponents concerns the context and level of the policy debate. These subcomponents assisted researchers in understanding the link between macroeconomic food security issues and the micro level farm household and trader behavior. Some FSA researchers used a slightly different approach - influenced by a marketing subsector framework - in dividing the study from the outset into four major research components - aggregate market behavior, farmer behavior, trader behavior, food system programs, policies, performance - and then specified the priority research questions within each category. The emphasis in this paper has been to use the priority

research questions as the basis for defining components and progressing through the RPM.

As much of the current development literature corroborates, international donors have employed theoretical economic models as the basis for the design and implementation of macroeconomic and sectoral policy reforms. In this situation, the models are more than a perceptual filter or device to negotiate our conceptualization of the workings of the economy; the theories shape actions (Sayer, 1984, p.77). To the extent that local policymakers are compelled to deal with the theoretically-based structural reforms, there is a significant parallel between the pragmatic, conceptual schemata used by local decision-makers and the theoretical models of interest to academics and donors. This pragmatic focus will be discussed in further detail in Chapter 3, as the researcher conducts reconnaissance surveys and develops questionnaires. The next section, however, examines sampling decisions since researchers generally determine a sampling strategy in the process of selecting a topic.

2.3 SAMPLING DESIGN

Selecting a physical research site in which to undertake research and determining the sampling design occur concurrently with or closely follow the specification of the research topic. With the exception of Rwanda, where FSA research was integrated into a national sample, research teams chose a limited number of geographical areas in which to conduct their studies. Selected areas permitted them to study how the interaction of institutional, technological, and environmental variables condition responses of food system participants to changes in these same variables brought on by policy reforms. In other words, the geographic scope needed to be sufficiently diverse to enable researchers to study these factors involved in the natural experiment under a range of environmental

conditions. The choice of research area was also guided by the projects' local institutional affiliations, ongoing research in the country, logistical feasibility, the level of available resources, and crop focus.

2.3.1 Influence of Institutional, Environmental, and Technological Factors

As the research topics listed in Figure 2-1 attest, FSA researchers were generally oriented toward the supply side of the food security equation. FSA interest in the chronic food insecurity problem directed researchers' attention to the long-run issue of improving labor and land productivity, which "affect both the supply dimension through depressed food availability, and the demand dimension through low surplus marketings and cash incomes that are unable to stimulate demand for farm and nonfarm sector goods and services" (Weber and Jayne, 1988, p. 4). Specifically, the interest in the agricultural production side of the food security question directed researchers to design their studies in a way to account for the influence of environmental factors - rainfall and soil type - on crop yields. In Mali, Senegal, and Zimbabwe, in particular, the agro-climatic variable affected the choice of research area(s).

In Zimbabwe, the interest in examining factors that have increased productivity in communal areas since the country's independence in 1980 prompted the researcher to choose two regions with different agro-ecological conditions. Similarly in Senegal, the decision to conduct research in three regions in the southeastern part of the country was based partially on an interest in studying areas with allegedly high and under-exploited agricultural potential. Within these three regions, the decision to select five departments was based on the research budget, the desired geographic scope, and an interest in studying areas in which government agencies were involved in input and output marketing. Subsequently, district (arrondissement) selection was based predominately on

those with the highest average cereal and cowpea production. Prior to their final selection, the research team affirmed that the selected districts contained the type of villages possessing the desired institutional characteristics.

The Mali research team selected two zones of similar agronomic potential but under the jurisdiction of different regional development agencies. This first level of stratification was aimed at studying the effect of institutions and the services they provide on the behavior of farm households. Within each of these institutionally homogeneous zones, Dioné assumed that farmers' strategies would likely vary with differences in the natural environment, which constitute the dominant determinant of yields. Two sub-zones of the rural development zones were thus selected on the basis of rainfall and soil type as well as the importance of coarse grains relative to the entire crop mix.[2] This selection "ensured not only a certain degree of control for rainfall variations, but also that only sub-areas with non-marginal coarse grain production were retained" (Dioné, 1989 p. 46).

In Somalia, the research team selected an area based on their interest in studying the interaction of institutional and technology variables as they effect farmer productivity. They chose an area in which several donor credit projects were providing in-kind credit to a select group of farmers to obtain inputs such as fertilizer and insecticide. This design enabled the researcher to examine the impact of new technology on farmer yields, relative to those attained by non-credit receiving farmers. In summary, the Mali and Somalia designs incorporated different levels of institutional factors in the

[2]The most southern sectors of the two sub-zones were discarded because of the relative importance of root and tuber crops in their production structure.

selection of the research zone, whereas the Senegalese and Zimbabwe designs controlled for them at the village level.

A second factor guiding area selection was the interest in collaborating with local institutions and building off the existing knowledge in each country. Collaboration with a Senegalese agricultural research institute influenced the choice of an area and topic which would complement but not duplicate the ongoing research, thus satisfying their objective of expanding the geographic scope of institution's work. In Zimbabwe, the decision to cooperate with an ongoing farming systems project - separate from the project's official affiliation with the University of Zimbabwe - enabled the research team to gain access to agronomic expertise and otherwise unobtainable data from agronomic trials and prior surveys. By introducing the FSA research as a continuation of their previous work, the farming system personnel also facilitated discussions with local political authorities and village leaders, preventing delays in implementation.

In Rwanda, the FSA project and statistical unit of the Ministry of Agriculture mutually benefitted from their collaboration; the former through the integration of food security research into an ongoing national survey; the latter by enlarging the scope of their production and consumption work through the addition of a marketing component. The decision to use the national sample did, however, preclude the FSA researcher from using a design oriented specifically to the study of the primary policy, institutional, or technological issues affecting food security.

2.3.2 Probability versus Non-probability Sampling

This section addresses some of the main issues related to probability and non-probability sampling. The aim of this digression is to discuss the difficulties encountered in administering probability designs in agricultural field research in Africa.

Understanding some of the factors influencing sampling decisions and the limitations to both designs will provide a better context within which to examine the FSA methods' decisions.

Within each area selected, researchers need to define precisely the target population of the study since it is this time- and space-bound collection of units from which a representative subset of units will be drawn and to which the survey results will be extended. The issues involved in attempting to extend findings beyond this group are discussed later in Section 2.3.8. Since problems often arise in what a researcher attempts to assert from the findings, it is important to define the characteristics of the population from which a sample will be selected and over which inferences will be drawn. In a national sample, this is straightforward; when only certain areas are chosen, definitions must be clear.

A sample is a part of a population of units from which that selected subset has the property of representativeness; in a sense, it is a replica of the population. By using probability sampling, one in which each unit in a population is assigned a non-zero probability of being selected, statistical theory provides a basis to compute from a representative subset of units some statement about the presumed nature of phenomena in the specified population supported by some numerical measure of its reliability (confidence limits). That is, probability sampling methods enable a researcher to calculate statistically the degree to which the sample estimate might differ from the true population value; this is the sampling error.

The common element in non-probability samples is the notion of judgement. A researcher exposes the sample selection to biases when every unit does not have nonzero probability of being selected. Prior survey research in Africa has shown that in non-

probability samples there is a tendency for certain groups of a population to be systematically overlooked when selection is not based on precisely defined rules. Not only may the sample be unrepresentative, but there is no way to determine the accuracy of the estimate or statement in relation to the unknown true population value since error and bias are inestimable. This does not imply that a biased sample is inevitable in non-probability design or that the higher risk of bias impedes a researcher from carefully establishing and following a set of rules to draw a representative sample. At the same time, probability sampling is not immune from the risk of being biased. The difference is that in a probability sample, the error in the estimates can be calculated; the risk is known (Bulmer, 1983; Casley, 1988).

In making inferences to the target population, a researcher assumes that the sample is a representative subset of the population. Representativeness is, however, a matter of degree - how well or adequately does the achieved sample represent the total population; it is a question of error and bias.[3] When a segment of the population is not included in the subset of units selected, the sample is biased and hence unrepresentative, resulting in unsound inferences to a population. The degree of representativeness depends on the method of selection and the skill and fidelity with which the sampling methods are executed, whether probability or non-probability.

A complete, accurate listing of the units in the population is an essential component needed to draw a representative sample. When an incomplete sample frame is used - the list from which sample units will be drawn - a probability sample will be biased since certain units did not have a chance of being selected. In sub-Saharan

[3] The survey population differs from the target population to the extent that there is nonresponse and noncoverage of elements in the target population.

Africa, the lack of a complete, accurate sample frame of the target population often compels researchers to use a multi-stage design because a listing of the population is required at the level from which the sample units are selected. A multi-stage design is one that divides a population into first stage sampling units (districts, villages), each composed of a number of second stage units, and so forth. Since lists of first stage units are usually available, the researcher needs only to compile a listing of units within the selected first stage units and not an entire region.

Listing constraints, a lack of information on the characteristics of a population, and a limited budget often prevent a researcher from considering other sampling options which, from a statistical theory perspective, are more efficient. These factors demonstrate the difficulties incurred in attempts to administer probability designs. First, where there is little information on the population, accurately calculating variable variances needed to determine sample sizes depends more or less on researcher guesses than on mathematical estimates. Second, with no choice but to use a type of multi-stage probability design to sample from a heterogeneous population, a researcher is resigned to accepting higher levels of error than what could be achieved if other alternatives were available in the statistically complex estimations of population parameters.

In theory, in order to obtain more precise estimators in a heterogeneous population using a multi-stage design, a researcher would seek to maximize variance between clusters (e.g., villages) while reducing variance within. Since increased sampling error arises from intra-class correlation - the tendency for sample units within a cluster to be more like each other than like members of other clusters - researchers should strive to choose a large number of small homogeneous clusters. But the cost of conducting the research can increase substantially when a small number of farm

households are sampled from a large number of villages (Murthy and Roy, 1983). Compounding the complexity is the interest and need to stratify either first or second stage units (e.g., villages or households). The number of first and second stage units to select also depends on the research objectives and primary analytical interest. A larger number of first stage units with a smaller number of second stage units is more efficient if the researcher is interested in calculating estimates for the designated target population (e.g., region, country, cotton farmers). However, a small number of second stage units may be insufficient to do analysis at the village level (i.e., examine differences between villages).

Stratification techniques are often used to increase the precision of sample estimates by making each strata as homogeneous as possible with respect to the property that forms the basis for classifying units; between strata variation is reflected exactly in the sample. Stratification gives the researcher greater control over determining strata sample sizes and thus improves the likelihood that the sample will represent more accurately the characteristics of the population. Whether one opts for proportionate or disproportionate samples - the size of the sample fractions relative to the size of the stratum in the population - depends on the research objectives. Equal sized samples for each stratum provides more "efficiency"[4] if the aim is to test for statistical differences across strata means. It provides less efficiency if the data are to provide overall population estimates of the means.

In some cases, drawing a disproportionate sample - different sample fractions for each strata - may be the only way to assure that a sufficient number of units required for

[4] Statistical efficiency refers to high precision (low variance) per element. In some books, an efficient sample has a similar definition as economic sample; low unit costs for fixed unit precision (or variance) (Kish, 1965).

statistical analysis are selected for a stratum representing a small percentage of the total population. Calculating separate sample sizes for each stratum may minimize standard error estimates for each stratum but increase the sampling error for the total sample. Additionally, when stratification is used at lower stages of a multi-stage design, a census must be implemented in order to determine the strata proportions within the selected first stage units to accurately weight population estimates.

Another tradeoff is that computer statistical packages often estimate standard errors assuming the researcher has used simple random sampling. Using statistical software such as SPSS to analyze data from more complex sampling designs gives biased estimates of standard errors and hence confidence intervals. It would not take into account, for example, the lower standard error attained from stratification. Unbiased estimates can be obtained with certain packages but require more time and complex calculations. Researchers must therefore examine the implications for their sampling decisions on their ability to do the required analysis.

Finding a solution to these complex sampling issues involves considerable tradeoffs, the solution to which depends on the researcher's objectives. Often, the overriding research objective is not to obtain statistically-valid population estimates within precise confidence intervals. Instead, the policy interest may be to examine relationships between certain variables. In this case the aim of sampling will be to have an adequate number of units for different strata sufficient for statistical analysis. The need for a probability sample may therefore not be as critical. However, if there is an interest in population estimates, a researcher needs to ascertain the level - district, region, national - at which they should be focused.

Policy analysts in one country told a FSA researcher during discussions at the end of the research that they were interested in information at the district level since it is there that projects are undertaken. This comment is a good example of the importance of interacting with policymakers who may be interested in the research findings and generating the information (estimates) in a form relevant to their needs. The greater the understanding that policymakers and the funding agency have of the selection procedures used to produce the information, the more realistic will be their expectations and the greater the possibility that they will have confidence and believe in the results.

The point of this discussion is not to attack either probability nor non-probability designs. Rather, the purpose is to move the debate to a more productive dialectic regarding how researchers can use probability and non-probability designs and judge the process and product of inquiry. More specifically, the aim is to point out some of the difficulties involved in closely following probability sampling rules in many African countries and to clarify some of the fallacies in the argument that probability designs are somehow objective and free from bias while non-probability designs are inferior and do not represent acceptable research. In both situations, an evaluation of the validity of the design, and thus the validity of the data must include subjective criteria, not just a set of preordained, objective measures. A researcher must examine the extent of adherence to sampling rules, the representativeness of the sample, and particularly the congruence between the procedures and the objectives of the research. And this must be done in light of the financial, time, and data constraints he or she faces.

FSA researchers used both probability and non-probability sampling techniques to select the sample villages, farm households, and merchants. The decision of what

method to use depended on several factors, but was determined particularly by the objectives of the study and available time and resources. The decision in some countries to draw a non-probability sample was based on the interest in choosing villages which possessed certain characteristics related to the central theme factors and the local food security problems. With a heterogeneous population and limited time and resources, drawing a probability sample did not ensure that villages with the desired characteristics would be selected.

This technique is analogous to some agronomic research in which a researcher may not draw a random sample in a fertilizer response study because most farmers are operating near the economically optimum range of fertilizer use. A random sample may not result in enough observations at the extreme ends of the response functions. Therefore, researchers choose farmers purposively based on their fertilizer use. Similarly, in much of the FSA research, researchers wanted to find at least some "extreme" observations to see what was feasible given high (or very low) levels of inputs, institutional conditions, or other variables.

2.3.3 Sample Size

The question of sample size cannot be decided in isolation but must be viewed in the context of the sampling design, the substantive research issues, cost and available personnel, logistics and management capability, the user's needs, and proposed plans for analysis. In theory, choosing a sample size is a well-defined problem for a single variable when the researcher can estimate its likely variation in the population as well as specify an acceptable margin of error and a level of confidence (Alreck, 1985; Casley, 1988; Kish, 1965; Zarkovich, 1960). The more respondents tend to differ in their responses for the designated variable, the higher sample size required to attain a certain degree of

precision in the estimates. Since surveys include many variables with different variances, often requiring varying degrees of precision and confidence for the estimates, and consequently different sample sizes, a researcher would do well to identify one variable with a high degree of variability requiring a high degree of confidence and assume that the calculated sample size is sufficiently large for the other variables. To determine a tolerable level of error in the estimates, a researcher needs to think about how the estimate will be used and the consequences of a sizable error.

FSA researchers and faculty have learned that an exclusive focus on minimizing sampling error through increasing the sample size may risk increasing the size of non-sampling errors present in any design, not to mention the cost. Enlarging the number of respondents interviewed can overextend the research resources and lead to the loss of control over the quality of the implementation. In other words, attention to sampling error, alone, may yield diminishing returns. Non-sampling error refers to errors in data collection, data processing and analysis leading to inaccurate measurement of a value. FSA researchers and faculty have learned that minimizing non-sampling errors depends on well-defined concepts, adequate operational definitions, accurate translations, and simple and easily understandable questionnaire formats. In addition, researchers must carefully train enumerators and supervisors, provide them with explicit instructions and sufficient logistical support, obtain the cooperation of village leaders and respondents, and initiate data verification and analysis early in the study (Bulmer, 1983; Crawford et al., 1988). Murthy writes that these are all factors "over which the survey statistician has minimal or no control at all" (Murthy, 1978, p. 246). As was mentioned earlier, a statistically-valid calculation of the sample size may not be necessary if the research

objective is not to make population estimates of a specific variable within a desired level of error. In this situation, other sampling criteria must be satisfied.

Each project's field research budget was an important factor in determining sample sizes. With the exception of Rwanda, where the FSA study was grafted on to an ongoing national survey, the number of villages and households was based jointly on conceptual grounds and the level of available budgetary resources to hire field staff and effectively manage implementation of village-level interviews. Given the number of enumerator months permitted with the budget, it is necessary to determine where they will be physically based during the research period, since the number and location of villages sampled is influenced by their distance from the base location.

The base location of the enumerators and distance from sampled villages is also important since enumerator traveling time affects performance. One researcher felt that if the distances between sampled villages and the village in which the enumerator was located were too far, a project ran the risk of the enumerators fabricating the data. He decided that enumerators should not spend greater than two hours traveling by motor bike from their base village to the remote village. Enumerators could set up an interview time with farmers in advance and go to the village for two days to carry out the survey.

Researchers then had to assess potential enumerator workloads. They determined the number of farm households that could be interviewed in a week by looking at the number of passes, the length of questionnaires, and the travel time between villages and between households. In attempting to do more than is logistically possible, a researcher may run into supervision problems, potentially compromising the quality of the data and the ability to satisfy the research objectives.

Lastly, and aside from the issue of situating enumerators, is the issue of a uniform sample size for all questionnaires in the survey. Although the same set of factors should be taken into consideration in making a decision, different questionnaires have different purposes and hence necessitate different sample sizes. The Rwanda FSA study implemented some questionnaires on subsamples of 100 farm households in order to study certain issues prior to their inclusion on the national sample.

As was mentioned earlier, most of the FSA studies were based on a variant of a multi-stage, cluster sampling design. Geographic or administrative areas (districts, wards and villages) were used as first and second stage units; farm households and traders were subsequently sampled as third stage sample units. In a multi-stage design using villages as the first stage unit followed by households at the second stage, researchers must balance the need to minimize variation in the estimates with cost considerations. Clustering the sample in geographically limited areas reduces the field costs of interviewing and traveling.

FSA researchers also incorporated stratification techniques at either the second or third stages of their design, at the village or farm household levels. In Zimbabwe, after having selected the research areas and wards, village leaders within each ward were asked to stratify villages according to their access to markets -- good or bad. Within each strata in each ward, an equal number of villages was randomly sampled. In Mali, Senegal and Somalia, however, researchers stratified households in the second stage following a census that produced the requisite data on the stratification variables as well as a sample frame.

2.3.4 Village and Market Town Selection

In Mali, Senegal, and Zimbabwe, FSA researchers selected villages with differential access to markets in order to study the effect of proximity on farm household's production and marketing behavior. Specifically, they hypothesized that farm households in villages with differential access to markets face different opportunity sets resulting in variations in their responses to changes in policy. Market access is comprised of several factors including distance from village to market, the existence and state of roads, the presence of assemblers that visit or are based in the village, the degree of linkage to extension networks, and the existence and the dynamism of village-level farmer organizations.

In Zimbabwe, ward and village officials were asked to define market access and to classify villages by this criteria - good and bad. Three villages were then randomly selected from each strata in each ward, a total of six. The researcher concluded that the leaders' criteria essentially consisted of access to a maintained gravel or paved road which determined whether a truck could enter the village.

In Mali and Senegal, the selection of the precise survey points was based on the location of a major coarse grain rural market around which villages could be chosen with respect to their market access. In Senegal, market access was defined in terms of physical distance, the quality of the connecting road, and the frequency of public transportation. In each of the five selected districts, market villages were chosen according to "the relative importance of the market in terms of cereals traded" (Goetz, 1986, p.6). The FSA team asked the market chief in the selected market villages to identify five villages with good access and five villages with bad access, to rank each

group according to the amount of cereals marketed, and to indicate whether the villages were representative in terms of ethnic group, population, crop mix and soil type.

The research team recognized the implicit bias in using chiefs who were familiar with adjacent villages that have good access to his market village and little knowledge of distant villages with links to other weekly markets. The research team assumed that the biases were fairly consistent and justified the purposive sampling in light of the fact that the budget permitted only a small sample of villages relative to an assumed heterogeneous population.

The selection of towns for the market component of the research occurred concurrently and in coordination with village sampling. The towns sampled for price data collection and trader interviews were those whose market was an intermediate destination of the grains grown in the sample villages and sold in weekly markets. The primary objectives of collecting price data was to examine the degree to which rural markets and market towns were integrated.

In Rwanda, the choice of market towns in which to interview traders was based on those districts with high, medium and low levels of agricultural productivity. The research team thought it would be more effective to gather information from "better developed" market towns where there was a higher concentration of traders and where it was assumed that the respondents were more familiar with the marketing channel. With five percent of the population residing in urban areas, the number of "larger" towns from which to choose was not that extensive.

Given the non-probability nature of the sampling and the huge range of village populations, Goetz attempted to select "representative" villages with populations near the district mode, setting a limit of one and one half standard deviations from the modal

village population for the district. In principle, one has no objective means for knowing what is "representative" or "typical" with non-probability sampling. In some districts, villages with populations near the mode did not contain a sufficient number of independent households required for analytical purposes (Goetz, 1986). Goetz's criteria for village selection is analogous to the FSA interest in choosing a 'typical' village based on a set of characteristics specific to the study focus.

This interest in studying 'typical' villages pertained as well to farm households and traders. Cognizant of the key policy issues, researchers attempted to study villages and farm households that are typical of major groups of these sampling units. Over time, researchers and faculty recognized the importance of including in the sample cereal surplus and deficit regions and households, both categories representing typical groups in rural areas. The concept of cereals availability and its division into surplus and deficit categories was derived from the food security policy interest in access to food. It evolved from researcher and faculty recognition that these groups of regions and farm households have different opportunity sets and constraints that influence their response to the changes in policy, institutions, and technology. By including both categories in a sample, researchers were implicitly "controlling" for this variable in the natural experiment.

Similar to the Senegalese study in its use of non-probability sampling to select villages in the first stage of the design, the Malian FSA study selected purposively four villages in two institutionally similar but environmentally different sub-zones. In addition to market access criteria, the research team was interested in selecting villages in which either an extension agent of a rural development agency or a farmers' association was located. The team assumed that the presence of an agent represented access to

technology which could have a positive effect on farmer production. Membership in an association, on the other hand, provided access to inputs and output markets for cotton production in one rural development zone. The team later discerned that market access in the physical sense was not a significant factor differentiating villages since there were good feeder roads in all of the areas.

In each sub-zone, a market village was chosen in which a permanent extension agent, and in most cases, a farmer organization were present. This village was assumed to have the best access to input and output markets and extension services. The second and third villages selected were in close proximity to the market village, with supposedly good market access. The second village contained a permanent extension agent and possibly a farmers' association whereas the third had neither. The fourth village selected had a permanent extension agent and possibly a farmers' association but was geographically remote from the market village. The research team later discovered that itinerant traders made transactions occasionally in the fourth village, making the village fairly comparable to the others in terms of market access. The research team felt that in spite of the traders' presence, the remoteness of the fourth village still had an affect on farm equipment levels. Comparing the fourth village with the second would control for the effect of distance to market on farm household's production and marketing strategies whereas comparison with the third village might suggest the extent to which possible effects of distance to the market are offset by effects of farmer organizations and access to extension services (Dioné, 1989).

Village selection in Somalia was guided by an interest in studying the effect of different levels of technology on agricultural productivity. The research team purposively selected ten villages that were currently participating in a program that provided credit

to purchase agricultural inputs. Every village selected was located in the perimeter of an irrigation scheme in the Lower and Middle Shebelle regions in which maize was the predominant crop, and under the jurisdiction of the extension service (Wehelie, 1987).

2.3.5 Role of Reconnaissance Surveys and Censuses in Sampling

All FSA researchers used rapid reconnaissance techniques to collect data for the purpose of selecting sample villages. As will be explained in more detail in Chapter 3, reconnaissance methods include informal, conversational interviews and semi-structured, open-ended interviews. They are also useful in identifying system participants' perceptions of policies and food system problems as well as developing a first approximation of the system's basic structure (Holtzman, 1987). They are important for determining the general characteristics of representative villages and households. A census, on the other hand, entails a complete enumeration of a population. Censuses were conducted to establish sampling lists and collect data on specific variables used to stratify the population. The two methods complement each other, the reconnaissance surveys generally preceding censuses.

In Senegal, the research team used a series of reconnaissance surveys and censuses to collect information needed to identify and choose the most important cereal market village and two satellite villages in each of the five selected districts. Based on discussions with government officials, local researchers, and cereal traders, villages were chosen according to "the relative importance of the market in terms of cereals traded" (Goetz, 1986, p.6). Researchers also interviewed weekly market village chiefs in order to select five active cereal-trading villages with "good" market access and five others considered to have "bad" market access. The informal discussions with the market leader prefaced a trader census aimed at collecting descriptive information and establishing a

sample frame to select cereal traders. Finally, researchers used reconnaissance information on the diversity and seasonal importance of different commodities in weekly markets to determine markets for price data collection.

In Mali, the FSA team used an interview schedule to assemble information from village chiefs and advisors on their perceptions of cereal marketing, differences in resources levels of farm households, predominant cropping systems, and farmer marketing strategies. Combined with visits to rural market towns, the village visits helped differentiate villages by specific strata in which the study was interested. In both Mali and Senegal, interviews with village chiefs in the research region helped the team decide which villages to select for the formal surveys. Questions posed to village chiefs basically centered on village infrastructure, services, and land development. This information later proved useful during the analysis stage. Similar informal interviews with administrators of regional development organizations were used prior to selection of research areas.

In addition to rapid reconnaissance techniques, FSA researchers in Mali and Senegal carried out censuses to establish sample frames and to collect data to stratify farm households and traders. In Somalia, lists were received from the credit project working with farm households in the selected villages. In Zimbabwe, village leaders provided sample lists of farm households.

In southeastern Senegal, a census was administered to the 27 chiefs of the market and satellite villages in the five selected districts. In addition to introducing the study to village chiefs, the census helped the research team decide which villages to use for in-depth studies and which for more extensive case studies. A similar census in Mali assisted researchers in selecting the villages in which the formal questionnaires would be implemented. The research team verified these lists and in cases in which there was not

a list, conducted a census. In both Mali and Senegal, the lack of complete lists of farm households in the selected villages and traders in market towns required that the research teams administer a census. The censuses also furnished information on certain variables that enabled the teams to determine the appropriate stratification criteria on which to divide the population prior to sampling.

In Mali the objective of the census was to collect information on a set of farm characteristics which might be indicative of the farm household's position vis-à-vis coarse grain production and marketing and with which to stratify the sampling units. The information consisted of collecting demographic data on the farm household; nominal farm size - small, medium, large; agricultural workers; off-farm activities and migration; animal and equipment ownership and rentals; access to credit; crop mix and sales; changes in land holdings; and access to land. Local extension agents residing in the villages were further asked to classify farm households according to their food status - that is, the households' level of difficulty in feeding themselves during the last three years.

In Mali, the research team decided to use the village-level extension workers of the rural development organizations to conduct the census due to their familiarity with and personal knowledge of the farm households with whom they had been living for over five years. This personnel decision gave the project additional time to recruit and train the survey enumerators. The research team also benefitted from the agents' ability to assess the perception of farm household food status, which weighed heavily in the identification of stratification variables.

The analysis of the farm household census data consisted of simple frequency distributions with which the researcher could compare sample villages with others in the

area. Secondly, it focused on the relationships between the major structural characteristics of the farm households and their position vis-à-vis food self sufficiency. In analyzing the estimated correlation coefficients, the Mali study discovered that farm equipment displayed the highest correlation with sales of coarse grain and cash crops, and with the household's food status as defined by the extension worker (Dioné, 1989, p. 56).

Similarly, the Mali wholesaler census was "aimed at identifying the wholesaler population and some of its major characteristics which might be useful for stratification and sampling purposes" (Dioné, 1988, p.67). The research team defined wholesalers as "traders who buy grains primarily from rural market and village-level assemblers or other small merchants, and sell mainly to retailers and other traders" (Dembele, Dioné, and Staatz, 1986). The data collected consisted of demographic characteristics, years of experience, geographic sphere (local, regional, national), scale (volume) of activity, physical and human capital, sources of working capital, specific activities and commodities traded, seasonality of cereal buying and selling operations, and relations with suppliers.

Having spent approximately one week in each rural market town, 90 to 95 percent of the regular traders were included in the census. Given the small number of wholesalers and the limited size of the questionnaire, the entire wholesaler population was not beyond the capacity of the survey resources. In retrospect, a smaller sample would have been sufficient.

2.3.6 Sampling Units

In a strict statistical sense, a sampling unit contains the elements of the population for which information is sought and is used for selecting a sample from the target population (Kish, 1965). FSA researchers generally used some definition of the farm household as the element of the population. The population element and sampling unit are not, however, always the same entity. In the first stage of a multi-stage sample, villages constituted the sample frame and were the sampling units selected. Each village contained several elements - farm households. In the second stage, however, farm households are the sampling units constituting the sample frame. Drawing a valid sample and collecting valid, reliable data demands that a researcher define precisely the sampling unit prior to sampling. The following section illustrates how FSA researchers worked out an operational definition.

The manner in which the researcher defines the entity constituting the units of the sample frame (e.g., farm household, household, family, farm, exploitation, concession) is a function of research objectives and the socio-cultural environment in which it is located. In many studies, researchers define the farm household as those individuals who eat from the same pot, "share a common source of food" or sleep under a single roof (Casley and Krishna, 1988). In other studies with different purposes, it may be more meaningful and conceptually sound to define a household differently.

In Mali, the sampling unit was based on the Bambara definition of the gwa or the family. The gwa teegee is the head of the extended family under which several separate households - nuclear families or ménages - can exist. The families of the sons of the gwa teegee usually constitute the extended family. The gwa teegee has the authority to allocate land holdings, 80 percent or more of which is usually collective fields. This

person is also responsible for allocating individual parcels to family members, for making investment decisions and purchasing equipment, and is responsible for all social and administrative liabilities of the gwa (payment of taxes and loans, gifts to in-laws and religious chiefs, etc.).

One of the difficulties of selecting and defining a sampling unit is that decisions concerning food security are made at different levels - e.g., some at the extended family level, some at the nuclear family level, and some at the individual level. As will be explained in Sections 3.1 and 3.2, researchers need to define carefully the data needed and interview the individual(s) best able to provide it. In Senegal, the research team focused on the concession - nuclear family - rather than the exploitation - extended family because they were interested in the independent consumption and production units where separate decisions are undertaken. They also interviewed a subsample of concession members who made production decisions on individual fields. Tradeoffs have to be made if the researcher wants to collect data on all these levels without resorting to a complex research design involving interviews with every household member. It is likely that a researcher will not understand the complex decision-making processes in the beginning of the research. It may therefore be necessary to conduct iterative, subsample probes as information is collected.

2.3.7 Household and Trader Stratification and Sampling

With information collected in the censuses, researchers stratified farm households on criteria related to the research focus on factors affecting responses to changes in policy, institutions, and technology. In Mali, the research team developed three classifications of animal and equipment ownership presented in Figure 2-5. It was

hypothesized that variable levels of equipment affected the ability of farm households to increase cereal production and marketed surplus.

FIGURE 2-5: EXAMPLE OF HOUSEHOLD STRATIFICATION

Equipped		Farm that owned oxen and a complete set of equipment for plowing, weeding, and transportation
Semi-equipped	Surplus	Farm that owned oxen and an incomplete set of equipment
	Deficit	
Non-equipped		Farm that lacked lacking plowing and weeding equipment

Farm equipment was more highly correlated with other variables characterizing farm households than any other item collected in the census. Furthermore, the three levels of equipment ownership and use displayed coefficients of correlation with both farm size and farm household's food status; best equipped households are the largest and enjoy the best food status. In other words, the three levels of equipment implicitly took account of variables such as family type, farm size, access to credit, sales of agricultural commodities, and overall food status. The semi-equipped category, the most heterogeneous of the three farm strata with respect to household food status, was further subdivided in food deficit and non-food deficit units in order to allow more precision in the analysis of the variety of farms at this critical middle-level of the technological path.

Based on information collected from reconnaissance surveys and a census, the Senegalese research team stratified farm households by their degree of involvement with government parastatals and drew a sample. In the market villages, ten households

involved with a regional rural development organization and ten that were not associated comprised the random sample. The satellite villages included ten randomly selected households.

The Somalia FSA study used two different sampling procedures for the two strata: farm households receiving credit and farm households not receiving credit. The sample frame for the credit-receiving farms was provided by extension agents who had lists of farmers to whom they distributed credit for seeds, fertilizer and insecticide. The random sample of credit-receiving farmers consisted of those who obtained credit on at least two inputs. In some villages, however, there were not always a sufficient number or farm households receiving credit to make up the desired sample size.

Using village resident lists, non-credit receiving farm households were selected in a systematic fashion. The selection interval was determined by dividing the total population of farm households by 25, the desired sample size, and systematically selecting every twenty-fifth household after a random start. The lists had been previously revised to account for deaths, moves, and credit-receiving farmers prior to selection. Approximately 35 percent of the households in the village were included in the sample. The researchers also sampled five additional households in each village in order to compensate for the potential effect of non-response. One of the drawbacks of this approach was that there was no random sample of the entire village (credit-receiving households and non-credit receiving households) making it occasionally difficult to interpret the results.

In addition to the stratified and random sampling of farm households, some FSA researchers selected purposively other kinds of farm households because random selection would not assure that sufficient numbers for analytical purposes would be

included. In all the studies, researchers selected the village chief to participate in the interviews. Researchers believed that the inclusion of the village chief's household was important for reasons of protocol, status, information, and community relations. In Somalia, including the village head in the sample assured other villagers that he supported the research and granted approval for their participation. The Senegal FSA team also selected farm-households of which women were the "head" and others that were actively involved in non-farm activities. Researchers did not, however, include these households in the analysis in which inferences were made to the village.

Trader samples were comprised of those individuals enumerated in the census. In Mali, the wholesale trader sample was stratified by storage facility ownership - an indicator of capacity and propensity to invest - and by the level of sales - an indicator of business scale. In hindsight, the Dioné concluded that the period of entry into the grain trade and their degree of specialization with respect to coarse grains might yield more interesting categories.

The trader component of the FSA studies was developed to collect general information on participants' standard operating procedures used to run their businesses. Some researchers felt that this objective did not compel them to interview the same traders in every round of the survey. In retrospect, while recognizing the transient livelihood of traders and thus difficulties in locating them for interviews, it is advantageous from the perspective of interviewer-respondent relations to maintain the same sample of traders throughout the survey. In some cases, research objectives and data needs will necessitate multiple interviews with the same traders.

2.3.8 Research Generalizations

The extension of research findings from the sampled villages and households to larger populations is commonly an issue of considerable concern to researchers. The ability to generalize is often equated with the degree to which the researcher followed probability sampling rules. Many researchers and policy analysts categorically reject any research findings other than those produced in a study based on a probability sample. This perspective removes automatically from consideration many creative, pragmatically important studies based on non-probability sampling designs and obscures analysts' understanding of the empirical difficulties of executing a probability sample in African countries and the statistical inefficiency of the available sampling options.

The basis for making generalizations from a probability design and the accuracy of statistical estimates depend on the degree to which the achieved sample represents the target population. Obtaining a precise definition of the target population is critical to making sound inferences. If the sample frame does not include all units of the target population, estimates will be biased. In this case, a probability sample does not guarantee automatically the selection of a representative sample resulting in accurate estimates and reliable inferences to a larger population.

Researchers and policy analysts often fail to examine rigorously the precision with which sampling rules are followed in drawing a probability sample, which is ultimately the main determinant of the statistical strength of the generalizations. Moreover, they ignore non-sampling error or assume it is minimal, inattentive to how the difficult execution of some probability designs increase its size. In short, the results from empirical research are no better than the methods used to produce them.

Many studies are undertaken which do not use probability sampling methods. Although there is not any basis on which to make statistically sound population estimates from a non-probability sample, researchers using these designs are still interested in extending their results.

Researchers may find it useful to think of the extension of research findings from a non-probability sample to a larger universe in terms of what evaluation researchers call 'extrapolation'. In this context, 'extrapolation', refers to "modest speculations on the likely applicability of findings to other situations under similar, but not identical conditions" (Cronbach, 1980, p.235). A researcher extrapolates by presenting sufficient evidence to support statements, producing results from statistical analyses, and sharing the line of reasoning and conceptual context in which findings are presented. Researchers must describe precisely the procedures used to select units, and on the basis of information collected in reconnaissance surveys and censuses, argue that the sample is "representative" of a particular area, group of villages, or households with a certain set of characteristics. It is likely that a researcher's interpretations of the findings are more generalizable than is the particular evidence used in support of them.

In non-probability samples, some researchers may also want to define explicitly the domain of applicability or conditions in which a particular relation or behavior occurs. Walker and Cohen refer to this delineation of the research scope as "scope limitations" (1985). The scope of the testable, conditional theory is thus confined to the conditions specified by the researcher. Its explicit definition allows other researchers to know when certain empirical evidence supports or contradicts certain relationships, thus contributing to the development of more empirically tested theories and preventing

spurious disconfirmations. Researchers need to find a balance between the idiosyncratic triviality of studying a single household and the irrelevance of universal statements.

In Mali, for example, information compiled in reconnaissance surveys and censuses in sixteen villages throughout the survey area - a total of 1,300 farm households - enabled the researcher to specify the scope of the research findings. He concluded that findings can be generalized to those areas with a similar density of extension agents and an input distribution system. The results are not relevant to villages in which farmers grow rice and tobacco and have a guaranteed market for their production. They also do not reflect the situation in the extreme northern or southern parts of the zones where marketable coarse grain surplus production is somewhat marginal. Dioné's effort to specify the scope limitations of his results were not limited to geographic boundaries but also referred to the delineation of the type of behavior of farm households or traders with certain types of characteristics.

Theory is generalized by relaxing the scope limitations to test the particular relationship under different conditions (Walker and Cohen, 1963, p.295). In contrast, the greater the number of variables 'controlled' in the design, the smaller range of naturally-occurring situations to which the results will be relevant (Patton, 1986, p.234). Since one can not control for every variable in an experiment or test a theory as a whole, theory is only advanced through subsequent investigations or experiments based on prior work (Freese and Rokeach, 1979). It is only by trial and error of generalization efforts, of expanding the scope limitations, that researchers will learn how far they can generalize an internally valid finding. The ability to develop knowledge about specific phenomena is enhanced when experiments are conducted over a wide variety of conditions.

The multi-country nature of the FSA project provides a type of replication and cross-validation between countries, permitting a potentially greater empirical and theoretical understanding of food security in Africa. The fact that two researchers may observe a different relationship, for example between off-farm income and agricultural production, is not necessarily contradictory but rather may be an indication that both individuals have observed something valid about relationships between variables in a natural situation. Rather than attempting to develop nomothetic conclusions, researchers sought to explain the multiple interacting factors, events, and processes that give shape to the behavior of farm households and traders. It must be emphasized that in generalizing to other populations of the same type, a researcher leaves the logic of the mathematics of sampling theory and bases the argument as to the extent of generalizability on substantive knowledge and the relevant theory within the discipline.

The iterative, experimental, and multi-country nature of this project is conducive to improvement of economic theory through the identification of those critical variables which limit or facilitate the "response of food system participants to the changes in the incentive structure engendered by the reforms" (Staatz, 1988, p.7). In other words, realistic behavioral assumptions about farm household behavior replace the often unrecognized and empirically weak statements underlying the economic models influencing the design of policy reforms. This knowledge can lead subsequently to modifications to and more effective design of institutional and policy changes.

CHAPTER III

FORMULATING QUESTIONS AND QUESTIONNAIRE DEVELOPMENT

This chapter synthesizes the process undertaken by FSA researchers to define precise research questions and data needs. It outlines a sequence of steps and conceptual issues that FSA researchers and faculty believe are important to effectively design food security research. It builds on the research topic, priority policy questions, and theoretical iteration of the components and subcomponents that the researcher has already defined. But the conceptual framework that guides the choice of questions and operationalization of variables is based equally on theoretical and pragmatic considerations. Investing time and attention to thinking carefully about these issues during the design stage can ensure that questions and variables are structured in a format conducive to accurate data collection and efficient data entry.

In addition to this theoretical component of FSA research, the pragmatic, policy-relevant emphasis of current food security problems require that researchers understand the views of local policymakers as well as farm households and traders. As argued earlier, the usefulness of a large percentage of previous academic research to pragmatic policy concerns has been limited by its narrow focus on issues of scholarly interest. Data collection is often directed to what is needed to construct a theoretical model, with lesser priority given to collecting data to deal with specific practical problems. In order to reverse this trend and improve the utility of information produced by researchers, the FSA project addressed a broader set of constraints delineated by policymakers and food system participants than just those posited by economic theory. The input of these individuals is very important in the early stages of the research design in order to keep it focused on practical policy issues and the most important food security problems.

This sequential design process was facilitated by a task calendar and the continued use of the RPM, both of which will be discussed in more detail as they relate to the design process. The research task calendar is a second instrument that displays the relevant food production, marketing and consumption events that will transpire during the study, and the time schedule for the implementation of data collection and other survey activities (Weber, 1990).

Having narrowed the research questions to their components and subcomponents through a combination of secondary information and theoretical knowledge, it is beneficial to reexamine these ideas and hypotheses in the context of the research setting. Conducting rapid reconnaissance surveys of farm households, traders, and other market participants is important to inject the practical element of the problem into the research design. How do these initial ideas hold up to the empirical reality? What additional components other than those posited by economic theory need to be addressed?

3.1 THE ROLE OF RAPID RECONNAISSANCE IN THE DESIGN PROCESS

A rapid reconnaissance survey is a "broad and preliminary overview of the organization, operation, and performance of a food system or components thereof, designed to identify system constraints and opportunities" (Holtzman, 1986, p.1). The survey includes informal, conversational interviews and semi-structured, open-ended interviews with farm households, traders, village chiefs, government officials and other people able to provide information on the system. This technique is useful in understanding the viewpoints of those who design and implement government policies and projects and those who are affected by them (Holtzman, 1987). A major objective of reconnaissance work is to understand what each group of people perceives as the

important food security problems. Specifically, what do they believe are the key components of the research questions?

Although the components outlined serve as a guide for discussion, a researcher must not be confined to the theoretically-defined parameters of the problem. The objective of the reconnaissance is to add an empirical dimension to the delineation of the research problem as it is seen by those who are in close contact with problems and policies. In short, reconnaissance provides the empirical background needed to modify the orientation of the research so that it is clearly and correctly focused on the relevant components of the locally-defined food security problem and government policy. At the same time, attempting to do rapid reconnaissance work prior to final thinking about the basic research topics and the fundamental components can often lead to unfocused and ineffective field work. It is thus important to outline carefully the theoretical components of the research question as well as organize the reconnaissance surveys.

Returning to the pan-seasonal pricing example, interviews during the rapid reconnaissance may generate a whole series of additional questions that go beyond the theoretical components, pertaining instead to the practical dimensions of the primary research question. Is the policy of pan-seasonal prices actually enforced? Are the market prices actually those mandated by the government throughout the entire year? At what time of the year do farm households sell cereals and why? Who is storing and why? If the policy were to change, who would have the facilities to store? Moreover, the researcher may discover that traders would be constrained by a lack of credit to invest in adequate storage facilities if pan-seasonal prices were dismantled. Additionally, discussions with farm households may reveal that insects prevent farmers from storing grain for long periods of time. Not only will components be modified throughout the

course of the reconnaissance but researchers can also begin to formulate and test questions which they want to ask in the formal surveys.

It is clear that many of the components are interrelated and that their boundaries become eventually indistinct. This is equally applicable to progression in the research design along the steps outlined in the research planning matrix. It may be difficult to separate conceptually the components of the research topic from the myriad of specific questions which begin to develop. Questions that a researcher wants to be included on the questionnaires arise naturally when thinking of the components of the design. Reconnaissance surveys provide an opportunity to examine or test these questions, pursuing the various nuances of an issue that are important to the development of questionnaires and data collection.

Reconnaissance interviews are also useful for collecting information important to the development of questions and questionnaires. The following sections examine some of the conceptual elements of question structure that a researcher needs to study during the rapid reconnaissance surveys. In addition to these substantive issues, FSA researchers and faculty also emphasized thinking about the effect of question structure on the efficiency of data entry and management tasks, and the ability to do timely, policy-relevant data analysis.

FSA faculty have argued that the starting point for questionnaire design "is to ask the question, how do respondents [farm households, marketing agents, consumers] think about and remember activities of interest to researchers?" (Weber, 1990). What terms and concepts do they use to describe their situation and problems? Second, which member(s) of the farm household can best provide information about certain issues in which the researcher is interested? Third, during what periods of the calendar or crop

year do farm households and traders perform production and marketing activities? What are their points of reference used to delineate these periods and allow them to remember certain activities? Fourth, what is the range of responses to certain questions in which the researcher is interested? If the reconnaissance is carefully organized, researchers can learn a great deal about each of these issues during their reconnaissance discussions with farm household, traders, and other food system participants. The following section examines each of these subjects as they relate to the development of precise questions.

3.1.1 Local Concepts

One major aim of the reconnaissance is to understand the conceptual frame of reference of the food system participants from whom data will be collected. Since answers to empirical questions presuppose responses to questions about the concepts used in differentiating phenomena, it is necessary to operationalize the concepts so that the definitions of the variables are representative of the related concept (Riemenschneider and Bonnen, 1979; Sayer, 1984). Given the emphasis placed on participant responses, as opposed to direct measurement, the likelihood of obtaining reliable data is improved when researchers develop questions and structure variables which respondents can and are willing to answer.

Each dominant theoretical tradition stipulates the important concepts and variables used to explain some aspect of reality (Pelto, 1978; Sayer, 1984). The utility of these concepts depends on how effectively they represent the actual structure of the phenomena under question. In other words, there are an infinite number of ways to categorize or to develop taxonomies for 'experiential phenomena'. The value of a classification depends on the specific interest at hand and its effectiveness in helping the

individual to discern relationships and facilitate understanding (Riemenschneider and Bonnen, 1979; Pratt, 1980; Sayer, 1984). Theories, in turn, are constituted of statements about interrelationships among sets of concepts. Analogously, their usefulness depends on their ability to make sense of some phenomena. Together with their underlying assumptions, concepts and theories are testable by means of empirical research.

Problems often develop when the concepts, while relevant to the decisions being made, do not accurately represent some aspect of the respondent's reality. It is thus critical to operationalize data and develop questions which, in Matlon's words, "prove effectively within the framework of perception and within his [her] memory system in the terms and in the disaggregated categories that the farmer [or trader] employs when thinking of the issues or events" (Matlon, undated, p.2). Researchers must use this understanding of the respondents' frame of reference to define concepts and questions with which food system participants are familiar and to which they can respond.

Researchers need to examine the relevant categories used by food system participants to describe their situation. How do household members categorize a bag of maize grain that is bought by a daughter working in town and brought to the village for family consumption? Would the respondent consider this as a household purchase or a gift? The respondent may say that they did not purchase any grain because he/she considers what the daughter brought to be a gift or in some other context. The issue concerns understanding the system of categories used by individuals to give meaning to events and phenomena in their environment. It also involves understanding the degree to which cultural values emphasize particular knowledge and neglect others.

Farmers' knowledge of certain phenomena of interest to the researcher varies with the type of data. Farmers may know the hectares of land planted to an industrial

crop under the jurisdiction of a government agency but may not know the size of another field planted to a root or tuber crop. Or, they may know the size of the field in a different unit of measure. There is some emphasis, value, or positive reinforcement placed on the knowledge of certain information. Lipton and Moore find it useful to categorize data as either registered or nonregistered, referring to the respondent's ability to remember a particular piece of information (Lipton and Moore, 1972). The frequency of occurrence of the phenomena also affects recall ability. Selling the entire millet crop to a government agency may occur only one time, making recall easy; this is registered and single point data. Remembering the number of kilos of cereal used for every meal over a week may be more difficult to remember because it is non-registered and continuous.

During reconnaissance interviews, pretesting and throughout the course of the study, researchers need to be open to learning and using local concepts. The categorization of certain phenomena, while different than the externally-determined groupings, may be more effective in optimizing respondent recall and thus better understanding their behavior.

To use external concepts, a researcher must determine whether an equivalent concept exists in the local culture. Do the concepts have "any meaning or the same meaning" to the people who are the focus of the study? (Warwick & Lininger, 1975) When written in a language different than that in which it will be administered, translating and back translating a questionnaire seeks to assure that translated concepts are linguistically equivalent in addition to conceptually equivalent. Even when questions are written directly in the local language by the principal researcher, it is important for other native speakers to back translate them in order to verify the correct use and

understanding of concepts. Questionnaires that are not translated increase the potential for enumerator bias through misinterpretation and inconsistencies in asking questions. Writing or translating the questionnaire in the language of the respondents forces the research team to discuss the meaning of each concept and the terminology to employ that conveys the intended meaning.

One task in the operationalization of a question involves defining an abstract concept in terms of a precisely defined variable(s). Some variables like hectares of land or kilos of cereal sold are directly observable and can be measured by indicators, their empirical presence defined by the value of the indicator. Construct variables, however, are a mental creation, conceived by a researcher and believed to exist on the basis of experience. Willingness to sell millet to private traders or food security status are construct variables that would need to be defined in order to measure their presence in an empirical situation.

Attempting to reconcile the different conceptual frameworks is often a very difficult process. When a researcher is resolved to employ his/her categories, which are often quite different from those used by food system participants, he/she risks collecting data of questionable validity. On the other hand, if the concepts used by food system participants make no sense to the users of the data, achieving the project objectives becomes threatened.

The task confronting a researcher is to serve as a "translator" between conceptual frameworks, using the new insights and terminology obtained from the empirical situation that are effective in comprehending the situation and to help modify the conceptual scheme of the researcher and policymaker. Effective modification often hinges on the ability of the researcher to explain the unfamiliar in terms of concepts

familiar to the desired audience. Cognizant of the policymakers' conceptual framework, knowledge, and understanding of the food security question, the issues raised in the study may extend the range of concepts useful in improving knowledge of the behavior of African producers and merchants and developing more realistic theoretical assumptions.

One particular category of concepts that researchers must understand is the different units of measurement used by food system participants in the research area. With what instrument is harvest measured or grain taken out of stocks for daily meals? Researchers must know these variable local units of measurement in order to word questions correctly and to determine their appropriate conversion factors to a standard unit of measure (e.g., kilogram). Instead of asking how many kilograms of millet was given to neighbors, the question is left open and the respondent can answer in the unit with which he/she is familiar. Researchers must be very careful in making any assumptions about the extent of use of some measure since measurement units are often localized to a district, a village, or even a farm household.

To calculate conversion factors, some researchers trained interviewers to weigh and record three samples of the contents of the local measuring device. This information was used to calibrate the correct conversion to metric units. In Rwanda, sample farmers participating in a national survey were given plastic buckets with which to measure and report yields. Loveridge adopted this technique to collect information on grain transactions. Farmers were asked to report how many buckets of sorghum or beans were bought or sold. Researchers need to take the time in the reconnaissance to understand the local measures used and to schedule time and equipment to obtain the correct conversion factors.

3.1.2 Reporting Unit

A second area of inquiry during the reconnaissance survey was aimed at determining the member(s) of farm households who should be interviewed in structured questionnaires. Some research method books refer to the individual from whom information is collected in an interview as the reporting unit. Deciding who to interview depends on the type of information and degree of detail required, the individual(s) who can most accurately provide it, and the amount of time and resources available to conduct interviews.

In theory, it would be optimal to interview the members of the household who are most intimately involved in the activity for which data are required. The respondent of the questions could be different individuals within the household who are in charge of certain decisions or activities. The eldest son may be responsible for managing grain stocks. The senior woman in the household may buy and sell grain. In many cases, one or two household members, such as the senior male and female actively involved in household decisions, can provide information about activities of other individuals.

What are the implications of asking the senior male and female about activities for which another household member may have more knowledge?[5] Would either be able to provide an acceptably accurate answer? If not, does the project have the time

[5] The term "head of household" is often used in agricultural research in Africa, implicitly referring to the senior male member of the family unit. It is a good example of an external concept whose utility is suspect in helping the researcher to understand better the dynamics of household decision-making. The manner in which decisions are made is a very complex issue, involving many household members. It is simplistic to assume one person, "the head", is the sole decision-maker. For the purposes of this paper, employing "head of household", evades the issue of which household member can most accurately provide information about a specific topic and thus serve as the respondent. It is an empirical issue to be determined by the researcher in the specific socio-cultural context.

and resources to interview more than one household member? Is it feasible to have several household members present at the same interview, each providing information to the relevant questions? How would responses be altered in the presence of other household members? To determine the accuracy of respondent answers, researchers need to interview household members during reconnaissance surveys, comparing their ability to provide answers.

Some FSA researchers interviewed the senior male members of the household, whereas others interviewed the senior male and female together. Those who interviewed a male and female together judged that they were able to accurately answer most questions in the questionnaires. Researchers must evaluate the accuracy of responses during reconnaissance surveys and pretesting and continually cross-check data throughout the research. For other variables like off-farm income or production activities in individual fields, it may be necessary to interview specific household members. There is, however, a tradeoff between the detail a questionnaire attains and the time and cost of the field work and implications on data management tasks. From a data processing point of view, it is a difference of 200 households versus 1000 individuals. The ability to use other members depends on the subject matter and the level of data. Researchers need to constantly examine the implications of these decisions on the budget and research objectives.

The decision to interview the "household heads" in FSA studies did not preclude researchers from interviewing other family members for certain information. Different people can be interviewed for different questionnaires at different sample rates. In Senegal, Goetz took a subsample of sample households in order to interview household members who cultivated individual fields about seed and chemical use. He determined

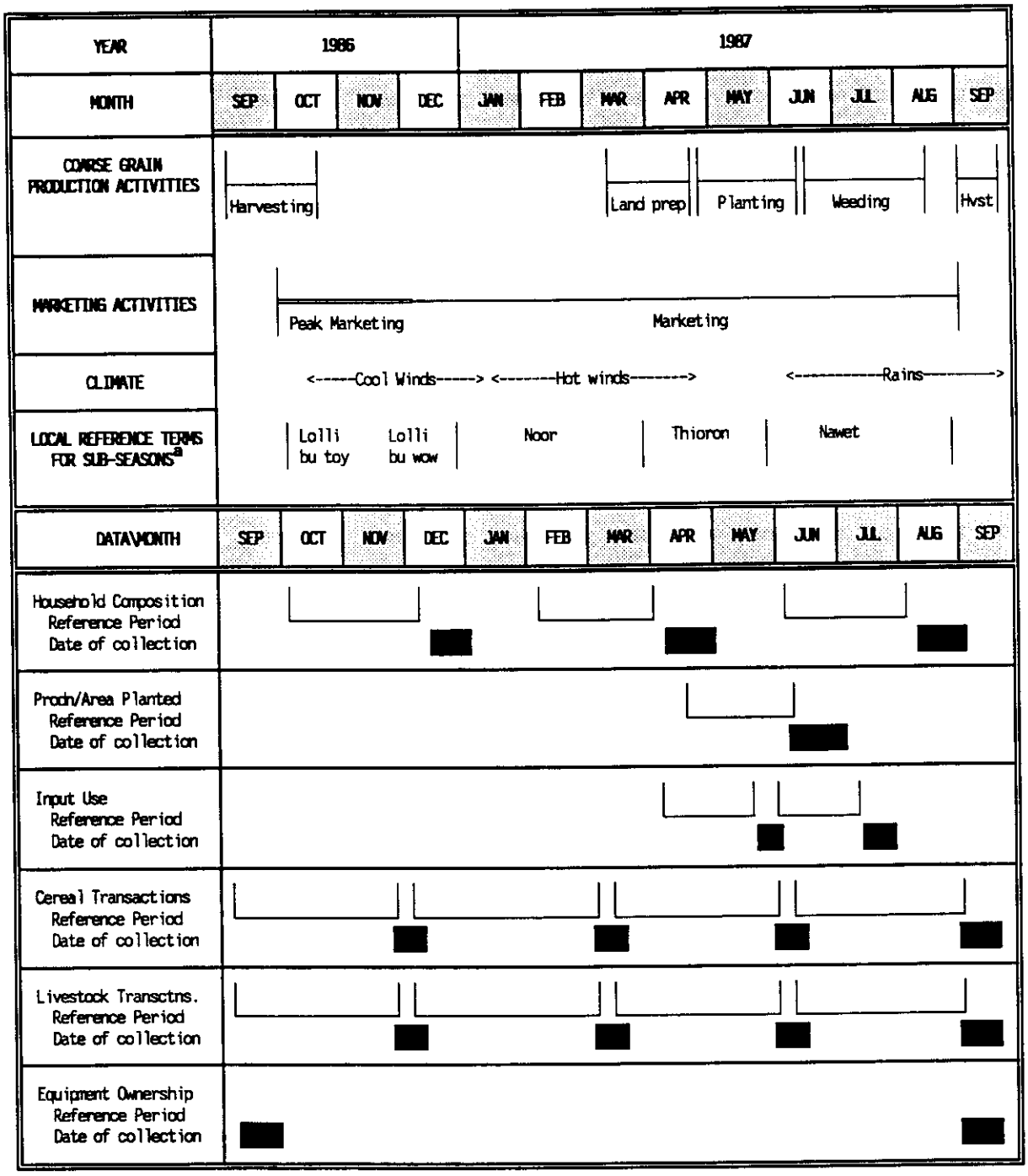
that neither the senior male nor female would be able to accurately respond to input-related questions for specific fields in the concession since each field was managed by one individual. This example is illustrative of the feasibility of interviewing different household members at different sampling rates, depending on the type of information requested.

3.1.3 Agricultural Activities and Points of Reference

A third objective of reconnaissance surveys is to collect information on the dates or periods in which agricultural activities are undertaken and the local points of reference used by respondents to differentiate periods in the year. A point of reference concerns structuring a question and using terminology that help a respondent remember the desired information at certain periods in a year. It establishes the boundaries between which the information reported should refer. This information is useful in scheduling survey activities, determining the period when certain data should be collected, structuring questions, the length of recall, and frequency of data collection.

Figure 3-1 illustrates how researchers can use the task calendar to fill in the top portion of the task calendar with information on production and marketing activities corresponding to the months of the year as well as the local terms which refer to the different periods. The rows for climate and local reference terms are included as an aid in the development of questions. FSA researchers determined that farm household members and traders often find it easier to respond to what they did in a particular season (e.g., dry season with hot winds) denoted by the local term than by the month. Using local terms as a reference point are especially useful when respondent are asked to remember specific activities at a certain time of the year. In another situation, a researcher created a row to indicate the school holiday periods when students were

FIGURE 3-1: TASK CALENDAR - SCHEDULE OF DATA COLLECTION[6]



a. Benoit-Cattin & Faye, 1982.

[6] This task calendar is similar to one used by the FSA research team in Senegal.

available to conduct the interviews. Similar to the RPM, the task calendar is a flexible instrument designed to assist in planning data collection.

Responses differ with the period of the year in which they are asked and with the characteristics of the current agricultural season (i.e, good rains, drought). Questions should be scheduled during the period in which farmers have recently been thinking of the issues and to minimize the time over which they must recall. Asking farmers about their most important problems, for example, is influenced by the time of the season in which the question was asked. Researchers found a task calendar to be very useful in making these survey and questionnaire design decisions. In the bottom half of the calendar in Figure 3-1, researchers can identify the optimal period in which to collect certain kinds of data and thus when to implement certain questionnaires.

The frequency of occurrence of an activity or the degree of change often affect the ability to recall. This change ultimately influences the rate of data collection. Recall refers to the period of time between the interview and when the phenomena occurred. It is over this period that a respondent is asked to remember and report certain information. The reference period alludes to the period specified in the question within which the respondent must furnish information on the item in question. A researcher may be interested in every occurrence of the phenomena in some particular period such as one month, a day, two weeks, or since last harvest. It establishes the boundaries of the period over which the respondent answers the question. A researcher therefore needs to specify the opening and closing dates of the reference period or note the unit of time used by the respondent. FSA researchers often used one end closed (e.g., since last harvest) and used the day of the interview as the closing date for the reference period. In a multiple-visit survey, binding the reference period between two interviews can assist

the respondent in answering the question and thus improve the quality of the information.

If the farm household's equipment inventory changes on a yearly basis, it makes no sense to collect it on a weekly basis. On the other hand, when a farm household eats every day or weeds fields on a weekly basis, possibly incognizant of the amount consumed or time spent in the field, the frequency will have to be much greater. One researcher discovered that farmers could recall over a period of one year cereal sales to government agencies which occurred only once a year, while informal sector sales took place on several occasions throughout the course of a year and needed to be collected on a monthly basis.

Collecting disaggregated data every month over a one-year period can be compared to the response of a question asking the respondent to recall the activity over the entire one-year period. In addition to verification, this approach can test relevant recall periods for different kind of data. In Somalia, Wehelie asked farm households to recall their cereal stocks along with quantities harvested and sold on a quarterly basis throughout the agricultural year based on a short recall period. These questions were preceded by a retrospective question pertaining to stocks over a longer recall period the previous year. He concluded that the responses seemed consistent when examined in combination with the farm size, the quantities sold, and a calculated yield estimate (one can guess the yield for a longer period). This approach of examining the consistency of data for one variable with others is another method of verification.

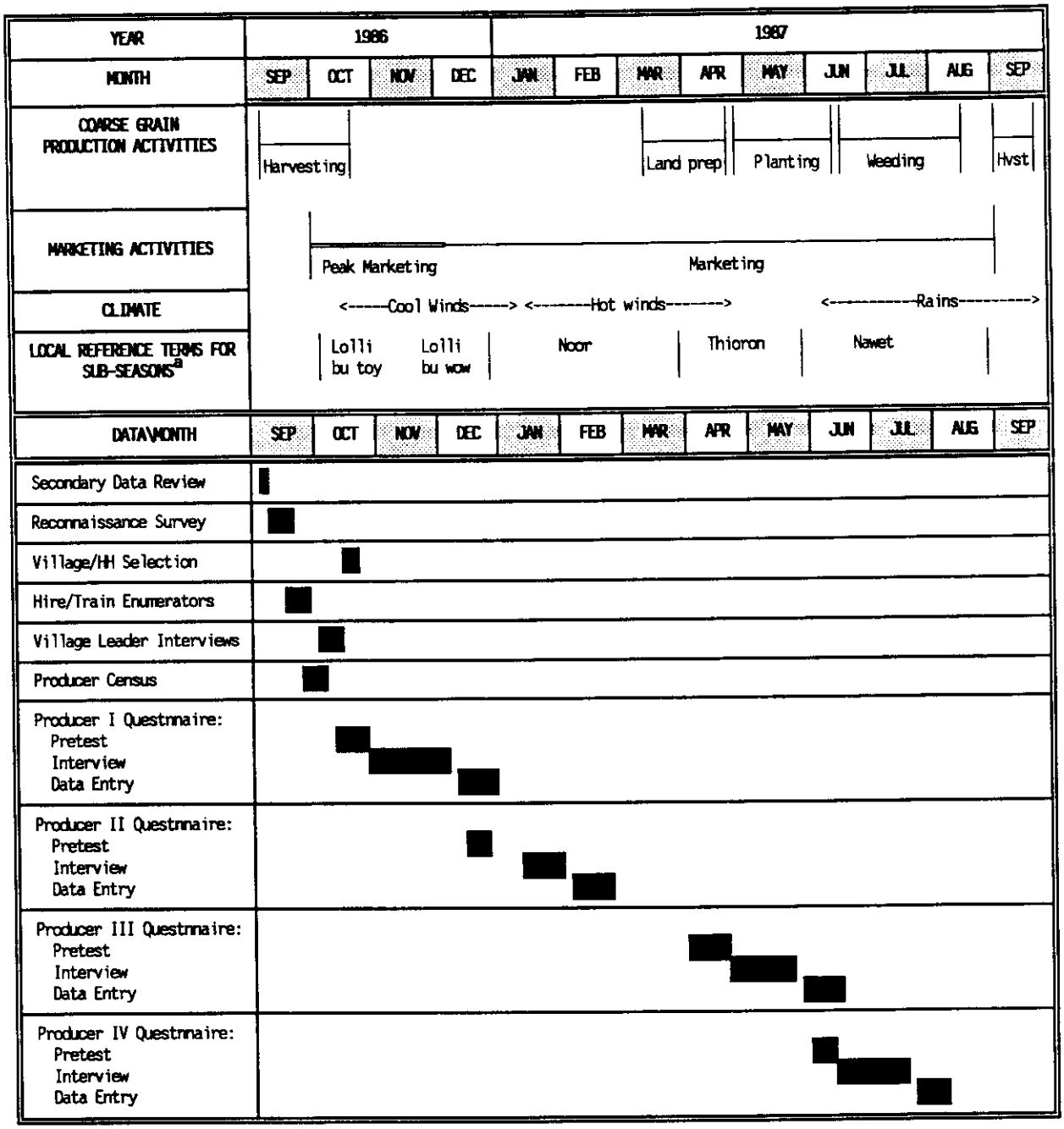
Having some knowledge of the rate of occurrence of a specific event or frequency of a change helps a researcher to determine the desired and feasible frequency of data collection. The frequency with which questions are asked depend on some assessment of

the accuracy of the respondent to provide the information, but also is a function of cost. In theory, a researcher needs to assess the impact of greater precision on the types of conclusions obtained from the data and changing the outcome of the analysis. For example, an increase of the interview frequency by fifty percent may in some case yield no more than a ten percent gain in precision but entail double the expense. The doubling of survey cost may be justified, however, if decisions depend on a high degree of accuracy for this variable. Do respondents' answers to questions of cereals sales, for example, become more precise by collecting sales transaction data on a monthly as opposed to a quarterly basis? The principal is important but in practice, quantifying the marginal benefit of increased precision is a difficult task.

At the same time, a researcher must consider the implications of increased interviews on the data entry and management task and on respondent fatigue. The decision can be very important from a data processing point of view, such as in Rwanda where the team collected and entered data on 20,000 transactions over 14 months from 1000 households, a total of 56,000 visits. Respondents' willingness to continue to give accurate information may lessen when considerable time is required.

Figure 3-2 shows the second variation of the task calendar, with survey activities scheduled in the bottom half, replacing the timing of collection for different types of data. Clearly specifying research team task assignments during the design stage helps the researcher anticipate when bottlenecks in implementation are probable and thus prevent potential conflicting task demands. Scheduling time to work with local analysts, do intermediate analysis, and write working papers may be very difficult given the extensive amount of time needed to manage field and office work. Planning with a task

FIGURE 3-2: TASK CALENDAR - SCHEDULE OF SURVEY ACTIVITIES[7]



a. Benoit-Cattin & Faye, 1982.

[7] This task calendar is similar to one used by the FSA research team in Senegal.

calendar can help a researcher anticipate potential problems in the areas of management and personnel.

The calendar is also useful for scheduling certain activities during the periods when there is a smaller work load. For example, during the planning stage in Rwanda, after having experienced the length of time required to train enumerators for the multiple visit national survey, the research team determined that a similar procedure would be too expensive and time consuming for a single visit survey. Using a task calendar, they examined where supervisors had slack time and scheduled them to conduct the surveys instead of the enumerators, alleviating the need to train enumerators.

The construction of a task calendar is also a useful device to assist in planning the research around key "anticipated" events which may occur during the course of the survey. Taking the time to try to understand what events may be taking place throughout the course of the study, and then to verify whether these are in fact transpiring, may enable the researcher to observe new phenomena or discover changes in the behavior of the respondents. A change in government price policy in Rwanda in the middle of the project, for example, provided Loveridge with the opportunity to examine its effect.

3.2 QUESTION AND VARIABLE STRUCTURE

Rapid reconnaissance surveys enabled researchers to refine research components and subcomponents and collect information on local concepts, reporting units, and agricultural activities that are needed to develop accurate questions. This section discusses the operationalization of questions and variables. Making decisions on the level of data and the type of variable incorporates the substantive knowledge obtained in

the reconnaissance surveys with operationalization of the question and variables. Operationalization of a data set refers to the format of questions and structure of variables and data files that allow the researcher to enter and analyze data effectively and quickly.

3.2.1 Level of Data

The level at which to collect data refers to what and how the researcher wants to measure and analyze some issue and how to structure a question and variable such that the respondent is able to provide the information in the required format and the analysis can be efficiently and promptly completed. Data level ties together the conceptual issues underlying question format - the precise focus, the reference period, the frequency of data collection - with the technical matter of developing data files that facilitate the analysis desired by the researcher with statistical software. This section introduces some of the important concepts related to levels of data and illustrates their relation to the issues discussed earlier.[8] Understanding the meaning of the data management terminology is needed to make substantive decisions related to data collection strategies and questionnaire design in addition to creating data files.

FSA researchers often collected data related to a household, trader, crops, or transactions. Each of these entities can represent a case. "Each case in a data set contains information about a specific physical or logical entity" (Wolf, 1988, p.1). A case can be visualized as a row in a matrix, with each column representing a variable. The particular values for the variables in a row describe a case. Variables are differentiated by their names, while cases are usually distinguished by sequential numbering. A key

[8] This section draws extensively from "Computer Analysis of Survey Data -- File Organization for Multi-level Data" by Chris Wolf.

variable(s) identifies each case. The value(s) of the key variable(s) is(are) unique to each case.

Level of data refers to the structure of the variables and cases in a data file. For example, the variables that describe a household - number of members, ethnic group, type of house - are different from those that describe an individual member of the household - age, sex, education, marital status. The level of data or unit of observation is different for the household and members. Their variable/case structures are different. Analogously, the key variables required to identify a unique case also contrast. To reiterate, the level of data is determined by the number of key variables needed to define the case.

At the household level, the key variable (e.g., HH - the household variable) takes on unique values to identify a case. Since there are several members in each household, information about each member that is arrayed in the case cannot be distinguished from the others by the same key variable used at the household level. A researcher must choose a key variable or combination of them to identify a unique case. A researcher could create a key variable, MEMBER, and assign distinct values for every member of every household in the sample. This approach, however, would not enable the researcher to easily ascertain the household to which each member belonged. Since this is usually of interest to the researcher, it is more effective to use two key variables (e.g., HH and MEMBER) to identify a unique case. Analogously, data on the attributes of the plots of land owned by the household - size, soil type, slope, fertilizer application - would be structured in a file in which the case refers to each plot, identified by two key variables, HH and PLOT.

The common feature in both the member and plot files is their relation to the household, the base unit of observation on which other levels of data are based. In other situations, the base level may refer to some other physical or logical entity. The choice of base unit of observation depends on the analytical interest of the study. Food security research uses often the household as the base level.

Understanding the meaning of case, level, and key variable are important for designing efficiently structured data files. A correctly organized data file contains only one type of variable/case structure. The data in the file refer to the same level or unit of observation. Different files represent different levels of data. That is, data on the characteristics of plots and data on the attributes of household members should not appear in the same file. Creating multiple data files corresponds to the different analytical interests of the researcher for different types of data and the distinct ways of measuring them. From a programming perspective, creating multiple data files, each with a different variable/case structure is more efficient in terms of the programming effort required to do the analysis. The command structure of statistical software packages can be more efficiently used if data files are structured in this manner. Taking the time to understand the software packages that will be used in the analysis will help the researcher to understand more clearly the advantages of this type of file structure.

To organize the data for entry, processing, and analysis correctly and most efficiently, a researcher needs to recognize the different levels of analysis. The analysis to be undertaken dictates the levels at which data should be collected for different variables, requiring that the researcher consider up-front the type of analysis that he/she wishes to perform to satisfy the study objectives. Even if the exact plans are not certain, a researcher needs to preserve his/her options for doing future analysis, assuming that

analysis will be conducted on many levels. Seriously thinking about the levels of analysis may also minimize the number of programming key strokes in the data processing stage. Having the files correctly structured facilitates the task of quality control, as data can be quickly entered and checked both manually and by the computer. It enables the researcher to do some initial analysis while still collecting data and creates an opportunity to return to the field to pursue unforeseen results.

Researchers often do not consider the data management issues until data are collected. FSA researchers have learned the difficult lesson that waiting until the data are collected before thinking about how it will be entered into the computer and analyzed often makes it difficult to do the intended analysis without substantial structural modifications in the data files.

Determining at what level to collect data is closely related to how people think about and recall information, as well as cost and time factors and degree of disaggregation. FSA has found it more effective to "collect specific information about actual behavior" instead of "asking respondents to generalize, or sum over various actions" (Crawford et al., 1988, p.4). Actual behavior is not only more "accurate and detailed" but can be recalled over a longer time period, "which may lead to less need for frequent multiple visit surveys" (Crawford et al., 1988, p.4).

Deciding the appropriate data level is partially a substantive matter related to the degree of detail required to do the analysis. Does it suffice to collect data on the total amount of cereal sold by the household - at the household level - or does the researcher need to collect information on each cereal sale: price, quantity sold, unit of measure, to whom sold. Determining the data level presupposes answers to questions on the type of

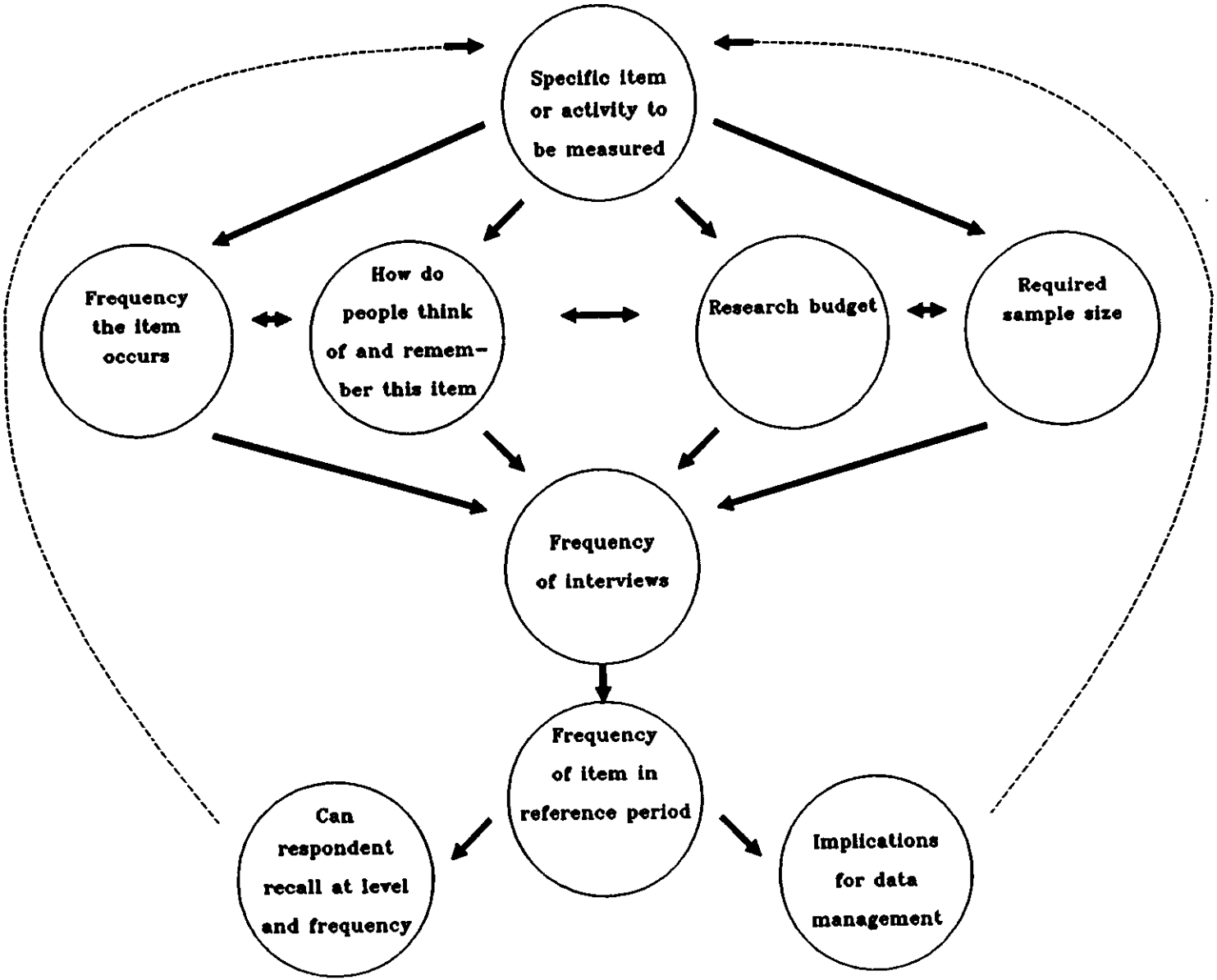
analysis necessary for the research questions. Inversely, it is difficult to think of data required for analysis without considering the issue of level.

Differences in the structure of data levels can be quite subtle. A researcher could design a part of a trader survey to collect data on the details of specific crop purchases. The key variables - trader, month, crop - specify the level. A slightly different focus might concern the characteristics of each purchasing trip - distance, means of transport, crops purchased, total quantity purchased, total cost, total value - rather than aspects of a specific transaction. In this case, trader, month, and trip are the key variables because the analytical focus is directed to the transportation issue, specifically to each trip.

Although the analytical interest may be clear, one needs to ask what the relationship of the variable/case structure is to the way in which traders think about their transactions and thus their ability to provide the information. Can the respondent provide information at the desired level of specificity for the particular reference period? The fewer financial resources available, the less frequent the interviewing. This implies a longer reference period over which respondents must recall specific activities. As illustrated in Figure 3-3, decisions must be made simultaneously, as each of these issues affecting the choice of data level has implications for the others. The following example further demonstrates some of the interrelationships between these issues of question and variable design.

A researcher may decide that he/she needs to collect data on fertilizer use and labor output for individual fields of millet during the planting and weeding periods. In the specific farming system where the research is being conducted, household members farm one communal field together but are granted smaller fields by the senior male and

FIGURE 3-3: ISSUES AFFECTING CHOICE OF DATA LEVEL



female to cultivate individually. In the reconnaissance surveys, the researcher discovers that neither the senior male nor senior female knows with any degree of certainty about the fertilizer applied or the labor hours worked to plant and to weed millet. This implies that the researcher will have to interview each household member who has a field. Is it financially and logistically possible to collect data at this level? Could a smaller sample size be used to collect this data?

Collecting data on labor hours worked by the individual is of the type that Lipton and Moore refer to as unregistered and continuous. The activity takes place over an extended period of time and each specific occasion is not as easily remembered as it would be if interviews were more frequent. This situation has implications for the frequency of data collection. Is it feasible to ask how many hours were worked in the last two weeks or last month? This is a difficult task for the respondents because they must consider multiple occasions when the work was performed in order to arrive at the answer. How accurate is the information? What reference period should be used over which the respondent can recall information? This is synonymous with asking how frequently interviews must be scheduled. The planting season may last a month and weeding season two months (additional information collected from the reconnaissance).

Are there time and resources available to collect this information at this rate if it means interviewing several household members every week? What are the implications of collecting this level of data on data management capacity? Increasing levels at which data are collected imply corresponding increases in the quantity of data collected. There is a big difference between data from 200 households and data from 1000 individuals in terms of processing and the ability to quickly turn around research results.

In this example, several levels are being considered, the implications of which are clearly obvious. First, collecting information on individual fields implies another level of data collection. The data collected will relate to individual fields within the household and multiple interviews with respondents implies still another level, as the same data will be collected on a weekly basis.

3.2.2 Categorical and Continuous Variables

In addition to the definition of data level, the operational definition of a variable must include a choice between structuring the variable as categorical or continuous. A categorical variable uses numerical values - the magnitude having no meaning - to represent discrete, mutually exclusive categories whereas a continuous variable represents an infinite continuum of numeric values (Alreck and Settle, 1985). The decision depends on the analytical interest of the researcher. Some researchers felt that when there is minimal empirical information on a topic, creating a categorical variable is an appropriate first step. Some FSA researchers felt that the choice of data format is also influenced by the scope of the research itself. Categorical variables can serve as stepping stones to collecting continuous, disaggregated variables. Collecting accurate continuous data will usually entail a more frequent interviewing schedule and can always be converted into a categorical variable.

If categorical variables are not carefully defined, respondents and readers may interpret them differently, leading to non-comparable data. For example, one farmer's view of what constitutes a "big field" may differ from the view of her neighbor's. Thus asking farmers to rank their field size as "big" "medium" or "small" may give results that are difficult to interpret. Furthermore, even if all the respondents agree on the

definition of the categories, if their definition differs from that of the researcher or reader of the report, the respondent's answer may be misinterpreted.

At this point it is important to reiterate the importance of focusing the design on the research objectives, collecting the minimal amount of data needed to analyze the important food security questions while remembering the drawbacks of collecting too much data. It was in situations similar to the one above where a RPM and task calendar proved to be very useful.

3.3 DATA NEEDS AND SOURCES

One of the biggest advantages of using a RPM to organize thinking about research questions and data needs is that it forces the researcher to focus on the priority research issues, to ask why certain questions need to be included, and to delimit the boundaries of data collection. There is a tendency on the part of researchers to collect as much data as possible with the given time and resources. This often leaves the research unfocused and has negative consequences for other aspects of the study. FSA researchers have tried to collect the minimal data needed and to structure the process to provide answers to specified research questions. Collecting data on a large variety of related and potentially interesting, but not directly required issues can hinder researchers in their efforts to provide timely, policy-relevant information to decision-makers, and to train local researchers. This approach contrasts with the more traditional way of designing questionnaires in which the dynamics of the process determine what is collected.

FSA researchers discovered that the time allotted to fulfilling large data collection demands conflicts with other important research and policy dialogue goals such as controlling data quality, providing local analysts with the opportunity to learn how the

food systems actually work, analyzing the data, and ensuring timely diffusion of research results (Weber et al., 1988). Trying to collect only what is needed to answer identified research questions and closely related issues allows the researcher more time for the following tasks: to verify responses and ensure that the information is correct and complete; to assess the quality of incoming data: to make initial interpretations of the data and subsequently modify new questionnaires or conduct more in-depth probes; investigating unforeseen information arising from survey (Holtzman, 1987). Chambers argues that researchers need to determine the level of "optimal ignorance" where the marginal cost of collecting additional information exceeds its marginal value. There are too many costs to collecting data merely on the appeal of its addition to academic knowledge (Chambers, 1983).

3.3.1 Depth versus Breadth of Data Requirements

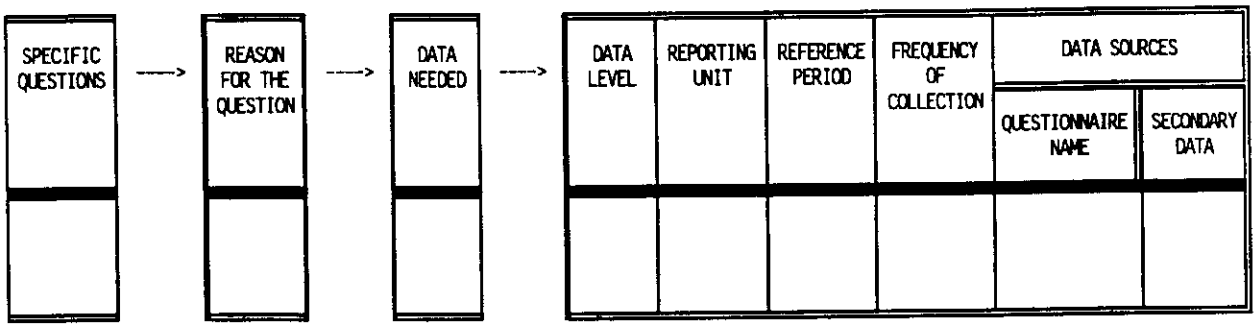
Defining information requirements inevitably entails making difficult decisions regarding the kind of data to be collected, at what level and frequency. The depth of detail pursued in a study is a function of the terms of reference, policymakers' information needs, and the amount of prior information available on the specific topic. In a policy environment lacking systematically-collected data, researchers have found it very useful to sequence their data collection, initially seeking to demarcate and understand the major components of an issue and gradually exploring specific elements in more detail. A researcher who invests a significant proportion of research resources from the outset to collect data on a narrowly-defined topic may risk discovering at a later date that this particular issue is neither important nor understandable outside of the larger context and interrelationships with other aspects of a problem. Conversely, gathering information on a large variety of issues may leave the research unfocused and

result in knowing a little about a lot of things but not knowing very much about anything. FSA researchers judged that going through a process similar to the one outlined here can help assure that the necessary data are collected and analyzed while the aforementioned problems are minimized.

Researchers must realize in determining the kind of data to collect that there are often many different studies occurring or recently completed, implying that one does not need to collect certain data types. Collecting detailed farm-budget data, for example, was not a high priority in FSA studies. Implementing intensive cost-route surveys would have cut back on the capacity of the FSA project to deal with important policy and institutional issues which were believed to be more important.

Figure 3-4 illustrates the parts of the planning matrix to be completed once the primary research questions, their components and subcomponents have been finalized after the reconnaissance. For every specific question that the researcher wishes to include in a survey, he/she should attempt to indicate the reasons for asking the question and the specific data to be collected.

FIGURE 3-4: RESEARCH PLANNING MATRIX - DATA SPECIFICATION



To reiterate, each of the issues discussed in the design of questions and variables can be incorporated into a research planning matrix. The purpose of the matrix is to assist the researcher in organizing the design and its implementation. Following the delineation in the RPM of specific questions, reasons for the questions, and data required, FSA researchers developed additional categories useful to their particular planning needs. Some researchers specified the data type - categorical/continuous - and frequency of collection, whereas others indicated the number of questions required for one kind of data and on which questionnaire the question would appear. All researchers designated the source of the data or manner in which it would be collected - secondary, reconnaissance, the number of the questionnaire.

It may also be useful to identify the level of data to be collected, the reporting unit, and reference period as included in Figure 3-4. Given the emphasis of this paper in collecting information on question/variable structure, it may be helpful to include these issues studied in the reconnaissance surveys.

3.3.2 Review and Criticism of Planning Tools

Researchers found that a research planning matrix helps keep a study focused on the important questions set out in the terms of reference. It also compels a researcher to think of the key variables useful for stratification of the population and minimizes the possibility of omitting key data from the study. FSA researchers and faculty felt that the planning tools contributed to some degree of standardization of concepts, definitions, and methods that are needed for similar types of research amenable to cross-country comparisons, greater external validity, and a more theoretical understanding of critical experimental variables.

Some researchers found that the it was very difficult to accurately specify in the RPM the specific variables to be collected, and question whether it can be restrictive, limiting them to preconceived ideas. Second, although recognizing its value in forcing a researcher to think through the coherence of their data collection critically and in planning implementation of tasks, some FSA researchers felt that there is a tradeoff in the amount of time invested in working on the RPM with work on other important tasks in the early stages of a project.

Due to administrative problems and unfamiliarity with realistically planning the time to implement certain components of the survey, many researchers found it difficult to maintain the schedule established in the task calendar. Researchers learned that it is difficult to schedule activities because of inexperience in knowing how long it will take to perform a particular task in the field. One researcher therefore decided to develop a monthly task calendar. Nonetheless, having an initial task calendar allows a researcher to plan how to shift activities and/or cut them if he/she falls behind schedule. Researchers must remember that it is a flexible document that can be modified over time rather than a once and for all planning device.

No matter how much a researcher prepares, planning cannot solve all possible contingencies. The researcher must be flexible, whether in terms of the data to be collected or in the execution of certain tasks. In almost every study, planning was too optimistic about the length of time required to SPSS/PC+ data entry and analysis programs, enter and clean data, and subsequently, turn around the research results in the form of working papers. In Rwanda, initial plans to conduct a training seminar for all enumerators in the national survey were abandoned after a cost analysis determined that it would be cheaper for the trainers to visit each sector.

Flexibility in the design is particularly important in order to obtain insights into the dynamic behavior of food systems since it enables a researcher to check continuously and reshape initial hypotheses as data became available and allows him/her to reformulate more precise data needs. Preserving one's option to be flexible to pursue unforeseen events is closely linked to how a researcher budgets his/her time.

Throughout every phase of FSA studies, researchers encountered multiple demands on their time and hence tradeoffs between activities. The allocation of a researcher's time to the numerous activities constituting a survey is affected by the number of researcher associates, supervisors, and other administrative personnel involved in the study and the tasks assigned to them. Although project personnel can undertake many tasks if properly trained, it does not mean that a researcher will be totally absolved of them. A task calendar is a useful device for planning survey implementation and subsequently envisioning and arranging all of the related tasks that must be accomplished.

A considerable amount of time in the early stages of a research study are often occupied in administrative activities - equipment, personnel, obtaining research clearance. Some researchers commented that an administrative assistant would have minimized some of the more mundane tasks throughout the project. Moreover, researchers must often meet with local government and village leaders, explain the study to them, solicit their cooperation, and get the village chief to call a village meeting to explain the study and introduce the enumerators. In brief, one cannot simply arrive in a village and launch some survey instrument.

3.3.3 Questioning, Observation, or Measurement

As alluded to earlier, following the specification of questions and data, researchers must determine the source(s) from which data will be collected. Although the majority of data in FSA projects was collected with questions serving as the instrument, the choice of method is based on the type and form of information required. It is also influenced by time, resource, personnel, and logistical considerations. Data can be collected by observation, measurement, or questioning. Many researchers recognize that different methods are appropriate for different situations (Patton, 1986). Every method presents advantages and disadvantages and errors. This section discusses the utility of questionnaires to collect data in food security research.

Many researchers justify using measurement rather than questions by arguing that farmers either do not know the information they want or cannot report the desired degree of detail. This preference for measurement may be due in some cases to a desire to avoid the difficult task of developing questions relevant to the farm household's mode of thinking. Some FSA researchers argue that farm households know how much land they have or the quantity of cereal harvested, but often in different units of measurement. One of the major concerns of relying on questions is, however, the accuracy of responses, and the degree to which they can be trusted. This issue is particularly evident in the early stages of fieldwork, when respondents may be suspicious of the purposes of the questions and uses of the results.

Cross-checking responses by asking questions in different ways about similar topics can be a useful way to assure their accuracy and consequently minimize the researcher's anxiety. One advantage of a multiple visit survey is that over time, farm households tend to become more comfortable, and the information they provide thus

becomes more accurate. Moreover, the respondent's memory may become better attuned to the type of information in which the researcher is interested. Dioné believes that farmers learn to memorize and to report accurately what they are frequently asked to provide. For the case of yield estimates, their knowledge is for the entire field and not just for one plot or one-tenth of a five acre field. In addition, the greater the respondents' trust in the intentions of the researcher, the more confidence researchers can reciprocally have that the responses represent the actual situation (Dioné, 1988).

A second advantage of using questions is that they can be asked and processed in a relatively quick period of time. Since many methods, such as physical measurements, are time-consuming tasks, they are not practical and feasible when the researcher does not know when he/she will need the information. There may be specific information requirements for a policy decision at a given time and for a given region. When the season has passed, a researcher cannot go out and measure five to seven plots of coarse grain field plots for 48 households in four villages in a period of four weeks. These constraints limit the usefulness of strict measurement in a situation where timeliness is important. The only way that this information can be collected is by using farmer estimates.

This approach also contributes to the objective of providing timely, reliable data in a sustainable manner. Once the farmers have worked with the enumerators and developed trust in their work, if additional information is required, it is relatively easy to acquire it. Making lengthy and costly measurements is neither responsive to these demands nor feasible for certain types of data, such as production estimates, after the harvest has occurred (Dioné, 1988).

Attempting to start afresh and collect only primary data can often, however, prove to be a hasty and costly decision when the data already exist. Prior to investing the time needed to design questionnaires, it is wise to examine the possibility of using secondary data.

3.3.4 Secondary Data Sets

All FSA researchers sought to use available secondary data to fulfill information needs when it was feasible. Once researchers defined general and specific research questions for each component and specified the corresponding data requirements in the research planning matrix, they continued a review of the quality and applicability of secondary data sets which they had begun in the preliminary conceptual stage. Based on their experiences in Zimbabwe, Bernsten and Rohrbach wrote that it "may be possible to meet some of the micro data requirements for completing project research objectives by drawing on existing data sets that have been collected for a variety of purposes in recent years," rendering unnecessary demands for collecting new primary data (Bernsten and Rohrbach, 1985, p.1).

The feasibility of using secondary data is largely determined by their quality and by the extent to which they are documented. The validity and reliability of data are a function of several factors related to the design and implementation of the study in which data were collected as well as the degree to which data sets were manipulated for political purposes. A researcher must examine carefully the aspects of the study which influence data quality, including sampling procedures, training and supervision of enumerators, and data processing procedures (Bernsten and Rohrbach, 1985). Consulting some of the analysts who participated in the study helps to clarify design and implementation procedures. Researchers should pay careful attention to question

wording, since responses are very sensitive to underlying meanings. It is often difficult to assess the suitability of secondary data to food security research needs when variables are ill-defined.

One benefit of taking the time to examine secondary data sets is the opportunity to study how prior researchers posed certain questions and what were the range of responses. Additionally, researchers cannot underestimate the difficulties of receiving permission to examine the data. Data banks are often guarded very carefully, requiring that the proper channels and contacts be used to gain access.

Some FSA researchers discussed in working papers and sub-sector reviews the results of their analysis of secondary data, demonstrating to potential users the possible inconsistencies and anomalies in widely consulted secondary data. By rigorously examining available data and cross checking different sources, researchers can generate demand for improved data collection and analysis and provide useful feedback to agencies that generate the data. In Rwanda, the FSA team decided to test the reliability of a retail price data time series by collecting retail prices for a short period of time and comparing the data to that collected by the ministry. After assessing the results, the research team decided that they could rely on the ministry's series for these data and thus save the resources that would have been used to accomplish the task.

In many countries, researchers confirmed the belief that a large portion of aggregate data may reflect government targets more than actual estimates. Cross-checking several sets revealed estimates varying by as much as 100 percent. Improvement of government estimates is very important since it often serves as the basis for data sets of international donors, which once in print, are frequently hard to verify and become 'gospel.' Moreover, researchers must be aware that governments, often

under pressure to comply with donor policies and reforms, may have reason to manipulate data banks.

In the same vein, researchers must be sensitive to interagency politics and careful in the approach they take in criticizing previous efforts. Instead of belittling the poor quality of data sets, it is more effective to work with local agencies to improve variable definitions, data collection and analysis procedures and thus the quality, reliability and usefulness of data. Extensively working with secondary data sets is often very difficult when there is limited time and resources to complete the FSA research. In this case, a well-documented study and data set including "a statement of the concepts underlying the data, how these concepts are operationalized, as well as some notion of the statistical sampling methods used" can serve as an example of how to establish a reliable and usable data set (Riemenschneider and Bonnen, 1979, p.154).

3.4 QUESTIONNAIRE DEVELOPMENT

When the primary data collection method is based on eliciting responses from food system participants, the choice of question type and the manner in which questions are formulated become very important. If the researcher has thought through the issues of level, reference period and variable structure during reconnaissance and question design, the task of developing the questionnaire is generally straightforward. Questions were directed toward collecting data on specific activities and not what usually happens. All FSA researchers designed and implemented an integrated series of multiple-visit questionnaires sequenced throughout the agricultural year. In this way, questions corresponding to a particular activity or period could be placed on the questionnaires and asked at the time that would minimize respondent recall. As stated earlier, a task calendar helps researchers to schedule the different kinds of data to be collected with

certain questionnaires at various times of the agricultural year. This section does not describe how to develop a questionnaire. Instead, it focuses on certain key issues that influenced FSA questionnaire development and affected implementation.[9] In particular, this section examines the questionnaire format as it relates to the ease of implementation and simplification of data entry.

Researchers generally used a tabular format to present questions related to multi-level data (e.g., household-member, household-crop, etc.). The more typical questionnaire design with questions in series was used for variables at the level of the base unit of observation - the farm household or trader. As Figure 3-5 illustrates, a table simplifies the presentation and implementation of questions with a multi-level data structure and allows numerous cases for a series of related questions to be clearly and concisely arranged. Precoded responses are written directly below the question.

The other alternative structure for questions at lower data levels - (e.g., household-member or household-transaction) would be to arrange in a series verbatim questions in which the wording is fully elaborated. All of the responses for a specific question would be grouped together and thus separated from the other variables related to a specific phenomena. For example, all of the quantities of cereals sold would be grouped together under the same question while the prices of every sale would be under a different question. The data related to a particular sale would not be readily apparent as it is when displayed in a table. When a question such as why the respondent sold grain to a specific marketing agent elicits several reasons (responses), the researcher

[9] The measurement and recording instrument used in structured surveys is technically referred to as an interview schedule; a questionnaire is a self-administered survey. For the purposes of this paper, this convention is disregarded and questionnaire refers to the instruments employed by FSA researchers.

FIGURE 3-5: CEREAL SALES QUESTIONNAIRE - TABLE FORMAT

Report all sales since last visit.

ZONE: _____ Z _____
CMDT = 1 OHV = 2

SUB-ZONE: _____ SZ _____
South = 1 North = 2

VILLAGE: _____ VIL _____

Zangasso = 1	Sounkolo = 2	Ntosso = 3	Bleindo = 4
Dougoulo = 5	Kemeny = 6	Petesso = 7	Kampoloss = 8
Ouelesse = 9	Sougoula = 10	Tenemamb = 11	Sanancoro = 12
Sirakorola = 13	Ngabacoro = 11	Chola = 15	Katiola = 16

HOUSEHOLD: _____ HH _____

PRODUCT 1=Millet 2=Sorghum 3=Maize	QUANTITY (Kg)	PRICE (CFA/KG)	CLIENT 1=OPAM 2=Trader 3=Producer	PLACE OF SALE 1=Village 2=Market	ORIGIN OF PRODUCT 1=Storage 2=New harvest	REASON FOR SALE TO THIS AGENT 1=Higher price 2=Only available		
PROD	S1	S2	S3	S4	S5	S6	S7	S8

would need to create additional variables (S6 and S7) for the second and third reasons and add columns to the table under the question. The order in which questions are asked should parallel the way respondents remember information. For each cereal sale, for example, the enumerator can ask about the quantity sold, price received, and so forth before asking about the next transaction - moving to a new row and case.

In some countries, researchers used one form to record cereal transactions for all respondents in a village in contrast to one page like Figure 3-5 for every farm household. This method not only saved paper but facilitated data entry as all cases were combined on a few questionnaire sheets.

Over time, researchers and faculty have developed a preference for presenting questions with only one response per variable per level in a sequential series, with the variable names and response space appearing along the right margin (Figure 3-6). Some researchers instructed enumerators to circle or check precoded responses below the question or write in another answer, leaving the right margin space blank. The supervisor or researcher who sight edits or postcodes the questionnaire would then check the response and write in the answer in the space along the right margin, thus introducing an initial check. Placing the variables and response space along the right margin for household level data facilitates recording and entering data. Since respondents are not forced to choose one of the precoded answers, researchers must leave sufficient space for enumerators to write other answers and comments. In other cases, enumerators would write directly in the precoded response in the space along the right margin.

In both questionnaire formats, researchers need to specify carefully screening questions and skips. Appearing in a different typeface, researchers need to develop meticulously instructions outlining the procedures that enumerators should follow in asking questions. It is often useful to create a supplemental instruction sheet that enumerators can take to the field. Question 4 in Figure 3-6 illustrates the use of a skip rule and in combination with question 5, an alternative question/variable sequence. If not clearly specified, enumerators may ask questions that should have been skipped and

FIGURE 3-6: QUESTIONNAIRE - SERIES FORMAT

Village: _____ VIL
Concession: _____ CONC
Exploitation: _____ EXP

1a,b. Do you have problems preparing meals with maize which prevent you from consuming more of it? If no, circle 0. If yes, what problems? (circle up to 2 responses)	0 = No problems 1 = Shelling and pounding 2 = Shelling 3 = Pounding 4 = Preparation takes too long 5 = Uses too much charcoal 9 = Other: _____	p31a ____ p31b ____
2a. Do you have difficulties storing maize? If no, circle 0. If yes, what problems? (circle up to 2 responses)	0 = No problems 1 = Insect problems 2 = Rodent problems 3 = Humidity problems 4 = Storage place problems 5 = Small storage space 9 = Other: _____	p32a ____ p32b ____
3. Do you use a machine to pound maize?	0 = No 1 = Yes	p33 ____
4. Do you have problems with the preparation of unhulled rice which prevent you from consuming more of it?	0 = No (--> 6) 1 = Yes	p34 ____
5. If yes, what problems? (circle up to 2 responses)	1 = hulling takes too long 2 = cooking requires too much charcoal 3 = 1 + 2 9 = Other: _____	p35a ____ p35b ____

obtain contradictory answers. This situation places additional pressure on the data entry program to detect errors and inconsistencies in the responses.

Identification codes of key variables placed at the top of every page in a questionnaire prevent loss if they become detached and facilitate data entry. Withdifferent data files throughout the questionnaire, placing the codes at the top alleviates the need to turn to the first page to determine the identification codes. When tables are used, similar identification codes for every case (e.g., village, household) appear once at the top of the page and not repetitiously as the first two variables of every row. Instead, the row begins with the differentiating key variable for the case structure (e.g., crop, member). Using roman numerals to delineate different sections of a questionnaire assists the researcher and enumerators in denoting the different data files.

Household or trader-level questions were generally scattered throughout a questionnaire corresponding to the subject matter to which they related. For example, most researchers asked some opinion and diagnostic questions in addition to more specific ones at lower levels. And it seemed conceptually clearer to group questions related to the same subject as opposed to grouping all the household-level files together on a few pages. There is a tradeoff in terms of the added difficulty of entering data because the data entry operator must page through the entire questionnaire in order to enter data at the household level.

Since prior questions can bias the responses to later questions, it is important that the researcher pay attention to the question order. A researcher should try to keep related questions together on the questionnaire not only for these reasons but also from a data processing point of view. As will be explained presently, the order in which

questions are placed on questionnaires is also affected by the specific data file capabilities of the data entry packages used.

In principal, the choice of variable name depends on the researcher. Some FSA researchers preferred mnemonics - names that help jog the memory (e.g., QMZHAR for the quantity of maize harvested) whereas others chose to use sequential alphanumeric schemes related to questionnaire and section number. Although the decision depends ultimately on researcher preference and what is easiest, using an alphanumeric sequence for other than key variables may be a more systematic method to document research materials. Each question can be matched with a questionnaire, variable, and data file. Nine questions and variables related to cereal purchases in the third monthly questionnaire could be assigned names ranging from P31 to P39; the P represents purchases - the abbreviated name for the data level and file; 3 for the month; and numbers one through nine to represent the question number. Although these issues may seem rather trivial, developing systematic procedures for implementation tasks can assist the researcher.

This situation justifies the recommendation to name variables on the basis of their case structure or level. Household level variables would be designated, for example, with the letter H and use a sequential numbering scheme as opposed to mnemonics. Similarly, variables with different multi-level case structures would be named with an alphanumeric referring to the subject area of the file (e.g., S for sale, P for purchase) followed by a number and if desired, additional identifying characteristics (e.g., S1PRICE). It is useful, however, to use the same mnemonics to name key variables (e.g., CROP, MONTH) throughout every file in the survey as they will be used as the basis for file transformation during analysis.

3.4.1 Type of Question and Interview

FSA researchers asked primarily structured, open-ended questions without suggesting any of the precoded responses determined in the reconnaissance and pretest. Although precoded responses were used, the list did not preclude enumerators from writing in other responses. In fact, this was encouraged. The literature on writing questions is vast, with specific information on the essential elements of effective questions. Whether open or closed, the attributes of good questions include brevity, clarity, focus and simplicity. Conversely, it is best to avoid questions that suggest responses, actually contain two questions, and that employ ambiguous words open to different interpretations. Questions must be carefully prepared as respondents may not be familiar with the rigid logic or wording. Closed questions can also hide ignorance or misunderstanding if not written in a style and comprehension relevant to the respondent reducing enumerator-respondent rapport.

FSA researchers who asked opinion and hypothetical questions learned that they must be carefully developed and analyzed. They judged that it is very difficult to avoid suggesting some idea to a person, making it difficult to obtain unbiased standardized answers. Moreover, there are problems of interview length, variability in interviewer skills and how well the respondent articulates, often resulting in a lack of control and difficulty in coding. Teaching enumerators how effectively and uniformly to probe responses to opinion and hypothetical questions demands extensive training. The opportunity cost of additional training may be very high if enumerators continue to summarize responses and do not record the subtle elements of their response. Informal interviews may be a more effective way to discuss many of these issues and determine subtle perceptions of the particular issue. Researchers and supervisors more familiar with

the research may be in a better position to conduct informal interviews and personally benefit from the interaction with the respondent.

FSA researchers used extensively a multiple response format for questions directed at quantifying the most prevalent constraints or reasons for certain actions. Determining a mutually exclusive and exhaustive list of categories is a difficult procedure due to the subtleties of issues being discussed. Although multiple response analysis will provide a list of the most pertinent attitudes or beliefs about a specific issue, it will not give any indication of the magnitude or degree of the strength of the issue as may be achieved in informal interviews.

Asking open-ended questions in an informal setting can provide information that is useful to verify formal survey findings and to learn more about the food system than can be obtained from structured survey research. Unstructured questions allow the respondent to speak in their own words and are effective in accentuating the intensity or qualifications of the response. Reliance solely on open-ended questions is problematic, as it is often difficult to aggregate responses from these questions over many respondents. Using a combination of research methods - methodological triangulation - can improve the validity of the research findings and produce different perspectives of a social phenomena.

3.4.2 Coding

Most survey researchers have advocated the use of precoded responses - containing a number or letter for each alternative answer - in structured questionnaires on the grounds that postcoding entails more time after data collection and delays the analysis. As a group, FSA researchers believe that using structured surveys does not

automatically imply precoding. The decision whether to precode or postcode has been determined by several factors in FSA studies.

From many perspectives, the crux of the matter hinges on the type of questions and the manner in which they are asked. If researchers use questions in which respondents must select a response from a predetermined list of answers, precoding may restrict the range of responses and force her/him to pick a response. Unless carefully developed and unless the enumerators are conscientiously trained, using precoded responses may result in the loss of subtleties in the answers. The effectiveness of this approach depends on the researcher's knowledge of the respondents' environment and potential responses to survey questions and thus his/her ability to develop exhaustive and mutually exclusive codified responses with greater variation between-categories than within. Precoding is therefore preferable from the viewpoint that it forces the researcher to think carefully of the questions to be asked, the potential responses, and how they will analyze these answers. Maximizing the benefits of precoding demands that the most prevalent responses be ascertained during the reconnaissance surveys and especially during pretest of the questionnaires.

Some FSA researchers asked open questions, allowing enumerators either to choose one of the precoded responses or to write in the respondent's answer. Training enumerators is just as essential for this approach, as they can easily choose a precoded response for an answer that is similar but not exactly the same.

For large data-intensive studies such as the 1000 farm household, bi-weekly sample in Rwanda, precoding can save a great deal of time. The weekly farm household questionnaire for transaction data was designed without codes because enumerators were expected to memorize them, thus decreasing the bulk of the instrument. In a single-visit

survey, precoding may not be as crucial. It could still have a major payoff because it not only facilitates data entry and analysis but requires the respondent to design carefully the question and think about possible responses and related analysis.

An additional practical issue affecting the decision to precode or postcode concerns the staff available to do postcoding and the responsibilities accorded them. If the researcher plans to postcode, then it is imperative that adequate time be scheduled to undertake the task. Some FSA researchers discovered that postcoding was not as time consuming as expected. In fact, the information gained from postcoding provided researchers with a better basis for interpreting responses and writing working papers. Some felt that the person conducting the analysis should do postcoding in order to be sure answers were appropriately categorized and categories were properly interpreted.

Rohrbach started the work thinking that the more he precoded the questionnaire, the better. He concluded the work believing that precoding should be minimized. Respondent answers can be inappropriately categorized or miscoded, resulting in the loss of valuable information and biased answers. Furthermore, with precoded questions, he feels that it is necessary to have a thorough knowledge of the system being investigated and be very certain as to what type of analysis will be required.

In writing down exactly what the respondent answered, responses can still be biased through the thought and writing process of the enumerator, albeit to a lesser degree. In either case - choosing a category or writing the answer - responses are filtered through the enumerator. The least amount of influence would be for the enumerator to write verbatim in the local language exactly what the respondent said, thus avoiding any translation. Researchers must pay careful attention to the process of interpreting and translating responses and training given to the enumerators.

3.4.3 Pretesting

Only through the actual implementation of a questionnaire in a pretest can a researcher assess how the instrument works and how respondents interpret and actually answer questions. Pretesting questionnaires was generally conducted by associate researchers and supervisors in non-sample villages in the different survey areas, usually preceding enumerator training. Some researchers discovered that it was easier to train enumerators after they had pretested the instrument, for they had already encountered most of the problems and potential responses.

In other cases, researchers benefitted from the participation of research team members in the design of questionnaires drawing on their experience and knowledge of the area. Using the variables and indicators outlined in a RPM, each research team member worked on the specified questionnaire, after which they synthesized each version to formulate the first draft. Begun four weeks in advance of their implementation, it left sufficient room for pretesting and revisions. In Somalia, extension agents gave the principal researcher feedback on the instrument and helped change wording, explaining where questions were awkward and where there would be potential problems. After revising the questionnaire based on these suggestions, they reformulated the questionnaires and sent them back to the field. Finally, submitting drafts of questionnaires to donors and policymakers for review or approval or to build credibility for the work is often a lengthy process, and needs to be managed carefully to avoid delay to the implementation of the research. In most cases, such formal reviews were not required.

Experience over the various countries shows that it is absolutely essential for the principal researcher to be directly involved in the pretesting process. This allows

researchers to observe which questions present problems for either the interviewer or respondent. Direct researcher involvement also provides an opportunity to gauge where additional questions are required and allows her/him to ask follow-up questions critical in interpreting whether the farmer completely understands the question and whether answers are complete. This can not be judged by reviewing written responses after the pretest. Even if a researcher does not fully understand the language, sitting in on interviews ensures that questions are answered completely and improves his/her ability to interpret correctly the responses.

Involvement can also provide the researcher a sense of the time requirements for the interviews. He or she should discuss the interviews with each enumerator after each day. When structured, precoded questions are used, pretesting contributes to the development of response categories. They also verify the feasibility of using local units of measure in the questionnaires. The length of pretesting is a function of the researcher's satisfaction with the instrument, and often the need to begin a questionnaire at a certain date.

In Senegal, most questionnaires were pretested and modified directly in the field, avoiding the lengthy time required to go to Dakar, modify and return. Pretesting for subsequent questionnaires was interspersed between other activities. In Rwanda, when supervisors pretested future instruments when overseeing the implementation of the current questionnaire.

CHAPTER IV

RESEARCH IMPLEMENTATION

This chapter discusses a few of the primary tasks involved in the actual field work of the FSA studies. The issues discussed in each section center on the importance of controlling data quality. The first two sections review the experiences of hiring, training, and supervising enumerators from different backgrounds and with different skills. The conduct and supervision of interviews are subsequently examined. Qualitative research methods are next discussed in this chapter because the content of the section focuses on the utility of a different way of interviewing and collecting information. The final section on data processing emphasizes the preliminary tasks - initiated in the field - that must be performed in order to put the data in a computer-readable form.

4.1 ENUMERATOR SELECTION

The selection of effective enumerators to conduct structured survey interviews is an important task for collecting valid and reliable data. Interaction between enumerators and respondents counts as much as an accurately designed questionnaire in obtaining accurate, quality data. Specifying the characteristics or skills of an effective enumerator is very difficult since every type of individual interviewer can potentially bring both advantages and disadvantages to the interviewing process. What constitutes an effective enumerator changes with the type of instrument used, the data desired and the local environment. Although one critical question concerns the ability to develop rapport with the respondent, there are unfortunately no guidelines on how to facilitate human interaction.

In general, FSA researchers hired enumerators who match most closely or can effectively relate to the personal characteristics of the respondents. This meant using

enumerators with rural backgrounds to conduct farm-level surveys and those from urban areas to undertake city/market level interviews. In this situation, the location of the survey and the type of respondent influenced the type of enumerator selected. In the farm household component of the Malian FSA, Dioné did not want to hire someone from the city with no feel for agriculture. Enumerators with a rural background are likely to better understand the respondents' frame of reference, and can thus understand the context of responses. The enumerators must be able to communicate with the respondents in their language without underlying biases or tension that may influence responses. Second, individuals from an urban background may not want or be able to spend a large number of days in rural areas. One researcher left the United States thinking that he would hire and train enumerators from urban areas for village level surveys. He changed his thinking after meeting an anthropologist, who, while working in the villages in the same research area, had used eleven different enumerators from urban areas in less than a year; no one wanted to work in rural villages.

Having a rural background and being familiar with an area does not demand that the enumerator originate from one of the villages under study. In fact, using an enumerator from a local village may present several difficulties due to his/her familiarity with respondents and family ties. In one instance, a local enumerator's parental obligations prevented him from completing the work, necessitating that he be dismissed. This was a difficult and sensitive task for the researcher since the survey was to continue in the village. If an enumerator is too well-known, she/he may receive biased responses or attempt to distort certain information. Researchers also need to be sensitive to ethnic considerations. Some farmers may not wish to give information to members of some castes unless they are highly educated.

The opposite side of the issue concerns the ability to ask sensitive questions. This is a "right" that outsiders may not have. Wehelie felt that if an enumerator from outside the village asked a man in Somalia the number of children in his family, he would be the subject of much laughter and the question would be avoided. For someone with whom the villagers are familiar, the question would not pose a problem. Other researchers argued that the inverse frequently obtains: respondents may not wish to disclose certain sensitive information to a local enumerator for fear informing the whole village.

Local enumerators may also not possess some of the desired levels of education and experience and necessary skills required by some researchers to do the enumeration. In one country in which local enumerators were used, they had a tendency to accept whatever was said. But this action may have been more the result of a lack of training than personal skills. Re-interviewing farm households, however, did not present any problems because local people realized that interviewing was new to the local enumerators and good experience for them. One must weigh the decision of local versus outside people in the local context.

In Mali, Dioné selected enumerators to work in the area closest to the capital, Bamako, from a pool of candidates maintained at the affiliating institution. He considered candidates with at least three years of experience who were familiar with structured, production-focused surveys. In the second area, populated primarily by an ethnic group different than that predominating in the capital area and to which the enumerators in the institution's pool belonged, he decided to look elsewhere for enumerators. Through informal discussions with extension agents and others familiar

with the area, he hired one individual who had been the manager of a farmer association and another who had a two year technical agricultural degree with research experience.

For the trader survey, Dioné felt that older, mature people would be more effective interviewers due to the suspicious environment in which traders act and the need for a more diplomatic approach to develop rapport. He preferred to hire university graduates from urban areas. Additionally, one rural market town enumerator possessed skills appropriate to be a supervisor - he was a former extension agent and regional director of the local, rural development agency - but was used to interview traders because as the son of a commodity trader, he knew most traders and transporters operating in the survey area. He was instrumental in providing them with information on the organization of the rural town, coarse grain markets and traders prior to the reforms.

Researchers refuse frequently to use extension agents, arguing that agents often think that they know most of the question answers. Or farmers may give them answers they expect the agent wants to hear. Moreover, many researchers feel conflicts will develop between the agents' regular job and the survey work. In Somalia, these preconceptions proved to be inaccurate. During initial discussions with collaborators in the Ministry of Agriculture, Wehelie learned that extension agents in the selected survey villages had worked on two other occasions collecting data. With an additional allowance, they could be used for FSA research. Wehelie learned that not only were extension agents knowledgeable about the villages and the credit project, but were accepted as members of the community. Thus, they were able to ask questions pertaining to subjects which would be very difficult for someone from the outside.

Enumerators obviously need to be literate and possess basic mathematical skills. Most enumerators hired by FSA researchers had, at the minimum, some primary education. Beyond this point, enumerator education level does not appear to be highly correlated with performance. Many survey researchers nevertheless bypass hiring teachers and secondary or university students because they are considered to have an urban perspective, are limited to work only during vacations, and often do not want to work in rural areas for long periods of time. Some researchers feel that enumerators with higher educational levels (secondary or above) may be more apt to become bored with the repetitious and tedious interviewing work than someone with less education.

For precoded questionnaires, there may be few advantages to using better educated individuals. For open-ended questions demanding more interviewing skill and initiative, enumerators with a higher educational level may also be required. Finally, experience with survey work is not always the most important criteria for selection. One researcher was advised to avoid hiring enumerators who had previous experience with a national sample because they were considered unreliable and quite expensive.

For those with a lower educational background, training and supervision must be more extensive if they are to develop a commitment beyond the financial remuneration. Losing people during the course of the research can be minimized by choosing enumerators who have fewer alternative employment opportunities. Using more highly educated enumerators may increase turnover as they use the project as a stepping stone, imposing additional costs on the surveys.

Several FSA researchers tested candidates for skills such as their general knowledge of a related research topic to see if they had a prior broad understanding of issues of interest to the project, mathematical skills, and knowledge of agricultural issues.

Additionally, Dioné asked enumerator candidates in Mali how they defined a rural household. Others tested their ability to measure field size, observed communication skills, tested their competence in translation, and asked questions to elicit attitudes about rural areas. In general, researchers found informal testing was a more effective instrument to judge the quality of the enumerators than formal evaluation.

Aside from having a certain level of basic skills, human qualities cannot be ignored. It is preferable to find people who are patient and with sufficient curiosity to ask follow-up questions if necessary. Choosing an enumerator who is honest and can establish rapport with and the confidence of respondents increases the odds of obtaining valid responses and limit non-sampling error. In Mali, after the first interviews but before the researchers even sent out the second production measurement form to one of the enumerators, over half of the producers had come to the enumerator and asked if he would be interested in this information, resulting in the collection of 50 percent of the production observations in his notebook for the upcoming survey. This success is an example of the value of and the benefits derived from establishing rapport between the enumerator and the farmer. One enumerator in Mali was asked by the village leaders to stay in the village and work with them and the village group with their problems.

In general, researchers advocated an informal approach to selecting enumerators, speaking with knowledgeable people in different positions to find out who was available and what kind of people are effective. This tactic avoided being overwhelmed with unemployed applicants as might happen in an open search.

4.2 TRAINING

The primary objective of enumerator training is to teach them the information and skills required to implement effectively the instrument with minimum personal influence on the information recorded. Proper enumerator instruction can minimize some of the numerous possible response biases from respondents who wish to be courteous or ingratiating, or who provide socially desirable answers or do not even respond. FSA researchers differ in their belief of what topics should be taught to the enumerators. A researcher must decide what information an enumerator should know in order to accomplish the interviewing tasks.

More specifically, researchers believe that training should include: research objectives, problems in rural areas, use of the data, definitions of the terms (to the appropriate level of specificity), the organization of the questionnaire, how to develop rapport, their jobs and responsibilities. For each questionnaire, researchers and supervisors should explain and discuss the underlying intent of every question with the enumerators, how to record and probe responses, what constitutes a complete or incomplete answer, field coding, and the schedule for implementation. They must also learn any special skills such as field measurement and weighing of products. Enumerators can also be trained to check responses in the context of others in the questionnaires. For example, some enumerators were trained to do a running grain availability balance sheet - adding grain inflows and subtracting grain outflows - and examine this figure in the context of grain stocks and consumption. Conversely, some researchers felt that specific explanations about the survey objectives may compromise research findings as enumerators can provide information to respondents that may bias their answers (e.g., farmer may wish to understate production).

A researcher should not underestimate the significance of building morale among enumerators and a feeling of responsibility for their work. This begins with an explanation of their role and the importance of their performance to the success of the project. Some projects invited local leaders or institute personnel to explain their support of the study. Some researchers stress the importance of psychological conditioning more than others; some researchers believed that one needs to have a strict hand over them and to "scare" them about the consequences of unacceptable work habits. Such views had been influenced by the experience of discovering an enumerator filling in the questionnaires without interviewing. What to do in this situation is very difficult. On one hand, the project has invested a lot time and training in this person; on the other hand, allowing this enumerator to continue working would set a bad example for others. In retrospect, the researcher thinks that contracts must include a clause for cheating, making clear the terms for immediate dismissal. Beyond these specific contractual terms, researchers and supervisors must furnish enumerators with sufficient work to keep them busy and closely monitor their performance.

Training consisted generally of classroom work followed by practice interviews in a non-sample village. In Rwanda, researchers used mock interviews to introduce questions, asking the enumerators to write potential responses to the questions in Kinyarwanda, the local language. Enumerators were then divided into groups accompanied by associate researchers to conduct interviews. Each enumerator interviewed one household in the presence of the others in the group who listened and wrote down responses. Households that were a part of the 1984 and 1985 national sample were interviewed in the pretesting since they had the necessary plastic bucket used for measurement.

The duration of the training period is a function of the experience of the enumerators, the length and complexity of the survey instruments, the number of passes, and the different kinds of questionnaires. Every person participating in the training was paid for each day in training. After the initial training, each additional questionnaire to be implemented was preceded by training in the field, lasting one half to a full day. Following training, most researchers remained in the field during the first few days of the interviews for each questionnaire.

Although researchers in Rwanda preferred training enumerators in a group, logistical difficulties, cost considerations, the survey schedule and field tasks prohibited training for subsequent questionnaires to be held in a central location for the entire team. This prevented enumerators from benefitting from the interaction with others and learning from the problems and issues raised by other enumerators. Researchers were obligated to visit each enumerator's location in the field to introduce additional questionnaires. Although it took more time to train individually, researchers, associates, and supervisors took advantage of these field training visits to pretest future questionnaires and conduct qualitative interviews.

Enumerators in Somalia were evaluated by an associate researcher on a scale of 1-10 for various criteria of the survey work: questionnaire coding, frequency of non-response, readability, mistakes. The top five ranked scorers received monetary rewards presented during team meetings. The researcher felt that the competitive spirit underpinning these evaluations provided incentive to do good quality, conscientious work. Investing time to review enumerators' work and provide feedback beyond supervision and data verification is another type of in-service training.

In addition to using financial incentives to improve enumerator performance, enumerators were paid a monthly salary. Some researchers made enumerator salaries contingent on satisfactory performance, withholding a proportion of their monthly salary as a surety against the successful completion of their assignments. The type of contract written depended on local laws and institutions. When working with enumerators who are attached to a local institution, it is necessary to provide them with additional incentives to carry out the extra work demanded by the project. Some FSA researchers provided interest-free loans to enumerators to purchase bicycles for field work, an incentive to assure better maintenance, whereas others gave an allowance for isolation.

4.3 FIELD SUPERVISION

Supervisors' primary task is to oversee the work of enumerators. Their duties often involve training enumerators, pretesting questionnaires, scheduling interviews, bringing supplies and salaries to the survey site, substituting for enumerators, conducting additional interviews, providing logistical support, resolving interviewing problems, public relations with the community and political authorities, verifying and correcting questionnaire responses, providing moral support to enumerators, and collecting the completed questionnaires. A skillful and conscientious supervisor can anticipate and solve problems in the field, filling a necessary role between enumerator and researcher and allowing the researcher to allocate a greater amount of time to other tasks. FSA studies have generally hired one supervisor for every two to three enumerators.

Throughout the research, supervisors and researchers need to work with and closely monitor enumerators in order to avoid simple acceptance of the first answer provided and to acquire a more complete answer. In the course of asking for more information, enumerators must be trained to avoid asking leading questions. This is very

important to be able to correctly interpret the responses. Without close monitoring, FSA researchers felt that there was a tendency for the enumerators to record a more consistent set of answers than were actually provided -- in a sense, to categorize answers in terms of what they had previously heard.

Depending on the amount of responsibility accorded supervisors, their role in the field and office in reviewing questionnaires is one of the most important steps to assuring good quality data. There is no replacement for critiquing questionnaires in the field. This review is not limited to their legibility and completeness but their logic. If researchers have not trained a supervisor to do this, then they need to be involved. If a field supervisor is trained to detect inconsistencies in responses or mistakes in the questionnaires, he can consult enumerators and have households re-interviewed if needed. If supervisors go back to talk with a respondent to check if the enumerator asked a certain question, they must be careful not to discredit the enumerator in front of the respondent. Allotting time for the supervisor to cross-check questionnaires in the field can save time and money and minimize the number of errors discovered in the office.

The ability of the researcher to manage efficiently the field work is influenced by the physical proximity of the office and research sites. Where the survey area is a long distance from the location of the local institution, researchers may wish to consider establishing a regional office.

Supervisor and researcher presence in the field can assure that questionnaires are always checked in the field and thus avoid numerous return trips from the data entry location in the city to the field. This is especially important at the beginning of surveys before bad habits are formed. During the data-entry phase consistency checks were

written into the data entry programs including range checks, cleaning rules as well as running frequencies and descriptive statistics.

4.4 INTERVIEWING

As stated earlier, interviews with farm households and traders were generally spread over a period of one to two years, ranging from four to fifteen structured contacts. Enumerators began each interview clarifying issues or questions from the preceding interview and emphasizing the link and continuity between each questionnaire. An enumerator needs to show respondents that she/he is interested in the information collected in the previous interview and that each interview is a continuation of the others.

Researchers must realize that farmers and merchants are intelligent people and try to sense what would appeal to the researcher and give the kind of information they perceive is expected. Responses can nevertheless be influenced by an interest in being courteous to the enumerator, in winning approval, or by disinterest or suspicion. These factors introduce biases into the interview. Many of these biases can be minimized by carefully selecting and training the enumerators. A primary objective of training interviewers prior to field work is to minimize the sources of potential bias in both the instruments and responses.

Several situational factors during the interview are also potential sources of bias. It is commonly thought that the presence of others at an interview may encourage a socially desirable answer. In Somalia, however, the presence of village elders at the interview had the opposite effect. Wehelie feels that respondents were urged to speak truthfully and tell, for example, how much grain they really had in stock. In this situation, third parties kept the respondents honest and also helped him/her remember.

Demanding that the interview be held in private may not be an effective approach due to negative cultural implications. A respondent may wish to capitalize on the social prestige conferred on the respondent in the act of a public interview.

The length of each interview can have a negative effect not only on the quality of farmer responses but also on the enumerators' ability to ask clear questions and to record exactly what was answered. An exceedingly long interview can prompt the respondent to make up responses in order to finish the interview as soon as possible. In FSA research, the interview times varied from a few minutes in Rwanda to two hours in Zimbabwe. The length of the primary producer survey in Rwanda depended on whether the farm household had conducted any marketing transactions since the last visits. In the event that there had not been any transactions, only four questions were asked - did you buy sorghum, sell sorghum, buy beans, sell beans - totalling about twenty seconds. If there was one transaction, the interview would take five minutes. In a biweekly or monthly survey in which the respondents had been answering production questions twice a week and transactions questions once a week since April 1985, the researcher felt that they would not have continued if there were lots of questions.

It was felt that enumerators in Rwanda could have worked longer hours; Loveridge calculated that when enumerators did not have to measure fields, they worked ten hours a week. When enumerators measured fields, they worked forty hours a week. Loveridge believes that enumerator morale would have improved if they would have had more work to do, reducing the idle time spent with other underemployed people. When considered from a data processing viewpoint, increasing the enumerators' work load

would have further augmented the data processing work, which in retrospect, the researcher feels was too large. [10]

In Mali, Dioné felt that shorter interviews were more conducive to the farmers' schedule and spread over a long period, would help cultivate a relationship between enumerator and respondent. He thus designed fifteen short questionnaires through which he collected data related to the farm household component of the survey research program. Aside from the interest in optimizing recall, dividing surveys into several passes allows a researcher to verify questionable responses with respondents and build on information obtained in earlier interviews. This approach is effective when questionnaires are implemented in a sequential process, beginning with the broad picture and progressing to more focused, disaggregated enumeration. Interviews were arranged around communal work days and arranged to best fit the respondents' schedule.

The number of interviews that can be conducted in one day depends on the length of the interview, prior scheduling by supervisors, and the work habits established by the researcher. Enumerators in Zimbabwe interviewed five farm households per day while most others completed three to four in one day.

FSA researchers felt that there is no substitution for spending time in the field during the implementation of the questionnaires. Participating in interviews gives researchers the opportunity to think of the information emanating from the surveys before it arrives in the office. Conversely, if the principal researcher does not spend considerable time sitting in on interviews and actively monitoring questions and responses, he or she risks not knowing how accurate the data really are once they arrive

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[10] Weekly visits to one thousand farm households over a period of fourteen months resulted in approximately 56,000 visits. Recording approximately one transaction for every three visits, the study generated data for 20,000 observations.

in the office. By resolving problems as they arise in the field, researchers and associates can minimize the need for re-interviews. An extensive field presence also sets a good example for everyone else, demonstrating the researcher's interest to the research team and the respondents and the seriousness and importance of each questionnaire in the study.

Having spent a lot of time observing interviews and checking responses, one researcher concluded that almost every question is subject to misinterpretation and a high margin of error in the answers. To some degree, problems will be identified in the course of pretesting and questions can be worded in such a way as to yield the most accurate response. Consistency checks can also be used to identify these problems within the questionnaire, though they do little good if the analysis does not begin until well after the data are collected.

In Zimbabwe, Rohrbach concluded after spending lots of time in the field during the interviews that enumerators have a tendency to interpret responses poorly or prematurely categorizing answers resulting in a loss of subtlety in the responses. Enumerators tend to write down the first response without probing, and categorize open-ended responses without recording the supplementary information. Although the problem may be inevitable, researcher presence in the field during interviews can help minimize it.

One researcher thought that giving enumerators a response sheet outlining the transaction data recorded in the previous interview would have been useful as a reference sheet with which to cross-check current responses. In one survey, a farmer reported a sale of 300 kilograms of millet since the last visit by the enumerator. This transaction was reported and recorded a second time when asked the same question in a

subsequent pass because the enumerator, supervisor or researcher did not notice the duplication until a later date. Having a response sheet in the field would have permitted the enumerator to verify whether the farmer was reporting the same sale of the previous period. The ability to furnish these sheets to enumerators before the next survey round would hinge on a competent and rapid data processing capability. Researchers would need to monitor carefully the effect of using these sheets on enumerator performance, as they could introduce a potential source of bias.

Researcher participation is important not only in the pretesting phase but also when the surveys are underway, especially during the first week of the implementation of a new survey. Problems of interpretation will always arise in the field no matter how thorough the pretesting. Sitting in on interviews, clarifying enumerator question understanding, and making judgments about how to interpret particular responses are key tasks that only the primary researchers can undertake and potentially a major factor affecting the quality of the survey results.

Beginning processing after the data has been collected and doing some preliminary analysis while the enumerators are still in the field enables the researcher to verify data consistency and accuracy, make internal consistency checks and thus have the opportunity to reconcile inconsistencies directly with respondents. Checking the quality of the data in the field - missing values, unclear responses, inappropriate ranges, inconsistent data - can be advantageous in reducing the volume of data and detecting initial patterns in the data. The ability to do this depends on the quality of the enumerators as well as the amount of time designated for this task in the design stage. Waiting until all the data are collected to consider coding, entry, and processing inevitably results in numerous problems, delays, and lower quality data.

When a multiple interview approach is used, it is often likely that there will be contradictions in the data. Discussing identified response inconsistencies with respondents requires that enumerators be trained to use tact and care in confronting respondents so as not to create a conflict. In Senegal, disparities between the calculation of cereal inflows and outflows, ending stocks and consumption were frequently inconsistent, a phenomena the researcher assumed was linked to illegal purchases of Gambian rice which was not reported and a sensitive topic of inquiry.

On the other hand, opinions change, so that differences in data are not always contradictory. One farmer, for example, responded that a certain type of fertilizer seemed effective but when asked again in another period of the year said that it was no good. This example illustrates the seasonal nature of responses as the farmer's negative conclusion came after a drought year. Aside from thinking why a respondent would want to suppress information, a researcher needs to recognize that people forget and that opinions, attitudes, and preferences are not always stable. Hence, caution and cross checks should be employed in analyzing data.

4.5 QUALITATIVE METHODS AND IN-DEPTH PROBES

Qualitative research techniques, both informal, conversational and semi-structured interviews, were also used selectively and effectively by some FSA researchers to collect data. Researchers and supervisors conducted both individual and open-group interviews throughout the course of the survey work during their trips to the field. They used these "social chats" to collect information on a variety of issues that would help in the design of questionnaires or in interpreting previously collected information.

In most cases, researchers used an interview guide to direct the open-ended discussions. They allowed farmers to discuss problems or interpret certain events in

their own terms amongst each other and were useful in better understanding research findings that were not clear to the researcher. Or, a researcher can use these sessions to learn about how farmers would alter their production or marketing decisions in response to certain changes in institutions. The semi-structured interviews also helped the researcher determine if it is necessary to pursue certain issues in a structured questionnaire in order to obtain quantified information. Finally, qualitative findings provide insight into the meaning of the data and help interpret statistical relationships.

Traditional research designs focused on specific hypotheses that are developed with minimal empirical information and unmodified through the course of the research seem increasingly inadequate to study African food systems. The multitude and rapidity of changes in agricultural policies and institutions are very likely to render the studies irrelevant by the time the study is completed. Throughout the course of the entire project, FSA researchers and faculty members have become more attentive to and interested in studying anticipated and unanticipated events related to the reforms. As insights are gained, new questions may become more important than prior ones, or the initial questions may need to be reformulated. In response to many questions generated by the research, FSA participants have also attempted to design detailed probes of small subsamples of the population which explore in further detail issues raised by early data collection. This progressive research approach is important for obtaining a sharper, more precise focus through the latter stages of the research.

The ability to study planned and unforeseen events as well as conduct more detailed probes of specific subsamples requires planning, flexibility in the design, an awareness of the social setting, and a capacity to process and analyze rapidly the data collected in prior stages. When events are anticipated and the researcher seeks to design

some part of the study around it, planning is critical. A research planning matrix and task calendar are useful tools to specify what data needs to be collected prior to the event and when the measurement or study on that event should be implemented. The researcher then has to implement this second sample by a certain time or possibly in accordance with a certain period in the agricultural calendar or a certain event.

Being able to make more in-depth probes depends on several elements in the research design. First, the opportunity to return to a subsample to examine a topic in more detail is a function of quickly processing and analyzing and determining important issues which would benefit from further precision. A researcher must decide what kinds of and how much information should be collected and analyzed in order to develop new stratifications. The order in which data are analyzed is also critical. Ten percent of the data, for example, could possibly be analyzed quickly in a two-week period, and 25 percent at a one-month lag. Determining what 10 percent to analyze depends on the priority research questions, what interests policymakers and what issues demand further precision. Scheduling time to conduct intermediate analysis is a key factor affecting the ability to take advantage of the dynamic situation.

Second, a researcher needs adequate personnel and resources to facilitate the field data collection and data processing tasks. Being able to respond to certain events during the course of the survey is a function of the capacity to process and analyze data. Researchers and data processing personnel must be well-trained and capable of efficiently and rapidly processing data before going out to the field. All of these elements combine to minimize the turnaround time crucial in responding to unforeseen events and probing the subsample.

A researcher who is conducting this kind of research for the first time often is not well-informed about not know how long it will take to implement a specific part of the work. Senior researchers with previous experience can be useful in providing guidance in this area. However, not even the most experienced researcher can prepare for all of the potential contingencies since every study encounters unique situations.

This iterative research process is very difficult to conduct with large data sets that demand extensive processing and analysis. Flexibility is also hindered in certain kinds of research, such as cost-route studies which amass large amounts of data collected throughout a tightly scheduled agricultural season. These demands provide little opportunity to conduct intermediate analysis.

During the planning stages of FSA research in Rwanda, the research team scheduled time in the task calendar to conduct in-depth farmer interviews with a subsample of the main survey. Specifying up-front the time and resources to do these probes was an important and necessary step from the standpoint of informing local project administrators. The negotiations needed to convince project leaders of the importance of this smaller study convinced Loveridge of the need to be sensitive to project objectives and interests of the host agency. Many research projects may not allow the researcher to go off on some tangent of their own to analyze a particular interest. Loveridge used this scheduled time to collaborate with an agronomist from another organization to study why the larger farmers who were the net sellers of beans and sorghum did not use as many varieties of seed as did those who were net buyers. They studied the effect of various production techniques and farm household resources on the transaction behavior of different groups of respondents. The success of this subsample survey was due to interest in collaborating with other researchers and project

leaders that enabled them to plan and execute the work. It also depended on the ability to turn around the data and identify net buyers and sellers within 6 months of the end of a growing season.

Some probes can be based on qualitative interviewing, such as occurred in Mali. In 1986, a rural development agency, following financial losses incurred because of the fall of world market cotton prices, attempted to limit cotton production. The research team also learned that the agency would not purchase the maize crop on behalf of the state marketing board due to the latter's inability to repay the agency's funds used to finance 1985 official maize marketing. The research team used this occasion to ask a group of farmers how they intended to react to these two events. From the answers obtained, it appeared that farmers planned to make significant adjustments in their allocation of land between crops. This information served as a starting point for a formal interview, based on a structured questionnaire, on the main determinants of farmers' planting intentions prior to the 1986 rainy season.

In another situation in Mali, the research team asked a group of farmers what their cereal sales strategy had been between December 1985 and April 1986, when government intervention to support producer prices had raised post-harvest coarse grain prices in rural markets. Most of them answered that they chose to postpone the sales of a significant proportion of their marketable surplus, based on their expectation that prices would continue to rise until the end of the rainy (hungry) season. This information subsequently helped the research team understand why, for the 1985/86 campaign, the normal seasonal pattern of coarse grain prices was significantly distorted, as most surplus producers in the zone made the bulk of their sales after April 1986, thereby depressing price levels throughout the hungry season.

Finally, researchers may find it useful to conduct "capstone" interviews after having completed a significant portion of the analysis of data collected from these same farm households. Researchers return to farm households or groups of farmers to discuss results, test preliminary conclusions, and probe for better insights as to why they behave in a certain way. This method helps the researcher gain a better understanding of the issues with the same set of respondents and may assist in the interpretation of the survey results.

4.6 PREPARING FOR DATA ENTRY

Many of the aspects that are usually embraced in what is called data processing - definition of data type and scale, data level and files, coding, data entry - were discussed in earlier chapters. Minimizing non-sampling errors during the data processing stage demands consideration of several other aspects, such as the design of questionnaires, hiring knowledgeable computer personnel, planning the type of analysis to be completed, and selecting computer hardware and software that satisfy researcher needs throughout the project.

Integrated data entry and analysis software facilitates the ability of researchers to create data files and enter data into a usable and analyzable form. Although a quantum leap from the days of sorting strips and tables, using these sophisticated tools does not alleviate the need to plan carefully for the effective completion of data management tasks. FSA faculty and researchers believe strongly that the key to efficient data management rests with the understanding that the entire design and implementation of the research project contributes to timely coding, processing and data entry and analysis. It should not be conceptualized as a task easily completed by programmers after the data have been collected.

If a researcher waits until all the data have been collected before thinking of data entry, data management difficulties can easily preclude the researcher from promptly producing relevant information. Moreover, the ability to enter data on a timely basis is an important part of controlling data quality and designing additional focused research probes. If a researcher does not develop the capacity to turn around the data quickly, it is easy to fall six to twelve months behind schedule, leaving no time to accomplish some of the project objectives. The first part of this section discusses the use of computer software for data entry and the data management process following data collection. The second part focuses on important issues affecting data entry.

4.6.1 Creating Data Files

FSA researchers, faculty, and computer staff have found that using an integrated software package such as SPSS/PC+ with both data entry and analysis modules can minimize many problems of file transfer and alleviate the need to write complex data entry programs. Although some software packages may be very effective for completing certain tasks, they may be either ineffective or unable to do other necessary applications. Choosing the software to use thus entails assessing computer needs and balancing the tradeoffs between the features of the packages.

Concurrently or shortly after the questionnaire design, researchers need to spend time designing data entry files. The structure of data entry files parallels closely the decisions made on the level of data (discussed in Section 3.2.1 of this paper) and on the kinds of analysis desired. To the extent that the researcher has considered these issues, the initial groundwork for creating data files has been established.

Creating data files involves variable definition, developing a data entry form that appears on the computer screen, and designing validation programs to enter data

according to specific rules and to check the values entered against defined ranges and logical expressions. More specifically, each data file can be programmed to include range and logical rule consistency checks, data entry screens that resemble the section of the questionnaire corresponding to the specific file, and skip and fill patterns. Ranges specify minimum and maximum values for continuous variables and acceptable values for categorical variables. The data entry program can check interactively for inconsistencies and invalid codes as data are being entered or after the data have been entered in the file. Programming skip and fill rules accelerates data entry since variables can be bypassed or assigned specific values if certain conditions or values exist in other variables. Given the short interval between data collection, postcoding and data entry, it may be difficult to finish programming ranges and rules prior to the beginning of data entry. Instead of cleaning interactively, the cleaning ranges and rules can be checked periodically throughout or after the data are entered.

Designing screens that resemble sections of the questionnaire help some data entry operators to enter the data quickly and accurately. Some data entry operators may find that these screens facilitate comparing the data entered with the contents of the questionnaire. For questions in which data are recorded in a table, using a spreadsheet format as the data entry screen may be easier for the operator. These forms are an additional help for data entry personnel to keep track of their position concurrently on the document and the screen.

Researchers should recognize that software programs are limited in their cleaning ability. For example, data ranges can protect against entering extreme values but not against inadvertently entering a 2 rather than a 3. It is thus necessary to use additional methods to verify that the data have been entered correctly.

4.6.2 Sight Editing and Postcoding

Enumerators should be trained to check for completeness and accuracy in respondent answers after interviews while the field supervisor checks interviewer errors and response consistencies. Completing these tasks before the questionnaires reach the office can minimize delays in data entry.

It is very useful to maintain a log in the main office documenting which questionnaires have been received, which ones have been edited, and which ones have had their data entered. It is very easy to lose track of the questionnaire status in a large multiple-visit survey in which a researcher is implementing several questionnaires using many enumerators, supervisors and data entry operators. The first cleaning step in the office following the field supervisor's review consists of sight editing or checking questionnaires for completeness and legibility, cross-checking answers for consistency, and flagging extreme values. FSA researchers examined relationships frequently between important variables such as quantity of maize consumed and the number of household members as a check on the logic of the data being reported. The data entry program can check for coding and data entry errors. Additional cleaning should also be conducted with the data analysis program to look, for example, for duplicate cases. Researchers cannot underestimate the importance of investing time and resources in detecting and correcting these errors.

Depending on the size and type of the survey and number of project staff, postcoding must take place at the same time or concurrently with the sight editing. It is important that the researcher be involved in deciding rules for assigning new codes, when to assign codes for missing values, "don't know" or non-response. Each of these categories represents a different situation with different implications for analysis.

Additionally, staff must be trained what to look for and how to code. Once the rules have been established and the researcher has been involved in postcoding a few villages, an office supervisor can do the postcoding, assigning new codes to every different response that is not obviously the same one so that at a later date, the researchers can combine and recode categories. The staff member responsible for coding should thoroughly document problems or questions pertaining to the interpretation of responses and the assignment of codes that the researcher must later decide.

4.6.3 Codebook and File Documentation

The listing of codes established during postcoding is the basis for a codebook and future file documentation. Creating a codebook is extremely important not only for others but also for the researcher months later when transformed data files and variables make little sense. A codebook serves as an index to the data files and the data. It is also an essential component of academic research as it is the only guide for other researchers to use the data set or verify the research results.

A codebook describes the structure of data files including a description of the case, level, key variables, variable and value names, modifications, and with what questionnaire the data was collected. This documentation becomes even more important as data are cleaned and transformed. New variables are created, data are recoded and all must be recorded. The codebook serves as the basis for creating a fully documented research project which should summarize the subjects and levels of different questionnaires, dates and place of implementation, and sample.

SPSS/PC+ provides a number of commands that can facilitate the documentation process. Commands can be executed to print out the labels or names for variables and their values - response codes. This information can be combined easily

with a description of the structure and composition of the data files - cases and key variables - and a list of the commands used to create and modify variables. The ease of transferring numbers and text between SPSS/PC+ and word processing programs facilitates the documentation process.

Finally, researchers may find it helpful to create an annotated questionnaire, containing the names of the data files written directly on the sections of the questionnaire corresponding to the questions and variables. Some researchers also found it useful to meet with enumerators to discuss the implementation of every question, differences in interpretation, difficulties of the respondents, and an evaluation of the accuracy of the responses. Typed up, this is another supplement to documentation and to the researcher throughout the analysis.

4.7 DATA ENTRY

Some software packages such as SPSS/PC+ used by most FSA researchers for data entry do not allow the user to open several files simultaneously. FSA researchers and computer staff concluded that it is more efficient to enter data for one file for all respondents before moving on to the next file. Entering all the data for one questionnaire would require successive opening and closing of every file. Having the questionnaire structured and ordered according to data level and data file minimizes the time needed to locate the data to be entered. Entering the data continuously for one file for all questionnaires enables the data entry operator to develop a greater sensitivity to responses. He/she would be more apt to detect inconsistencies in the data since they remain on the same level pertaining to the same topics for all the cases before moving on to another part of the questionnaire. Some FSA researchers entered data two times, relying on the data entry program to compare both values and identify discrepancies.

The ability of the project to complete data entry in the time set out by the task calendar depends on the size and skill of the data processing staff and the amount of time and attention accorded by the principal researcher to oversee the work. In theory, FSA projects hired a sufficient number of people to carry out data entry. All personnel were trained by the project and some received additional formal computer training outside the project. In reality, researchers encountered frequently unexpected difficulties with the personnel accomplishing the tasks for which they were hired. Researchers need to make explicit in contracts the duties of personnel hired to do data entry work. This is especially important when the collaborating institution's personnel fill certain positions.

Many researchers processed personally a large amount of the data collected. Although this demanded a lot of time and may have had a high opportunity cost, researchers felt that it was the only way they were able to assure data quality. Entering the data also permitted them to see the responses early in the research, to read enumerator comments in the margins, and to analyze this information useful in designing subsequent questionnaires. In other words, it was the first step in thinking through the analysis and preparing for new surveys.

Nonetheless, personnel decisions must be examined in the context of the whole project. Wherever the researcher decides to allocate his/her time implies tradeoffs in other areas. Some of the personnel problems were unforeseeable and beyond the researchers' control. Combined with an underestimation of the time required to initiate and firmly establish the data processing, over-ambitious scheduling, difficulties mastering the intricacies of software programs, and exigencies of field work, data entry and processing did not always proceed as well as expected. In some situations, data entry did not get underway until after the second or third questionnaires had been implemented.

Once personnel are trained and have begun to enter data, the data management aspect becomes very routinized, taking increasingly less of the researcher's time and leaving more time for analysis and writing working papers.

In the future, FSA researchers would consider rotating enumerators between interviewing in the field and data processing tasks in the office as a way to increase their interest in the research and help in the verification of the data. Logistical problems and concern with decreased contact between enumerator and respondent influenced the decision not to do it. There may be a potential problem in keeping good village relations between the enumerator and villagers, although one could introduce two enumerators to the villagers at the same time.

CHAPTER V

RESEARCH DISSEMINATION

The FSA research extension effort was designed to disseminate research findings to policymakers periodically throughout the life of the project. This approach was premised on two ideas: first, that policymakers are concerned with the dimensions of current problems and methods to rectify them; second, that providing a rough idea of what is going on at the microeconomic level when policy decisions are being made is preferable to no information. New information can lead to changes in attitudes or perceptions of how farmers are responding to institutional, policy, or technological changes, and in turn, alter behavior, or policy decisions.

FSA recognized that there are different types of audiences to which reports and seminars can be directed, demanding different types of analysis and a variety of media through which research results can be disseminated. Researchers must make an early effort to identify clearly the audiences for various research reports. To reach the majority of the relevant decision-makers, researchers used both informal and formal means to disseminate research outputs. Based primarily on descriptive/diagnostic analysis, these various techniques allowed a timely release of useful research findings to decision makers while feeding back insights on additional data needs to the research team. Working papers and conference papers were the two primary written vehicles, while conferences, seminars, and informal meetings served as the major oral modes used to distribute information to a variety of audiences on a timely basis.

This chapter contains a brief discussion on data analysis as it relates to disseminating research findings. The majority of the chapter examines the different strategies used by FSA researchers to report findings.

5.1 DATA ANALYSIS FOR POLICY EXTENSION

In general terms, data analysis is the search for meaning in the collected data. Describing data involves the measurement of variable distributions. Explanations involve measurement of associations between variables. The techniques with which a researcher explores relationships depend on the type of data and the objectives of the analysis. As reiterated throughout this paper, thinking about analysis should begin during the design stage when researchers are specifying research questions and data requirements. The FSA project recognizes that different audiences have different information needs, and hence, require different kinds of explanations. Researchers must therefore provide in succession various levels of analysis and types of outputs.

The direction of the analysis should be influenced by the same set of questions asked during the research design. What additional information could make a difference to the direction of incremental, problem-oriented decision-making? Researchers generally began analysis with frequency distributions and descriptive statistics of the variables. Computed for all variables, these statistics help the researcher find data entry errors, check outliers, and cross-check missing value corrections. A large amount of the initial computer analysis involves transforming data, such as converting local units of measurement to metric units. Bivariate analysis follows the calculation of basic univariate statistics and entails an examination of correlations to help clarify relationships. Cross tabulations are a common analytical technique, showing the joint distribution of two or more variables and are generally accompanied by a chi-square statistic to test for the significance of their relationship.

Intermediate analysis to be presented in working papers emphasized descriptive statistics and cross-tabulations. Researchers undertook more sophisticated analysis as

data were generated and significant correlations delineated. It is important to structure data files to preserve the options to conduct the analysis at different levels in the future.

Loveridge thinks that it is preferable not to analyze the micro level until the larger context is understood. If he had started at the household level without getting the national picture, he would not have realized the importance and role of commodity imports, and thus not given a lot of attention to purchases at the household level.

FSA researchers generally felt there is a tradeoff between what you need to do professionally for an academic audience and what you need to do for the audience in country. Sophisticated regression analysis may not be a high priority for government officials and donors but may be required by academic research demands. Yet, if the regression results are presented in a straight forward manner, they can be very useful for strengthening an argument at a later date.

In more sophisticated modeling work researchers felt that some of the popular household models that often specify exact data requirements while excluding others, a priori, can be very constraining and insufficient in explaining the production and marketing behavior of food system participants. Some researchers felt that it is important to look at different theories and choose those aspects that best help them to explain the situation. Researchers cannot lose sight of their focus on specific problems and the need for their findings to be policy relevant. Effective models are those that help explain pertinent problems such as the variations in cereal production or sales by using variables other than just those posited by neoclassical economic theory. Just because the equipment may be profitable does not mean that it will be forthcoming; the market may also not be functioning. There are institutional factors which affect farm household behavior and thus their performance.

Beyond these general problems, each discipline uses certain techniques and every research question requires a slightly different approach. It is therefore difficult to generalize about research techniques without discussing the specifics of each dissertation. Interested readers should therefore consult the dissertations resulting from this research.

5.2 WORKING PAPERS AND PRESENTATIONS

Working papers and seminars served a vital role in providing a basis for ongoing policy discussions and fostering greater effective demand for social science research to inform policy. This was particularly evident in countries where there was no tradition of this type of analysis and policy extension work. At the same time, writing working papers, through repeated practice, contributes to the development of the skills of local researchers, strengthening their analytic, reporting, and policy extension skills.

The subject of working papers evolves from the researcher's knowledge of the current policy debates and interests of the local policymakers and donors. A researcher must be careful that the information provided to policymakers is policy relevant and not so disaggregated that it is no use to them (e.g., number of hoes in a village). When a researcher seeks to explain the results to a policymaker, they should provide concepts that help make sense of the information, and with interpretation, help create meaning and evoke a more sophisticated and enriched understanding of the complexities of an issue. In Senegal, Goetz often tried to cast working paper discussions in the terms of the local and donor debates on cereal self-sufficiency. Some researchers would caution future researchers to be careful of the issues discussed in working papers because they may be contrary to the ideological predispositions of the government or funding agency (e.g., if it shows that privatization may not work or show that it is a slow process).

While the greater part of a research process deals with the conceptualization, design, research methods, analysis and interpretation, the presentation of research findings is also important, as the format implies some kind of interpretation, imposing "form and meaning" (Riemenschneider and Bonnen, 1979). The writing process helps the researcher think about the issues, and when it elicits feedback, assists the researcher in thinking of new questions. Working papers do not need to be polished results since there is little peer review, but should present enough data and a clearly written message supported with tables and figures. Some researchers began writing very short, succinct "Information Notes" after finding that working papers were too big and detailed. They found that there is a high payoff to writing a shorter piece that can be quickly disseminated.

Researchers need to be attentive to the audience of the article and target certain pieces at an intended audience. In some cases, the audience of certain working papers were local policy analysts who often have no experience or background training in economics, let alone are familiar with using up-to-date empirical information for policy analysis. They may revise last year's production figures but may be trained to do little else. Some researchers concentrated on writing good policy-relevant papers aimed at a hypothetical decision maker.

Determining the amount of information needed to be collected and analyzed prior to releasing some intermediate report is a difficult trial-and-error process. Analysts or other researchers may criticize some conclusions if they seem lacking in evidence or are weakly presented. Since the research is not focused on the problems of the day-to-day operations and issues of the food system but on the fundamental,

structural aspects of food security policy, it may often be necessary to withhold dissemination until additional information can be collected and analyzed.

The time taken to write many working papers can be a source of conflict with other research activities; there is a tradeoff between writing reports based on intermediate analysis and other research tasks. Some researchers opted for writing more formal, polished papers to be presented in conferences and directed toward a larger audience. Similar to working papers, but based on more extensive analysis, writing conference papers helped push researchers to put together information and findings. When combined in a volume publication, as in Zimbabwe, conference papers may increase the credibility, visibility, and support to the project.

Informal meetings were used frequently by FSA researchers in addition to written reports and formal presentations. The personal relationships that Wehelie developed with ministry officials in Somalia provided him an additional forum through which ideas could be discussed and information could be disseminated. Similarly in Mali, Dioné made informal briefings to local policymakers, USAID officials, and policy reform guidance committees, often organized around working papers.

Informal channels were even more important when a researcher was formally isolated from direct contact with policymakers outside of seminars. One researcher was surprised to learn about informal dissemination channels developed by the director of the collaborating institution, who would distribute his working papers to friends for review and advice on whether it would be politically smart to distribute them officially.

Conferences and seminars proved to be very effective for discussing research results and at times, when attended by the Minister of Agriculture, provided the most direct line to the policy process. The conferences were useful for establishing and

maintaining contacts with mid-level bureaucrats as well as for receiving insight and opinions on the initial research findings. Attendance at conferences was improved when participant's names were placed on the conference schedule, extending the range of people abreast of the emerging themes of the research.

Some researchers think that smaller seminars are more effective because the focus can be oriented directly to the perspective or interests of the audience. Dioné held more formal, quarterly staff meetings with officials from an inter-ministry commission in charge of the implementation of the food strategy and the USAID mission in order to assess project progress and present and discuss ongoing findings. These were usually planned to coincide with the visits of participating FSA faculty. Rohrbach also conducted topic specific meetings with extension personnel, marketing board analysts, and other researchers.

All FSA researchers felt strongly about the importance and value of returning to the sample traders and farm households to discuss research results. Section 4.5 discussed briefly these final discussions from the standpoint of verifying findings and collecting more information. From a policy extension perspective, presenting research findings to the respondents is an integral component of farmer-researcher-policymaker dialogue. Rohrbach felt that seminars with farmers were not only useful to discuss preliminary study findings but also a necessary courtesy and critical for building good will, which is essential for later research efforts in the same areas. Future efforts to hold rural seminars with farm households, traders, extension agents, rural development agency officials, and local government leaders would allow policymakers to hear directly about farm- and trader-level constraints and lead to more concrete policy recommendations to improve the food system.

Finally, monthly coarse grain producer and wholesale prices generated by the FSA project in Mali were sent regularly to the information center of the Inter-State Committee for Drought Control in the Sahel (CILSS) in Ouagadougou.

5.3 RESEARCHER REVIEW OF THE DISSEMINATION PROCESS

Some FSA researchers felt that they spent too much time writing working papers during the course of the research. Although the project did not have any established requirement on the number of working papers to write, the emphasis on rapid dissemination impelled some researchers to promise more than they could deliver. In creating their own pressure, researchers underestimated the time it takes to produce a clearly written, policy-relevant paper.

A researcher must assess his/her opportunity cost of time to writing interim working papers. The time and intellectual effort required to write a good paper can often detract from effective management and participation in the field research. Getting the papers in publishable form for dissemination is very time-consuming, and may not represent effort well spent while surveys are underway. A researcher needs to assess the importance of his/her presence in the field, sitting in on interviews and how much can be relied on supervisors and enumerators. One researcher felt that his presence minimized the number of improperly filled out and incomplete questionnaires that required the team to return to the field. Although it is may be useful to do some analysis and write a paper during the field research as an input into the development of more focused questions or in-depth inquiries, overemphasizing them can be counter productive.

In addition to project management, researchers need to spend a considerable amount of time guiding analysts in conceptualization of the research, data processing and analysis, and preparing working papers. Some FSA researchers felt that the amount of

time for training the local associate was limited, suggesting that the type of people hired must already have experience outlining and writing research reports.

The general feeling among FSA researchers is that their associates should not write more than one working paper a year; more than this is too ambitious since they have difficulty synthesizing ideas and supporting evidence, and papers end up being repetitive. Some believe that they would have learned more by spending more time in the field participating in implementing the questionnaires and doing supplemental informal interviews.

Some researchers believe that discussing the fundamental issues in quickly dispersed working papers is a questionable use of time since only a partial view of an issue is presented halfway through the data collection; a researcher may prefer to wait until the end of the project when he/she has more time to do more thorough analysis. As was stated earlier, working papers without adequate thought and data can yield misleading and even wrong conclusions. Some researchers found them, however, to be useful tools to think about modeling and to pull together ideas.

Others felt that producing one or two papers a year is more in line with the longer term, strategic focus of the FSA research than daily policymaking. One researcher would only discuss issues in papers if they were complementary with the short-term situation and fully complete. Although some researchers felt that specific short-term questions are decided on a political basis with little factual information, accepting this situation as a fait accompli seems to be exactly opposite of what the project is trying to accomplish: provide timely information to policymakers. The amount of emphasis to give working and conference papers also depends on the quantity of accurate statistics policymakers currently have. For many countries that have rapidly

implemented policy reforms with little empirical information, an additional working paper providing basic descriptive analysis can be quite valuable. From the perspective of the Ph.D researcher's career, however, the project emphasis on working papers and the broader social needs of the country may not be consistent with their personal incentives. This is one of the consequences of linking FSA research to graduate training.

In all FSA studies, researchers were constantly interacting with consultants working for ministries and international donors as well as being asked by local USAID missions for specific information. The researcher needs to carefully balance being responsive to the funding agency's and consultants' short-term information demands with learning to close the door and say no. This is especially difficult when the project is producing a lot of empirical information in a country where there has been little previous research. Excessive mission demands can compete heavily with ongoing requirements of research programs. A researcher can easily, without knowing it, get him/herself too involved meeting their demands, briefing consultants or collecting data not related to the terms of reference.

Researchers felt that in the future the project should refrain as much as possible from acting as a type of 'staff economist" for it creates high expectations and makes it difficult to refuse later requests. Although a researcher needs to be attentive to short-term policy requests, turning down additional information requests is not shutting the door on the funding agency but an attempt to satisfy the original objectives specified in the terms of reference. In this light, researchers justified and limited their discussion with consultants and short-term work for USAID to topics relevant to the project research.

For a graduate student doing research for the dissertation, however, a researcher still needs to be responsive to the funding agency, occasionally showing evidence of their work. The line of responsibilities must be clear for both the researcher and the funding agency, to whom they should report. Given the objective of informing policymakers, some researchers viewed positively their interaction with the USAID mission, as an opportunity to learn more about their information needs and perspective on food security problems, providing ideas for doing subsequent analysis.

The amount of time that the researcher may serve in a "staff economist" type of role differs by country and the size of the project. In a country like Zimbabwe, where there is a greater analytical capacity and information, there may not be as great a demand on the researcher to satisfy short-term demands. In a large project, the researcher may also be relatively removed from this role as senior people can act as a buffer between the funding agency and the field research.

Some researchers expressed a final concern with the control of information generated in the project. They learned the difficult lesson that research results cannot be shared with outside consultants without specific agreement on procedures for acknowledgement of the source, as in any academic publication. One researcher provided a great deal of information to consultants and in one case, did not receive proper citation in the published report. This researcher would thus recommend only providing information on a written basis with a release form, signed by the party. It is important to share the information generated but not to the extent of jeopardizing the researcher's own interests and credibility.

CHAPTER VI

SUMMARY COMMENTS

The first phase of the FSA project has provided researchers and faculty many lessons on how to design and conduct food security research effectively in Africa. This paper reviewed a set of design principles and research tools that the FSA project has found useful and which may be useful to others. The amount of detail and examples used to explain these concepts and techniques make it difficult to summarize their key aspects in a concluding chapter. This final chapter is, hence, not intended to be a comprehensive overview that can stand alone from this paper.

The first section of this chapter examines selected conceptual issues and research methods that worked satisfactorily and increased research productivity and that may be useful to future researchers. The second section addresses the relevance of the FSA research design model to other projects and African research institutions.

6.1 KEY PRINCIPLES OF RESEARCH DESIGN AND IMPLEMENTATION

The research discussed in this paper was conducted as part of a larger project with three primary objectives: developing new knowledge on food security problems; improving the long-term capacity of local institutions to research and analyze changing policies; and disseminating timely, policy-relevant information to policymakers on the factors that affect farm households' and traders' responses to reforms. This additional focus on human capital development and policy dialogue affected the decisions FSA researchers made throughout the course of their research. Future researchers must realize that many of these decisions and tradeoffs encountered by FSA researchers were affected by these specific project objectives.

6.1.1 Research Objectives and Design Factors

The pragmatic focus on researching policy-relevant issues contributed to the design of studies aimed at understanding the interaction of changes in institutions, technologies, and policy rather than a more narrowly conceived definition of some food security problem. Planning effective policies to improve the availability and access to food requires knowledge of how these factors interact at the micro- and macro-level. Researchers chose topics and designed their research to study situations in which the factors were being modified by government and donor actions. Broad thematic research interests were made more immediately relevant because they were guided by current policy concerns.

FSA researchers and faculty encouraged policymakers to participate in the problem definition and research design in order to cultivate their interest in the study and to assure that the research is relevant to their current analytical needs. Policy analysis becomes more effective because it has a strong empirical base. Designing applied, policy-relevant research in combination with efforts to improve the capability of local institutions and researchers helps develop greater credibility for the project. It gives government officials further reason to consider local funding for a project that seeks to develop a sustainable system of local research, policy analysis and extension.

The delineation of the research questions was thus guided by the country's specific food security problems, the government's objectives, and current policies and programs. Much of the research focused on the operational aspects of the government activities, namely, policy reforms. Researchers studied the documents outlining the government objectives and the reforms with the objective of discovering which components were based on empirical information and which were hypotheses based on

assumption. These information gaps provided the basis for deriving researchable subhypotheses or questions "related to a set of environmental, institutional, technological and policy factors that were considered most likely to affect the ability of farmers and traders to respond to the policy reforms" (Dioné, 1989, p.33).

These subhypotheses, in turn, established the basis from which researchers could begin to define the theoretical and pragmatic components of the research question. Taking the time to set forth these components assisted researchers in establishing a solid theoretical and pragmatic foundation for the design of questionnaires. In many ways, deriving subhypotheses and components provides a bridge between the conceptual and operational aspects of the research design.

As outlined in the research planning matrix, the components and subcomponents are an important intermediate step between defining the research topic and developing questionnaires to obtain primary data. Researchers may find it useful to consider the components as sections of a questionnaire, grouping conceptually-related questions together. The subcomponents can be viewed as the different questionnaires, or parts thereof, that must be directed to different actors and institutions - farm households, traders, extension agents, market prices. That is, some of the questions and data constituting a component must be directed to farm households whereas others are asked of traders. Some research may examine or include macroeconomic aspects of the food system and therefore must be include as a subcomponent (e.g., monetary, fiscal, or exchange rate policy).

Conceiving the research as a quasi-experimental design served as a useful conceptual framework because it directed attention to researching the separate and interaction effects of changes in institutions, technology, and policy - design factors - on

people's behavior. Researchers determined what specific factors are being modified by the reforms and thus constituted the treatments of the natural experiment. A second interest concerned how the factors condition the responses of farm households and traders. Access to credit and input and output markets, owning certain types of agricultural equipment, or farming in a particular agro-climatic zone may affect the ability of farm households to respond to the reforms and improve their food security.

6.1.2 Sampling Issues

Resource constraints and interest in studying specific factors related to the reforms influenced the decision in some countries to use non-probability samples. In other words, when all constraints and objectives were balanced, a non-probability sample was often more conducive to allowing the researcher to design a study centered on the natural experiment. Some researchers used a sample design in which they selected regions and villages according to the presence and different levels of the important factors that influence the direction of people's responses.

Chapter 3 also examined the empirical advantages and difficulties of executing probability samples in many African countries. It is very important to specify clearly the research objectives and the primary level of analysis (e.g., region, village) because they affect all subsequent sampling decisions. In some situations the primary objective may be to make population estimates and draw inferences to a regional or national level. In other cases, the researcher may be interested in examining relationships between different groups. Overall, the elaboration of the research design must be guided by the research objectives, statistical theory, and resource constraints.

FSA researchers were frequently interested in studying the differences between characteristics of two or more groups (e.g., surplus and deficit farm households). Many

statistical analysis techniques require a certain number of observations to be able to detect significant differences. Researchers must attempt to define the groups for which separate estimates are needed and then select sufficient numbers of observations for reliable analysis. One of the analytical interests in FSA research centered on groups of farm households who were differentially affected by reforms due to environmental, policy, institutional, or technological factors. An important question is whether the samples sizes are sufficiently large to enable the tests to be conducted?

One of the first issues confronting a researcher in the design is the definition of the target population. And a related issue is obtaining a current sample frame for the sampling units in the designated target population. Differences between the survey population - the one actually sampled - and the target population can result in inaccurate estimates. Once study areas were chosen, FSA researchers conducted rapid censuses to establish and update existing sample frames of farm households and traders. Multi-stage samples are useful because they only require a sample frame at each stage for the units that have been selected at that stage. Their second advantage is that the cost of the field work is lower because the farm households are clustered in a small geographical area. The number of first and second stage units to select depends on the research objectives. The ratio of these units differs depending on whether the interest is in drawing inferences to a larger population or exploring relationships between groups.

Stratification can be used at either the first or second stages of a multi-stage design. It is only necessary to stratify those sample units that have been selected into the sample in the previous stage. That is, researchers only need to subdivide farm households into strata for the villages selected in the first stage. Researchers stratified farm households based on those factors that were hypothesized to influence their

responses. Villages selected in the first stage of the Zimbabwe sample were stratified by market access whereas farm households selected in the second stage in Mali were stratified by equipment levels. Stratification provides researchers better control over selection in each stratum, thus helping assure that there are sufficient numbers of farm households for different levels of the factors or for specific strata criteria.

Increasing the sample size expands field management and supervisory responsibilities and affects the ability to control the quality of the data, potentially leading to higher non-sampling error. A feasible and manageable sample size is also a function of the budgetary and technical resources and thus the number of enumerators and supervisors that can be hired. Given the objective of producing timely, policy relevant information, the size of the sample must not delay data processing and analysis and result in the accumulation of unused data.

Developing a consistent and substantively meaningful definition of the farm household - the common element in FSA studies for which inferences are made - can be a lengthy and difficult task, as every culture characterizes this entity in different ways. It is important to tie the farm household definition to the specific research focus. A consumption-oriented research focus may result in a different definition of the farm household than one used in a study on production issues.

Although the FSA project has made important progress on sampling issues, additional work needs to be done to better understand the tradeoffs involved in sampling decisions. What are the implications of certain types of research objectives on sampling decisions? What sampling rules need to be followed if the researcher is interested in making inferences to a larger population? Should the difficulty of calculating standard errors with statistical software packages affect the type of sampling design? What are

the analysis options available to the researcher who is confronted by inaccurate standard errors?

6.1.3 Question Formulation and Questionnaire Design

Collecting reliable, accurate data should be one of the researcher's major concerns during the design and implementation of a structured survey. Researchers need to invest time to pay careful attention to the issues that improve the content and formulation of questions and the structure of questionnaires. The systematic collection of responses to the same stimuli in a form conducive to prompt data entry and analysis is a major advantage of using a structured survey instrument. Researchers must carefully develop the content and structure of the question so that it invokes the same interpretation for all respondents and minimizes biases introduced from the instrument and interviewer. FSA researchers believe that rapid reconnaissance methods were useful to collect information on issues required to design effective questionnaires.

One of the most effective ways to collect specific information is to use the terminology that respondents employ when thinking about the issues in which researchers are interested. How do people remember certain information and what concepts do they use to describe this phenomena? What point of reference do people use to determine the period in which the phenomena occurred? Using local terms that refer to the different periods in the agricultural calendar or climatic conditions are two examples of how local terms can be effectively employed in a survey to help respondents recall specific information.

The term or concept of data level integrates many of the aspects of questionnaire design. The level of data refers to what the researcher wants to measure and in what format. Finding an answer to the question of at which level to collect data involves a

close examination of research objectives, and the specific data processing and analysis required. A key question is whether the data levels correspond to the way in which respondents conceptualize and remember the items of interest to the researcher.

The frequency of occurrence of the phenomena of interest is an additional component affecting data level decisions. How does this factor affect the length of time that respondents retain disaggregated information at the desired data level? Given the desired level of data, a major question is during what period(s) of the year should interviewing take place and at what rate. The answer to this question is affected by the manner and ability to recall at this level, the frequency at which the phenomena transpires, other obligations on the respondent's time (e.g., agricultural tasks), and the field work resources of the project. Researchers also need to determine the periods that would be most conducive to minimizing the recall period of the respondent and maximizing the benefits of project resources. The reference period will be longer when there is less frequent interviewing, requiring that the respondent recall more specific activities and its requisite data items.

One objective of reconnaissance surveys and an important input into the design and implementation of questions should be the determination of to whom the questions should be addressed. Many researchers have automatically assumed that questions should be addressed to the "head of household". This simplistic decision has implicitly contained a priori assumptions about decision making, knowledge, and power within the farm household. The respondent to interview is a key empirical question depending on who can most effectively answer questions given the research objectives and resources. Deciding who to interview also contributes to the determination of data level, as certain

disaggregated data must be provided, for example, by individual household members and will likely be more costly to obtain.

The questionnaire pretest enables the researcher to determine whether respondents can accurately recall each of the specific phenomena (cases) that transpired in the reference period. If there are insufficient resources to collect data at a certain level and at a desired frequency, the frequency of the interview may have to increase or the researcher will need to reexamine the decision on collecting the data at that particular level.

One value of a survey is that it facilitates the systematic collection of quantified data on specific phenomena that can in turn be processed and analyzed promptly, especially with the use of microcomputers. Timeliness in disseminating research results is an essential component of conducting policy-relevant research and building local credibility for this kind of work. If researchers conduct rapid reconnaissance surveys and pretest questionnaires thoroughly as advocated in this paper, response categories can be easily developed while still allowing for other answers. Whether precoding or postcoding techniques are used, enumerators must be trained how to ask questions and report responses. Enumerator bias can affect the interpretation of open-ended responses or the choice of a precoded answer. The choice of coding technique depends largely on how the questions are asked. Both methods demand a considerable amount of time and work, whether researchers develop precoded responses prior to the interviews or postcode answers. The advantage of precoding is that the work is completed before the interviews begin, minimizing the time after the data are collected when the researcher may want to begin analysis and conduct in-depth probes.

To date, FSA research has relied on direct questioning as the primary method to collect data. Responses can be processed quickly and over time generate increasingly accurate answers as respondents develop greater trust in the researcher's intentions and their memory of items of importance to the study improves. This does not imply that other methods cannot be useful. Both qualitative methods and physical measurement can be effective for collecting specific types of information and can be implemented on smaller selected samples. Using multiple research methods - triangulation - is an effective approach for collecting data because the different methods provide different understandings and perspectives of social phenomena and thus enrich the researcher's explanations.

6.1.4 Planning Tools

The research planning matrix (RPM), discussed in Chapter 3, is useful in thinking credibility for this kind of work. If researchers conduct rapid reconnaissance surveys and RPM assisted researchers in making the difficult design and management tradeoffs about what data to collect while trying to avoid the collection of superfluous data. The task calendar was an effective tool in helping to conceptualize the research as well as in planning data collection and scheduling the myriad of small tasks involved in the design and implementation of a survey.

The planning tools presented in this paper provide examples of how research can be managed but more importantly outline some of the issues that FSA researchers and faculty believe are important to successful research. Thinking about these issues and planning their execution in the early stages of the research will enable researchers to participate more fully in the actual field research. Planning ahead and scheduling activities provides greater flexibility to investigate interesting and often unanticipated

issues that arise in the research. The specific form of the planning tools presented in this paper are not rigid, definitive, instruments. Researchers can easily modify the parts of the RPM as their need dictate.

The last section in the RPM used by many FSA researchers referred to the source of the data. Researchers should not reject the possibility of using secondary data to fulfill their data needs. As FSA researchers discovered, however, data often do not exist in the form desired or their quality is questionable. This situation will undoubtedly improve as more attention is given in individual countries to collecting reliable, valid data as well as documenting the collection procedures needed by other researchers to evaluate and use the data.

6.1.5 Implementation

All FSA researchers believe it is important that the principal researcher spend time in the field during the implementation of the survey. Sitting in on interviews and monitoring enumerator and supervisor performance give the researcher the opportunity to learn directly from the respondents and get a feel for the data before it arrives in the office. Investing time to plan survey tasks during the design stage is an important step in collecting accurate and reliable information, and increases the likelihood that the researcher can actively participate in the field research. Several additional aspects of the implementation affect the quality of the data.

To select enumerators, researchers should start by looking at what type of individuals have been used by previous researchers for socioeconomic field work in rural areas. The local institutions participating in the study may also have suggestions or a pool of people available to work as enumerators and supervisors. In addition, it may also help the researcher to develop a list of basic skills he or she requires. At the

minimum, these may include the ability to speak the language used in the research area and knowledge of agriculture. Based on these criteria, a researcher should interview and select a number of potential candidates to participate in training and further evaluation. Although the initial interviews may give the researcher some indication about the seriousness, curiosity, and commitment of the individuals, it may be more effective to interact and observe them over a longer period during training and actually conducting interviews. The extra time taken to evaluate their ability may increase the training costs but will pay off if it avoids problems and the need to replace someone in the future. Training enumerators in a group may be preferable but is not always logistically feasible. When possible, it gives enumerators the opportunity to help one another and benefit from others' questions and insights.

Field supervision represents the first opportunity to identify and correct inconsistent or inaccurate data. The individuals hired to supervise are critical to the effective implementation of the field work as their logistical responsibilities must be completed in order to conduct the survey. Their value is, however, particularly important in their interaction with village leaders and in checking for errors and inconsistencies in the questionnaires. Their role as a monitor of enumerator performance must be performed diligently.

The preliminary tasks of editing questionnaires, creating data files, coding, and entering data may be some of the more mundane but necessary parts of field research. Editing questionnaires a second time in the office and using computer programs to check responses early in the field work preserve the option to return to the field to re-interview or check responses. This quick turnaround of the data is also essential to giving enumerators effective feedback on the quality of their data collection work. Although

office staff can perform a lot of the work, researchers must be involved in scheduling these tasks and assuring that they are being performed correctly and efficiently. If not carefully planned and implemented, data processing tasks can take up a lot of time, decreasing the researcher's time spent in the field or other activities, and subsequently hindering him/her from doing analysis and writing timely working papers.

Investing the time in the early stages of the study to plan and complete some of these tasks is beneficial if for no other reason but to have the opportunity to participate in interviews, probing and learning directly from the respondent. The smooth functioning of the data processing tasks is needed if researchers plan to conduct intermediate analysis and maintain any hope of returning to the same respondents to conduct in-depth probes. FSA researchers believe there is a high payoff to scheduling time to do data entry and analysis, and being flexible to explore new information with subsequent subsamples of particular groups.

Designing computerized data files should proceed smoothly if the researcher has worked out the substantive and operational aspects of the question and variable format, and learned about how the command structure of the data analysis package(s) performs certain operations. Even if a computer technician or an associate completes these tasks, the researcher must still be intimately involved because the structure of the computerized data files may not be conducive to doing the type of analysis required by the researcher. In short, there is no way to avoid these tasks without risking the possibility that it will not be done according to the researcher's interests.

To summarize, there is a strong relationship between investing time in the painstaking tasks of checking data both in the field and office and the quality of data collected. In theory, it is possible to design a sample to estimate some parameter with a

specified degree of precision. But if the researcher does not take the necessary steps to iteratively assess and improve the quality of the data being collected with a given sample design, the estimates derived thereof may be virtually meaningless or worse, outright misleading because of the false sense of precision.

6.1.6 Dissemination

The overall food security data base is still relatively limited in many African countries. Accordingly, empirical information on the basic parameters of food security issues remains in large part unknown to those making policy. Initial analysis in the FSA project centered on descriptive and bivariate statistics. They may seem rather simple and unexciting to academic researchers but their importance cannot be underestimated. Policymakers find it hard to believe results generated from a sophisticated statistical model if they have not first studied and understood the basic descriptive statistics. The necessity of producing descriptive statistics in the early phase of the research does not imply that sophisticated analysis is not needed or beneficial. As the researcher attempts to make sense of some issue and explain reasons for behavior, more complex analytical techniques will be required. The key is to maintain the emphasis on the research and policy dialogue objectives and not allow the quantitative tools alone to dictate the direction of analysis.

It is also necessary to understand the framework of decision-making in the relevant ministries in order to determine to whom and in what format results should be distributed. What is the organizational hierarchy and the process through which decisions are made? Who are the individuals that do analysis and may be receptive to research findings? A researcher may have to demonstrate initially the relevance of the research for policy. Efforts to include policymakers in the design process is an effective

first step in demonstrating the relevance of research for policy. Asking policymakers and analysts to share their views on important problems and issues to be researched may help to create interest in the research, to show the commitment of the project to its goals, and thereby begin to create demand for the findings. Close collaboration with the local research institution and research counterparts is very important if they are to gain credibility for their work and thereby improve their chances of obtaining budgetary resources to continue such efforts in the future.

Given the numerous demands on a researcher's time during the field research and the objective of distributing timely, policy-relevant results, researchers may find it in their interest to agree with the funding agency and local institution to produce a selected number of intermediate outputs. They should then schedule the time needed to analyze and prepare these papers or presentations. Writing and presenting a working paper at a local conference in which selected policymakers have been invited has proven to be an effective method to present current research findings that are relevant to the current policy debates and generate feedback for both parties. Researchers who present results at seminars can help officials interpret the microeconomic findings and stimulate dialogue on current policy questions.

In addition, researchers must also reserve time to interact with local counterparts during the preparation of their reports. Some researchers warned of the potential to become occupied with writing too many working papers to the neglect of managing and participating in the field work. Not only is the researcher's presence important to monitor interviews, interpret responses, but it is a valuable opportunity to learn. There is no automatic solution to this dilemma of competing time demands, but it is clear that

successful efforts to balance these factors can pay off with better research and policy dialogue.

6.1.7 General Observations on FSA Methods

Many of the techniques and methods discussed are not unique to FSA. However, the opportunity to conduct a relatively long-term research project has allowed researchers and faculty to iteratively design, test, and refine a set of integrated procedures for research planning, data collection, analysis, and disseminating results. This paper has attempted to articulate the current thinking on FSA approaches to conceptualize, design, and implement pragmatic, policy-oriented food security research. They can serve as a starting point for future research and continued iteration of effective methods.

It is undoubtedly clear to the reader that this type of multi-purpose research project is more researcher, supervisor and supporting faculty intensive than generally supposed. Researcher participation in all phases of the design and implementation requires that the individual has previously acquired many of the skills discussed in this paper. In addition, there are high opportunity costs throughout the design and implementation, especially with respect to the use of researcher time. Researchers need to assess the marginal costs and benefits in deciding where to spend their time. Some of these tradeoffs confronting FSA researchers were the result of the specific project purpose that emphasized local training and policy extension. Other researchers may not be required or choose to invest as heavily to train local analysts or to write periodic working papers. Conversely, other researchers may not benefit from the experience and participation of local analysts to assist in the design, implementation, and analysis. Moreover, their research may not easily assist in the policy dialogue process.

Nevertheless, tradeoffs in the allocation of researcher time between the various research and analysis activities are ubiquitous in survey research.

6.2 RELEVANCE AND TRANSFERABILITY OF FSA APPROACH

This section addresses the relevance of the FSA approach that combines applied research, strengthening local research capabilities, and policy extension as a model potentially applicable to other settings and projects. It is clear that in the short-run it may be difficult to transfer this model in its ideal form to African institutions characterized by resource-constrained research environments. The FSA approach is very labor intensive throughout both the conceptual and operational phases. Training graduate students and local institution counterparts to do this research requires strategic assistance from experienced faculty and technical computer personnel. FSA faculty played a crucial role in helping researchers in the substantive design decisions as well as in questionnaire design and assistance in analyzing, writing up and disseminating research findings. Moreover, technical computer personnel helped train researchers to use software needed to design questionnaires and conduct data entry and analysis and continued to provide critical support throughout the project. In short, the ability to fund and provide this type of training and support to host country researchers is critical.

The intensive participation of Ph.D researchers and experienced faculty - two factors that characterize this model - may be presently beyond the capacity of local research institutions. But many donors and host country institutions in Africa are currently placing emphasis on building up such capacity and the experience of the FSA project could be of considerable interest to these projects.

The FSA emphasis on carefully coordinating research, training, and policy dialogue may be a useful conceptual framework with which to undertake such institution

building efforts. In addition, the relative emphasis on these three components of the FSA project may be a useful set of criteria with which local institutions and donors can assess future investments in research projects. With small research budgets, it is clear that research must be focused on pertinent policy issues. In the immediate future, it appears that structural adjustments and policy reforms will continue to occupy a great deal of attention of donors and governments. To date, there has been a large amount of donor supported and dominated research conducted on the short-term impacts of reform programs. This is probably necessary and important research. It does not replace, however, applied research focused on the productive responses of food system participants, the technological, income, or institutional barriers preventing farm households and traders from attaining the policy prescribed objectives, and assessing the cost-effectiveness of alternative policies (Staatz, 1988). If the design of the reforms is neither based on empirical information nor continually and iteratively reformulated and modified, monitoring short-term impacts will become a permanent endeavor as new reforms are introduced.

Host country research institutions need to evaluate carefully the type of research programs in which they want to commit their resources. Attention must also be focused on the actual design. Policymakers and local research administrators need to assess whether multi-purpose surveys conducted on a national sample are appropriate for researching priority policy questions and collect the specific data needed for their analysis. In particular, policymakers and local research institutions must determine if this approach is generating the type of information needed to understand the factors that influence behavior and thus the elements that must be added to the reforms if they are to lead to improved performance.

Notwithstanding the importance of analyzing short-term problems, it is also clear that efforts must be made to continually train local researchers with the objective of developing the internal institutional capacity to conduct future research and analysis without reliance on outside assistance. The theoretical and in-service training required, as exemplified in this paper, go beyond that learned in graduate programs. The skills and knowledge needed to manage field research effectively are learned only through actually doing the work. As previous field researchers will attest, the knowledge and understanding gained from direct participation in field research is invaluable and arguably, a necessary part of developing effective policy analysts.

The investment in researcher and faculty time, and resources for field work in the FSA project are significant. There are few, if any, research and training institutions in Africa with the ability to duplicate these investments. This is being recognized increasingly by host country and donor officials. There is likewise a recognition of the need for empirical insights into the reform programs being undertaken. Therefore, conceptualizing research not only as an opportunity to conduct applied research, but also to contribute to improved policies and, at the same time, to develop human capital is important for building additional capacity within African institutions. The solution to developing a sustainable applied research program that emphasizes training and policy dialogue when there are minimal financial resources may be found in a scaled down approach funded by small, incremental investments. Based on the FSA experience, donors and research administrators may want to evaluate the effectiveness and relevance to national objectives of implementing large-scale and independently focused training, research or extension projects. Isolated projects focused on only one objective - either applied research, training or policy extension - may not be as effective as a program

based on more modest combinations of the objectives that are well coordinated and policy relevant.

Evaluating the return to research, training, and well-informed, empirically based policy analysis is a difficult task. It would be advantageous to develop some quantitative measure of the rate of return to this type of program to use in convincing donors and national governments that investing in building up the research and policy dialogue capacity of local institutions will have a high payoff. Short-term policy dialogue and technical assistance missions are being used extensively by donors to assist in their development investment decision making. An important question is whether these short-term efforts can find effective ways to contribute to the longer-run information and capacity building required.

Towards this end, two observations are offered. First, the value of information generated by applied research is derived from its use in making decisions. Many of the decisions policymakers are facing in terms of structural reforms affect large numbers of people. Generating timely, empirical, and policy-relevant information that leads to well-designed policy and minimizes negative consequences can be extremely valuable. Since "knowledge about a specific problem is dependent on the system of inquiry used in obtaining that knowledge," researchers and administrators must pay close attention to the methods used in obtaining the information (Riemenschneider and Bonnen, 1979, p.146). Effective applied research must therefore be policy-relevant and based on sound methods.

Second, short-term, donor-supported technical assistance efforts may be missing opportunities to develop local capacity by providing in-service training similar to that provided in the FSA project. Policy research and analysis (especially short-term in

nature) conducted continuously by or dependent on foreigners is clearly not sustainable and arguably not the most effective type of analysis that can be undertaken. Investing in the development of local researchers and a policy analysis capability, however, contribute to flexibility and rapid responsiveness that is not available from outside analysts. If effectively trained, local analysts can complete more research and do policy analysis that has a higher probability of being considered by policymakers because it reflects local realities more clearly and is based on a broader "understanding of the local institutional, social, and cultural context" in addition to sound economic analysis" (Steedman, 1987). The policy analysis and elucidation of available choices to policymakers are also likely to be politically acceptable ones when they are developed by local analysts.

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