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COOPERATIVE AGREEMENT ON HUMAN SETTLEMENTS AND NATURAL RESOURCE SYSTEMS ANALYSIS

Clark University
International Development Program
950 Main Street
Worcester, MA 01610

Institute for Development Anthropology
99 Collier Street
P.O. Box 2207
Binghamton, NY 13902

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A REPORT ON METHODOLOGIES FOR SURVEY RESEARCH

Peter D. Little
Angelique Haugerud
Michael L. Burton
Gerald Spittle

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CHAPTER I

INTRODUCTION

A. Background to Survey Methodology Improvement Project

This report responds to concerns expressed by REDSO/ESA that the survey methodologies used in support of AID's policy-based assistance programs in Eastern and Southern Africa be as rigorous as possible given constraints on time and funding. The outline of the report is based on a scope of work prepared by REDSO/ESA that requested separate sections on (1) survey design; (2) survey management; and (3) data analysis.

REDSO's recent surveys (ongoing and planned) in Burundi, Kenya, and Tanzania provide some of the empirical materials for the report. These studies give points of departure for making recommendations to improve REDSO's survey design, management, and analysis. We use data from our own work and that of other researchers to supplement REDSO's survey materials and to point to models of possible use to REDSO.

B. Demands of Policy-Based Socioeconomic Surveys

Socioeconomic surveys carried out in support of policy-based assistance programs create the following special demands on the researcher:

- an emphasis on collecting local-level data that has clear relevance to larger macro/sectoral concerns and that can be used later to monitor the impact of policy changes (e.g., changes in pricing policy);

- a focus on multiple data collection units, including those at individual, household, community, regional and national levels; and
- an emphasis on collecting data on income, economic differentiation, and other indicators of welfare and poverty, which can be used to monitor local policy impacts.

In short, the demands of socioeconomic surveys for policy-based programs differ in several ways from other types of development social science research. Discussions with REDSO staff confirmed this and pointed to four critical problem areas that are of special concern to REDSO's survey work. These include:

- designing survey instruments that adequately measure income and other wealth characteristics, often within the time constraints of a one-shot survey;
- deciding on a sample size that is sufficiently large to assess variation in a national sector, but small enough that the researcher can maintain quality control -- frequently there is an inverse correlation between sample size and quality of data collected;
- devising cost-effective monitoring systems that measure the local impact of policy changes, using carefully selected indicators; and
- designing data analysis/management systems that provide policymakers with relevant survey findings in a timely

fashion.

These points are discussed in several sections of the report.

C. Typology of Surveys

The report uses a four-category typology for discussing general survey methodologies and the specifics of the various REDSO surveys. This typology describes the kinds of social science research that REDSO often conducts, but it is not intended to be exhaustive of the types of surveys carried out by development social scientists. The surveys noted below are discussed in more detail in Section (II).

1. Short Exploratory Surveys

This refers to the brief reconnaissance research AID Missions and REDSO often carry out. We distinguish between unstructured, exploratory surveys and semistructured rapid assessments. The former are usually limited to 2-3 weeks in duration, use unstructured survey techniques, and rely heavily on secondary data. The latter are often called rapid rural appraisals (RRA) or diagnostic research (i.e., in the farming systems approach) and use semistructured survey instruments with fieldwork lasting up to 4-6 weeks. While in the case of farming systems research, diagnostic research is a first step in an overall research program, in the design of development programs the rapid assessment is often the only social science research conducted.

2. Short-Term, Focused Surveys

This type of research frequently deals with a specific region or district and lasts 2 to 3 months from design to presentation of findings. It often uses formal questionnaires and quantitative data analysis. The recent Meru District and Nairobi health surveys carried out by REDSO and USAID are examples of this type of research. In these cases, the research problem is well-focused; the Kenyan health surveys were limited to exploring the use of public versus private health facilities, and the practicality of user fees for government facilities. Because the problem is well-defined, the survey can focus on a limited number of variables and use a relatively simple questionnaire. These location-specific surveys make generalizations to a wider universe (national level) difficult.

3. Medium-Term, Broad-Based Surveys

This survey type usually is sector-based and national in orientation. It is designed to acquire one-shot, baseline data and to be completed, from design to data presentation, in 6-8 months. For these surveys, of which the Burundi household and Tanzania road studies are examples, the policy questions/problems are not well-defined. The survey instrument must address topics that range from farm management practices to income and expenditures. In the Burundi case there is a premium on timely submission of findings, because the data are to be used in the design of an AID-funded policy reform program. In contrast to survey type (2) -- short-term surveys -- there is more time in a

6-8 month survey to pretest questionnaires, to have them translated into the local language, and to carry out more sophisticated data analysis and presentation.

4. Recurrent, Multiple-Visit Surveys

This survey type often is used to monitor the impact of a particular development program or policy, or to collect "flow" data on labor, consumption, expenditure, and other variables that are difficult to measure adequately through one-shot surveys. In the case of monitoring, a baseline survey is carried out first and from this indicators are selected that are updated periodically to measure change. In contrast to single-visit surveys, the multiple-visit approach has data collection spread out over one to five years. The recurrent survey is particularly appropriate for measuring the local impact of policy reform on such socioeconomic indicators as income, consumption, expenditures, and marketing behavior. While this approach is least representative of the kinds of surveys carried out by REDSO, it receives considerable attention in the report because (1) it is a cost-effective, simple technique for measuring the impact of policy reform, and (2) it has many advantages over one-shot surveys, in terms of quality of data and capacity to measure change.

CHAPTER II

SURVEY DESIGN

This chapter discusses essential steps in survey design. It begins with a definition of a research problem and ends with a discussion of interview schedules. Frequently surveys are not developed in a stepwise fashion, so that the actual design of survey instruments reflects neither the problem identified nor the data required to address the problem. Certain design issues of particular concern to REDSO, such as measurements of income, income distribution, labor, and production output are given special attention at the end of the section. This chapter of the report is considerably longer than the others, because survey design is an important step that determines the success of survey management and data analysis.

A. Research Design

1. Problem Definition and Hypothesis Formulation

We must examine at least two levels of problem identification in the design of policy-relevant surveys. The first is to identify the policy problem or issue the data are to address. The second is to formulate researchable hypotheses that can be investigated in the field. The more precisely initial policy problems and objectives can be defined, the more useful and focused the data collection and analysis will be. A good contrast is between AID's recent district-based health-user survey in Meru, Kenya, where the problem and policy implications

were clearly identified, and the recently-completed Juba Valley Studies, where objectives and policy implications were very broadly defined.

The initial identification of the policy issue or problem is often given to the survey researcher by policymakers, with instructions such as: "tell us what the impact of liberalization of price policies will be on small farmers." At this point it is important that the researcher and policy makers discuss how the data to be collected will be used, what level of specificity or quantification is required, and why certain findings might have policy implications. Such discussion helps to limit the scope of the survey and to show where assumptions about the relevance of survey findings may be unrealistic. For example, policymakers may hope to have quantitative data on a larger percentage of households than is realistic, given resource and time limitations. Because adequate discussions between survey researchers and policy makers are often absent in the design of surveys, the researchers often embark on a research project that goes beyond the time limitations set by the project (often no more than 6-8 months at the maximum).

As Casley and Lury (1987:18) point out, it might be prudent to present some hypothetical research results to the intended audience and ask whether a certain finding might have policy implications under the program. For example, one may learn that a certain agricultural policy is likely to result in environmental problems, because certain crops will be expanded

onto marginal lands. Is this the type of finding likely to address the particular policy question? Obviously, there is a limit to how far a project officer or policymaker can go in specifying the policy issue, but pushing toward specificity at the earliest stages of design will avoid later misunderstandings or disappointments when, for instance, qualitative rather than quantitative findings are presented.

a. Hierarchies of Research Questions

Once the policy issue, the audience for the research findings, and the resource limitations of the survey have been defined, attention can be directed toward identifying testable research problems or hypotheses for the survey. It is useful to think of research problems in a hierarchical sense, starting with a general problem and then defining specific related problems. It is the latter that often lead more directly to the design of survey instruments and data analysis systems. The AID/Michigan State University Food Security Project has used this type of approach (part of their "research planning matrix") to identify research problems in several of its projects (Crawford et al. 1988). A hypothetical example of this type of hierarchical ordering of problems would be a survey of rural-urban linkages in an African country. At the highest level the general research problem might be stated as follows: the economic interactions between rural and urban areas mutually benefit both sectors and are important for generating development in particular regions. Several specific questions then can be identified that are

related to the general question. These might include, for example, whether the strongest economic linkages between urban and rural areas are in terms of commerce; whether rural-urban linkages mainly benefit the larger towns; or whether production and trade in certain agricultural commodities influence the nature of relations between rural and urban areas. These then can be turned into testable research hypotheses.

Using the example of REDSO's Burundi household study, we can discuss a similar process of ordering research questions from the general to the specific. In this case, the general research problem is whether or not rural Burundi households participate significantly in trade, either as sellers or buyers of food and other goods. In the Burundi study, the policy framework was very broadly identified (e.g., U.S. agricultural and economic policy reform), but certain specific assumptions had been made about the nature of small farmers. These defined research questions that were incorporated into the survey, including the relationship between agroecological zones and household income and expenditures; the nature of income and expenditure linkages between rural and urban areas; and differences in expenditures by income category. These subsets of the larger research question can be further broken down into more specific research questions. For example, one might want to test the hypothesis that the importance of nonfarm income varies with distance from major urban centers. Under the time constraints of REDSO's surveys it is unlikely that identification of research problems or

hypotheses would proceed much below a third level of identifying research questions. In the Burundi case one could pose a fourth-level question such as the importance of nonfarm income for certain members of the household (young/old, male/female) in relation to distance from urban centers.

b. Beginning To Think About Data Analysis

It is advisable when formulating specific research questions and hypotheses to plan for the types of data and analysis required to study them. Survey questions are frequently posed without their ever having been considered implications for analysis. The types of analyses required to answer specific research questions should be outlined. The simplest way to proceed is to construct a cross-tabulation chart, listing all the possible relationships between variables that would be essential to answering particular research questions. Along the top of the table would be a variable such as income and along the side a variable measuring certain crop mixes. It should be noted that in most cases the researcher would be looking at relationships between at least three variables -- for example, income, crop mix, and agroecological zone/location -- but to keep matters simple we will use the two-variable case. The hypothetical tabulation will indicate what type of data are required to fill in the blank in the chart between the two variables (i.e., to confirm or disconfirm the relationship); what types of analysis might be required to answer the question; and whether or not understanding the relationship between the two variables is worth

pursuing in view of the policy objectives and general research problem.

At this point in the design, it is useful for the researcher to list all the possible interrelationships and analyses that would be needed to answer the research question(s). For example, if measurements of income distribution and its impact on certain economic activities are essential to answering the research question, then a decision must be made about how many economic activities should be analyzed with respect to differences in income. The more work that can be done at this point, the more focused the actual survey instrument and data analysis will be. In addition to thinking of hypothetical cross-tabulations, one can draw up a tentative list of all the data tables that one might want to include in the presentation of research results.

The next several sections discuss specific types of data that are useful in development research, identification of appropriate units of analysis, and determination of appropriate survey types.

c. Beginning To Think About Data Requirements

A major reason for considering possible tabulations and data analysis when formulating research questions is to begin to think about data requirements. What particular data are required to assess relationships among sets of variables? For example, if a subset of research questions concerns the relationship between availability of farm labor and adoption of new farming techniques, then obviously labor use data must be collected.

Since collecting data on agricultural labor inputs is time-consuming, the researcher must decide what types of labor data are essential to the project, given time and resource constraints. Alternative means of collecting labor data are discussed later in this chapter.

We have outlined a three-step, iterative process that allows identified research problems to be related to data analysis and data collection requirements in the very earliest stages of research design. By looking at data analysis and the kinds of data that need to be collected, the researcher can verify whether s/he has identified a feasible research problem. When this iterative process is completed and a viable research problem is in place, then the design exercise can turn to the specifics of data collection and the identification of appropriate research units for the survey.

2. Types of Data Required

a. Levels of Measurement

Socioeconomic data can be measured at three levels. Nominal variables involve coding observations or responses into discrete categories. Examples of nominal variables are gender (male, female), ethnicity (Kikuyu, Luo, Somali), coffee production (present/absent), and paved road (present/absent). Ordinal variables involve categories that can be rank-ordered. Examples are education (none, primary, secondary, university), status of wife (first wife, second wife, third wife), and size of farm (large, medium, small). Ordinal variables are often used to give

some sense of quantity when exact quantitative measures are impossible. Interval scale variables involve measurement with real numbers and can be added and subtracted in a meaningful way. Examples of interval scale variables are coffee production (number of bags), number of people in a household, and years of education.

b. Quantitative Data

Quantitative analysis can be the aim of any of the four types of surveys discussed in this report. Rapid assessments or exploratory surveys, for example, may collect data on wage rates, field size, or retail prices. Short- and medium-term surveys and multiple-visit surveys often involve collection of quantitative data on variables such as household production, consumption, expenditure, income, and farm size. Many agricultural projects require quantitative information on crop output consumed at home, marketed, and given away. Two types of quantitative data may be distinguished: continuous and stock data.

Continuous data on labor, consumption, expenditure, or income often are collected through recurrent-visit surveys. There are also shortcut means of gathering such data in single-visit surveys. Agricultural economists have well-developed research methodologies for cost-route surveys to measure production inputs and outputs over one or more agricultural cycle(s). These recurrent-visit surveys usually are based on recall data. The alternative is direct observation or direct measurement of labor allocation, food consumption, or crop

yields. Allan Johnson's (1975) random visiting technique is one means of collecting time allocation data through randomized direct observation. Direct measurement of crop output is discussed in Section II,C,3 below.

Reliability of recall varies by data type; for example, cattle sales are remembered longer than smaller and more frequent sales of food crops and longer than daily labor inputs. Recall is best for infrequent events of great significance to the respondent, and poorest for infrequent or irregular events of little significance.

Respondents may reply to questions about frequent and regular events on the basis of generalized past experience rather than specific recent behavior. This need <u>not</u> be a disadvantage in surveys. In the case of labor input data, for example, relying on responses based on such experience in a one-shot survey can reduce survey costs. For example, AID's Burundi study requires assessments of rural households' use of hired, family, and cooperative labor. The information necessary to program planning can be obtained in single-visit survey questions about respondents' labor requirements based on general experience. Recalling specific labor inputs over a particular season is less reliable, and recurrent-visit surveys on daily time allocation are usually unnecessary for AID's purposes. How to collect labor and time allocation data is discussed more fully later in this chapter.

Based on years of field experience, Peter Matlon, Michael

Collinson, and other agricultural economists have assessed the relationship between interview frequency and recall reliability for a number of types of data commonly collected in agricultural surveys (e.g., daily labor inputs, harvested quantities, food purchases).

The design, implementation, and analysis of standard cost-route surveys are quite costly in time and labor. The policy concerns prompting the survey will determine whether the level of precision obtained justifies the expense. Since the 1970s, a number of agricultural economists have developed shortcuts that eliminate the need for frequent (e.g., twice weekly) interviewing, but that still allow collection of rural economic data useful to policy decisions. Timing a one-shot survey at the end of a production cycle, for example, may provide more reliable data on farmers' profit and loss positions than a midseason survey that requests information about a previous season. In the latter case there is greater risk of transferring income or expenditure items out of the intended reference period.

Stock data on assets used in production or land or livestock holdings can be collected in one-shot surveys. It is often useful to do an inventory of fields, crops, cultivars, storage facilities, house type, and agricultural implements. These data should be confirmed visually to the extent possible. A combination of direct observation and interview techniques is likely to give the most reliable data.

While visual inspection of the livestock of settled farmers

is sometimes possible (if animals are grazed on or near the farm), it is more difficult to verify the animal holdings of nomadic peoples. In assessing farm size, direct measurement techniques include aerial photographic surveys and field measurement (e.g., with compass and tapes). Casley and Lury (1987:191-194) describe physical measurement techniques for land holdings. Field measurement is best done immediately after planting or harvesting, rather than in midseason, when crops may be trampled and visibility poor. Land measurement is sometimes locally sensitive, if it is associated with government reform programs, volatile tenure security issues, or taxation.

One alternative to measuring land is estimation based on local proxy measures, such as number of heaps of yams or cassava, or number of days required to ridge. These proxies are then converted to standard area units based on direct measurement of a sample of fields, followed by use of a regression equation relating the two variables (to predict field size on the basis of estimates in local units). Estimates based on local measures of course are subject to errors arising from nonstandardization of measures from one field or farmer to another. Differences in soil density, for example affect work rates and hence proxy measures based on them. Other complications arise in equatorial rainforest zones of shifting cultivation, where seasons are not pronounced.

In areas where title deeds have been issued, farmers will probably know the size of their parcels. Care should be taken to

avoid confusion between hectares and acres; land titles issued in central Kenya, for example, have used both units at different times. Wherever possible, the researcher should ask to see title deeds to confirm size and units. De facto "ownership," residence, and control of land, however, often do not coincide with official land registers. An individual may farm several parcels of land, but be official title holder of only one. Interviews and participant-observation must be used to assess the relationship between informal and formal systems of land tenure.

c. Qualitative or Ethnographic Data

Most development projects require a combination of qualitative and quantitative data. Norton and Benoliel (1987:7) suggest, for example, that quantitative data can tell project managers what has happened but not why or how. Qualitative data, they say, are required to answer "questions concerning institutional performance, the implementation process, participants' behavioral change, participants' quality of life, and unanticipated . . . project impacts."

Qualitative observational data provide a check on recorded quantitative data, sometimes turning up overlooked phenomena of importance. Examples include stumbling upon illegal beer-brewing as an important income-earning activity, or recognizing important local political alignments from seating patterns and interpersonal interactions in official meetings. These data can help in the interpretation of quantitative data and in the identification of additional research issues.

Key informant interviews seek out individuals or groups of people who have special knowledge on a topic of interest (e.g., chiefs, district officers, agricultural extension agents, rural traders, teachers, health workers). The biases of such individuals must be balanced by seeking out other less visible individuals and those likely to hold contrary opinions. Group interviews require sensitivity to participants' beliefs about the connection between their replies and possible sanctions or benefits. Chambers (1987:43) has found that such interviews are especially useful in collecting information about distribution and quality of natural resources (such as soil or vegetation patterns).

A variant on key informant interviewing is the interviewing of key informants who are connected by a social network. One common use is key informant interviewing that traces the linkages in a market system. These kinds of interviews may require tracing linkages across international boundaries, as in studies of African livestock marketing. This kind of network sampling of key informants may be the only reliable way to get data on such a system. In using key informant interviewing to study market systems, the best procedure is to begin with medium-scale market people in the middle of a system -- people who have direct experience with linkages downward to the rural producers as well as upward to the international level.

d. Data Required for Cross-Sectional Analysis

Cross-sectional data are collected at a single time for a sample of individuals, households, or communities. In development studies such data are collected using focused, short-term surveys or broad-based, medium-term surveys.

Cross-sectional data may have a single level or multiple levels. In the former case the units might be households within a given community, or communities within a given region. In the latter case the first level could be individuals and the second level the households wherein they reside. A second example would be households at the first level of analysis and communities at the second level.

In these cases, the information management system should allow for two or more levels of data, for example, blocks of data (households) and records within blocks (individuals within the household).

With a multiple-level data structure it may be desirable to code for the relationships among the units at a given level. For example, in household surveys where several individuals are interviewed within a household, one might code for the specific relationship between every pair of individuals. Doing so requires a code for the various categories of relationships, then construction of a matrix of the relationships among the individuals. For example, in an African household the categories could include husband, wife, cowife, father, mother, son, daughter, male sibling, and female sibling. If one were to do

this, the network matrix representing the social ties within a household should be stored in a separate array, with a label that indicates which household it describes.

Software for storing data coded at more than one level are described in Chapter IV.

e. Data Required for Time-Series Analysis

Data from more than one point in time will be collected either through a multiwave survey or through the use of a continuous monitoring system. Typically the question asked of the data is whether outcome measures (e.g., market participation, production of some crop, quality of life indicators) have changed as a consequence of policy changes or project implementations. There are two distinct situations with respect to the policy variable(s). In the first case there is a discrete policy change or project implementation. The research question involves a before and after comparison, with one or more data points before and after the policy shift. For example, one might have quarterly time series data for five years, with the policy change or project implementation occurring at the end of year two. An example would be monitoring of changes due to construction of a dam, where data were collected for several years before and after the dam was constructed.

In the second case the policy varies continuously. An example would be an experiment with floating exchange rates, where the variable (the local currency exchange rate) would change on a daily or monthly basis. A similar concept would be

liberalization of grain marketing so that grain prices could fluctuate continuously.

Most books on research design state that more powerful inferences can be made from data on change over time than from cross-sectional data. Evaluation research as an academic discipline is based on the idea that true experimentation with a before and after comparison is the ideal way to conduct evaluations. The ideal experiment would involve an experimental condition (those who receive the policy implementation) and a control group (those who do not receive the policy implementation). Individuals would be assigned at random to the experimental group and control group. Both groups would be observed before and after the implementation.

Clearly, this kind of experiment cannot be conducted in development studies. Rather than having random assignment of people to groups, what we typically find in development studies is assignment of communities to treatments based on political considerations or on current development priorities. In that case, there are a number of caveats that must be attended to with respect to any inferences about change. The following threats to validity of inferences about change over time are discussed in Campbell and Stanley (1963) and Cook and Campbell (1979).

i. Selection Bias

The individuals or communities that receive the policy treatment will not be a random sample of the entire population. These communities may have characteristics that make them more or

less likely to be selected for policy implementation. The differences between groups receiving the implementation and other groups that do not receive it may be due to these selection attributes rather than to the policy variable. Two common types of selection bias are selection in favor of high-income groups and selection in favor of low-income groups.

The former may happen for political reasons, or because high-income groups are closer to roads, own the land, have better network ties for obtaining credit, or are linked more closely with the communications media. The latter often happens because of a development policy that targets low-income groups.

In making inferences where community assignment to policy treatments is nonrandom, thought must be given to the kinds of selections that have been made and to the ways that those selections can be hypothesized to affect the validity of inferences. Wherever possible, communities that have been selected on the basis of some social attribute should be compared with communities that differ on the same attribute.

ii. Regression to the Mean

This basic law of statistics magnifies the effects of selection bias. At any given time some of the individuals who are far from the mean of a statistical distribution are there due to chance events. The most likely event over the next time period is that those individuals will move closer to the mean. If individuals or communities are given some social intervention because they are far below the mean on some variable, such as

economic status, chance will bring them closer to the mean in the next time period, thereby raising their economic status.

By this law of statistics, any group of extremely poor people will become less poor in the next time period purely by chance. For example, some of them will be poor because they have recently suffered from accidents (their house burned down, their one cow died of disease), because of unusual climatic events (typhoons, drought, flooding), or because of a death in the family. Over time, through the operation of chance, such a group of extremely poor people will become somewhat less poor, as they recover from these chance events.

If a project is aimed at those poor people, and if they become less poor over the life of the project, part of their improvement will be due to regression toward the mean, not to the project.

It should be emphasized that even though the selected group will become less poor by chance, the societal income distribution will not change by chance since there will be new people thrown into extreme poverty by the chance events of the new time period.

The best way to estimate the effects of regression to the mean is to compare the targeted population with another population with similar social characteristics that does not receive the treatment. For example, suppose there were a program of support services for rural enterprises whose primary goal was to provide employment opportunities for the poorest of the poor, and the population to be monitored was selected because of its

low income. Evaluation of the effects of the program would be accomplished best by monitoring some other population of very poor people with similar social and cultural characteristics to the study population, but in an area where there was no rural enterprise program. Gains in social welfare indicators for the study population would be compared to gains in the same indicators for the control population. Only if the gain scores for the study population were significantly greater (using t-tests) than the gain scores for the control population could one infer that the rural enterprise project had an effect on employment of the study population.

Clearly, this kind of evaluation will be very difficult to do in practice. Most social policy evaluations involve only the targeted population; monitoring a community outside the range of the project in question could be difficult to organize and administer.

For this reason, we recommend that monitoring not be based on the observation of populations that were selected because of their unusual social characteristics, but should be, wherever possible, based on representative samples from some general population (e.g., a community, region, or nation).

One advantage of policy-oriented evaluations over project-oriented evaluations is that policy changes tend to affect a general population, whereas projects often target a selected subgroup.

iii. Maturation

During the life of the project the people who experience its implementation are aging. In most societies there is a developmental cycle of household prosperity, with rising standards of living from early adulthood to middle adulthood, and declining prosperity from middle adulthood to old age. In a country with rapid growth rates, most people are young, so over the life of the project, most people in an evaluation sample will be moving from early adulthood to middle adulthood. Their economic status would have improved because of maturation.

During the same time period a new cohort of people will move from adolescence to the poverty of early adulthood. If the evaluation is based on a fixed sample (a panel), the new cohort will not be included in the sample.

iv. History

History refers to secular changes within the larger population. For example, during the five-year life of an evaluation a nation that depends heavily upon growing coffee may experience a boom or a slump in coffee prices. The increasing or declining prosperity during the life of a project evaluation may be due largely to the historical effects of coffee prices on the nation as a whole. Because of the effects of secular trends, it is common to find that many social indicators move in the same direction, and are highly correlated with each other. This problem is usually called temporal autocorrelation. It is parallel to the problem of spatial autocorrelation discussed

below.

v. Testing (experimenter) Effects

These are effects upon the observed population due to the presence of the observer. In the case of a large social research project in a small, rural community, the money spent by the project and the employment generated by the project may have a significant impact on the community. A second version of the experimenter effect is that respondents will become trained over time to provide answers that they think the interviewer wants to hear. For example, they may want to please the interviewer by providing evidence of successful development, and bias their responses over time to filter out negative information.

In general, the larger the research team, the more money it spends, and the greater the degree to which it represents an alien culture and values, the greater the experimenter effect. For this reason we recommend that longitudinal data be collected by local people, with only one such person being stationed in each community, spending a small amount of money.

3. Identification of Significant Research Units

In identifying research units, the lowest level required to address a research problem must be used. It is always possible to aggregate data from lower-level units, such as households, to larger units, such as communities, but it is not possible to disaggregate data collected from larger units to make valid inferences about smaller units (see Bernard 1988). If the research question or hypothesis requires exploration of variables

at the household level, then it is necessary to collect data at this level and not try to infer relationships from a larger unit, such as a community or region. As noted below, it is often a problem when researchers use the household as the standard unit, but discover that in order to answer the stated research question a sample of subhousehold units needs to be examined.

a. Subhousehold Units

While it is generally recognized that many research problems require data collection at the subhousehold level, very few surveys actually utilize such units. Rather, the more common procedure is to collect household-level data and then infer the relationships at subhousehold levels. Assessments of nutritional and food-aid programs have probably made the largest gains in using subhousehold units for sampling, especially in utilizing female-focused units (e.g., a mother and her children). Anne Fleuret, for example, examined the impact of a food aid program on children and mothers in Taita, Kenya, by employing a unit of analysis that was composed of a mother and her children within the household (Fleuret 1988). In looking at food aid impacts on women and children, she not only had to define a subhousehold unit but also had to examine relationships among different subhousehold units (i.e., intrahousehold dynamics). Because surveys of subhousehold units have only recently been undertaken, there are not many models of survey schedules that can be used. Most of these are usually appended to household schedules with instructions to interview only the head (e.g., a woman) of a

certain subunit. The logistics of preparing an interview schedule for subhousehold units are discussed in a later section. When data are collected at the subhousehold level, they usually accompany a household survey.

b. Households

There is probably no social unit that has been more misused in survey research than the household. Most problems stem from difficulties in defining a household (usually said to be all those members of a residential unit that "eat from a common pot"), and from assumptions about the household acting as a corporate unit. This definition is flawed in certain communities, such as nomadic ones, where households are often split during much of the year, and where the sharing of labor and rights to assets (i.e., animals) are more important criteria than is the sharing of food. Moreover, in many rural areas of Africa household composition changes during the year, because of wage labor migration and the borrowing and incorporation of kinsmen at certain times of the year (e.g., the agricultural season).

In defining the household or a unit that approximates it, two general rules should be followed: (1) what definition of household or other residential unit allows you to address your research question; and (2) what is the actual classification terminology that the community uses to define residential units. The latter criterion gives a good idea of what the meaningful residential units for the community are and helps in the decision about an appropriate unit. Answers to household-level questions

may be given in the context of their own definition, so it is important to be aware of the local taxonomy. While the "household" is the standard unit of analysis for most government surveys in Africa and, thus, in many cases the REDSO researcher has no choice but to use the government's definition of a household, researchers should indicate any resulting limitations on possible inferences and analyses.

For some survey objectives, a rigorous definition of household may not be necessary. In a rapid exploratory survey that aims at quickly documenting different farming or marketing systems, neither a rigorous definition of household nor examination of subhousehold units may be required. However, inferences about male/female differences in farming systems, for example, cannot usually be made from this type of data. The Burundi household study is one where the objectives are broad enough that a fine-tuned definition of household or subhousehold units is not required. This survey has been designed to provide information on rural and urban income and expenditure patterns that can then be used to assess whether or not rural Burundians operate in a self-sufficient subsistence economy. The survey can also answer questions regarding the influence of agroecological zones and location (vis-à-vis urban centers) on rural income and expenditure patterns, as well as the nature of economic linkages between rural and urban areas. In sum, it is often unavoidable (and in some cases it is preferable) to use the "household" as the unit in social surveys, but, as noted above, one should be

aware of tradeoffs in analysis and in addressing certain questions regarding intrahousehold activities.

c. Community/Village

The community unit is often appropriate for carrying out short, exploratory research that collects background data on a relatively large area. Again, the question one wants to answer in the survey should direct decisions about whether or not the community is a useful unit of analysis. Even in short-to-medium term research (2-8 months), where households are the primary unit of analysis, the community can also be an important unit. From our experience, most household-level surveys should be complemented with an examination of particular communities. In activities such as irrigation, forestry, and range management (including tenure) the community is a particularly useful unit, since many important decisions affecting household behavior are made at this level. In many cases, the notion of community or village as a social or spatial unit is already defined by the government and, thus, for results to be incorporated into existing data bases and programs the survey must use the government's typology (whether a community is called a sublocation [Kenya] or a beel [Somalia]).

The use of community as a unit of analysis may not be as important for certain types of policy-based surveys, as it is for rural development research involving location-specific projects. In the Burundi household study, for example, the important units of analysis are household and agroecological zone, whereas

community is not treated as an important unit. Similarly, in carrying out feasibility research for a USAID maize marketing program in Kenya, the authors found that the policy issues and problems were such that farmers (male and female), traders, and districts were the important units of analysis, rather than community (Barclay et al. 1989). In the latter case, the social analysis dealt with the potential impacts of changes in maize marketing policy on farmers and traders. When location-specific studies are carried out to examine the implications of a policy change in a sample district (such as was the case in the Meru health survey), then community is likely to emerge as an important unit for organizing data collection. In the Meru case households were surveyed in four communities, representing two different agroecological zones, to assess the use of public and private health facilities. A case study of the impact of policy change in a particular location is another example where community is likely to be an important unit of analysis.

d. Administrative Units

Surveys are often locked into designing data collection among predefined administrative units, such as districts or provinces. The practical logistics of designing a survey require that permissions and help from government officials be sought at different administrative levels, in order to carry out surveys within administrative units. This affects the organization of the survey. The administrative structure may also influence how the results of a survey are utilized. In Kenya with its strong

emphasis c district-level planning, it would be very difficult to carry out a regional or national survey that did not use in part the district for organizing data collection. In other countries it may be a different unit, but in most cases administrative structures will have some influence on how data are collected. The use of administrative units for organizing research should not hamper research design. If necessary, the limitations of the administrative structure can be overcome during analysis by using a combination of districts or subdistrict units, which may make more economic or ecological sense.

e. Regions/Agroecological Zones

Many countries in eastern and southern Africa are so ecologically diverse that in order to carry out policy-relevant research it is necessary to sample different agroecological areas. Exploratory, short-term surveys of farming systems almost always include a sample covering different agroecological zones. Ecological variables have such an important effect on cropping patterns, consumption, and marketing in countries like Kenya, that it would be difficult to design any survey of household economies that did not account for ecological variation. A survey on household income and expenditures, the results of which are to inform national policy decisions, must cover at least the major agroecological zones.

Most African countries already have an agroecological classification system for agricultural planning. In Burundi, for

example, the existing agroecological classification system is being used to organize data collection. Most such classifications are based on cropping patterns and not on marketing or other economic activities. In the Burundi case, the recent AID marketing study found that the country's classification system had little relevance for market systems. The testing of whether a particular classification system is appropriate for a survey is time-consuming. In the Burundi case, there was not sufficient time to do it. We suggest, however, that one function of the short, exploratory survey be to estimate whether a particular agroecological classification system is relevant for a proposed study. While the system cannot be fully validated or invalidated, one can observe, for example, whether significant marketing activities seem to correlate with the typology; or whether the classification is based on cropping differences that may be too detailed to be relevant for the proposed survey. In this case, the classification system could be simplified to limit the number of different zones that need to be sampled. This seems to have been the case in the design of the Burundi household survey.

4. Determination of Survey Type

Selection of survey type is determined by the assessment of the research problem, decisions about the type of data to be collected, and the identification of appropriate research units. Here we consider the four types of surveys identified in the Introduction (I). It should be noted that carrying out one type

of survey does not preclude conducting another type of survey either before, during implementation, or after the main survey has been completed.

a. Short Exploratory or Reconnaissance Surveys

i. Unstructured, Exploratory Surveys

The short exploratory survey of 2-3 weeks relies heavily on secondary data, unstructured interviews, key informant interviews, and group interviews. It comes closest to approximating what Chambers calls "rural development tourism." It is not designed to be a formal survey and in most cases little attention is given to units of analysis or sampling. Interview guides may be used to direct interviews but rarely would a formal questionnaire be used. We strongly recommend that this type of survey never be treated as an end product in designing the social analysis of a policy-based program. It can, however, play a very important role in providing qualitative context for a short, focused or medium-term cross-sectional survey. We would suggest that these types of surveys always be preceded by an initial exploratory survey, in order to assist in the design of more formal interview schedules.

ii. Semistructured Rapid Assessments

Here we consider two types of rapid assessments: (ii-a) rapid social assessments and (ii-b) diagnosis of farming systems.

ii-a. Rapid Social Assessments

In what follows we will use the term "rapid social assessment" rather than the term "rapid rural appraisal" because

there is nothing about the methodology that limits its use to rural communities.

Rapid assessment involves a short field visit by a multidisciplinary team to a sample of communities, villages, neighborhoods, or institutions. It is usually focused on a single economic sector and often limited to a particular region. Typically the team breaks down into subgroups for focused interviews or observations. For example, there may be a specialized team that interviews women or a specialized team that interviews key actors in the market system.

Rather than using a closed-ended, structured interview, the rapid assessment team uses a semistructured interview guide, containing a list of topics to be addressed. In Appendix 5 we have a proposed list of topics for such studies.

Selection of communities for a rapid assessment should follow accepted sampling procedures. Even though the data are less structured than in a formal survey, it would be a mistake to think that a rapid assessment involves casual or haphazard sampling. Sampling should be motivated by theoretical concerns related to the problem under investigation. Communities should be selected to provide meaningful comparisons across large-scale variables. For example, in a study of impacts of proposed changes in grain marketing the communities might be selected to vary systematically with respect to agroecological zones, access to markets, and distance from urban centers. The phase of exploratory research using secondary sources should be used to

obtain information about communities that will form the basis for rapid assessment sampling.

The number of communities selected for a rapid assessment will have important consequences for the quality of the inferences from the assessment. If sampling is done properly and enough communities are selected, then the rapid assessment can provide useful comparative data from which one can generalize to the range of diversity in a region or nation. Although certain nonparametric statistical tests can be done with a sample of 8-10 communities, we would suggest a minimum of 15-20 communities as the basis for these kinds of generalizations.

With a minimum of 15-20 communities, properly conducted rapid assessments will not be as rapid as they are portrayed as being. They remain, however, a cost effective way to obtain high quality information, in a short time period. The key to keeping costs down is to not have an overly large research team. This is probably wise anyway, since management problems with a large team could reduce data quality. A study of 20 communities by a team of two US-based researchers and three local researchers, with two days in each community and one day travel time between communities would cost 120 days of US salaries and 240 days of local salaries.

ii-b. Diagnosis of Farming Systems

In the 1970s, agricultural economists began to develop <u>rapid appraisal</u> techniques to identify production constraints and possibilities for improving farming systems. Informal or

exploratory surveys by interdisciplinary teams often precede larger formal surveys. In comparing the results of informal and formal surveys, Steven Franzel and others found the former to be quite reliable and cost-efficient when conducted by experienced researchers. As refined by the CGIAR centers (see Hildebrand 1981; Rhoades 1982; Collinson 1981), an essential ingredient of exploratory surveys is an interdisciplinary research team that includes both biological and social scientists. These individuals visit farmers in rotating pairs or threes and the entire team discusses its findings at the end of each day. Each individual's ideas come under the scrutiny of scientists from other disciplines, a process that can provide important insights into local farming problems and possibilities for improvement. Advantages of informal over formal surveys are that they take much less time to execute and analyze, and their inductive approach may reveal lines of inquiry of unexpected importance. Once a formal survey is underway, on the other hand, consistent efforts must be made to maintain flexibility and openness to new ideas and avenues of inquiry.

Informal rural surveys consciously avoid a number of familiar biases in rural development tourism: dry season, paved roads, progressive farmers, males, elites, proximity to urban centers, development project zones, and educated individuals who speak a European language. They collect data from secondary sources (maps, aerial photos, reports, publications) before fieldwork, and then through direct observation, unstructured

semistructured interviews, and participant observation. In farming systems research, informal or exploratory surveys are useful at several stages, including mapping agricultural zones, defining a working typology of farmers, problem diagnosis, assessment of project feasibility, technology development, and design and testing of on-farm trials. Much useful qualitative information about the social organization of agriculture, farmers' practices and their rationales, principal crops and cultivars can be collected through informal surveys.

The results of rapid or informal surveys alone are unlikely to persuade policy planners. "Informal" conclusions usually must be translated into numbers and percentages from randomly sampled larger populations in formal surveys.

b. Focused, Short-Term Surveys

As noted earlier, the Meru health survey is an example of a focused, short-term survey. It took approximately six weeks to complete from design to write-up of findings. A determination of whether or not a short-term survey is appropriate will be, of course, strongly determined by time constraints. If the given time constraint is around 6-8 weeks, then the choice for the surveyor will be between the semistructured rapid assessments (described above) and the short-term survey, which uses a formal survey instrument. At this point the deciding factors should relate to the following questions: (1) are quantitative data and formal sampling required; (2) is formal data analysis, using more than descriptive statistics, required; (3) can the research

problem be addressed using only one district or region rather than a larger sample; and (4) is the research problem of such that a short, focused questionnaire can be used? If the answer is affirmative to the four questions, then a short-term formal survey is preferable over a rapid appraisal, in part because more precise and convincing data analysis can be made. It should be noted that even if the research problem has implications for national policy it might be more useful to direct the research to one particular region or district, using a focused questionnaire, rather than conducting a rapid appraisal of an entire national sector. What may be lost in comparability is compensated by the better control of data, the better sense of cause/effect, and the greater amount of quantitative data.

The types of topics that can be addressed in a focused, short-term survey include:

- the effects of policy change in a particular region;
- particular policy questions that can be stated in a dichotomous fashion, such as do health consumers prefer private facilities over government facilities (e.g., the Meru case) -- or do small farmers prefer to sell grain to government parastatals rather than private traders;

A one-shot, short-term survey is probably not appropriate when data requirements focus heavily on continuous or flow data.

The short-term survey frequently provides data on presence or absence of certain characteristics; hypothetical questions related to a very specific policy issue (in the Meru case, it was about willingness to pay health user fees); and certain basic demographic and socioeconomic data, usually at the household level. Because the focus of the query is on a well-defined policy question, questions can often be stated so that only yes/no answers are required.

The decision to carry out a formal, short-term survey does not preclude: (1) conducting an initial, exploratory survey to acquire data on potential research sites, general ecological and economic variables, and background, secondary data on the area; and (2) carrying out other types of research that complement the formal survey. Regarding the latter, we would always recommend that some qualitative research be pursued in the same area as the formal survey is being conducted, in order to provide a context for assessing the survey's results, to serve as a validity check on the survey's results, and to acquire a better understanding of systemic relationships. For example, in a formal survey of small farmer marketing preferences with regard to private versus government channels, the principal researcher should conduct semistructured interviews with private traders, officials in appropriate public institutions, transporters, and local agricultural and cooperative officers. Since some policy-based research is controversial by its very nature -- for instance, questions regarding whether or not farmers are already marketing

their goods through "unofficial channels" -- there needs to be some quality check on survey responses. Little, for example, found that farmers in parts of Kenya are very reluctant to talk about preferences for where to market maize, since they know that there is only one officially sanctioned market channel. He used interviews with local shop keepers and transporters to help interpret and, in some cases, invalidate the results of a formal farmer survey.

c. Broad-Based, Medium-Term Survey

Unlike short-term, focused surveys, this type of survey can provide the basis for selecting certain variables to monitor during the implementation of a policy. As we indicated in previous sections of the report, the more focused a medium-term survey (4-8 months) can be, the more useful will be its results. Data should be collected on no more than 200 variables and questions limited to no more than 50 to 60. Our preference is for any broad-based surveys to be conducted with the ultimate goal that it be used as a basis for monitoring the impact of a particular policy. Broad-based surveys are appropriate for providing general demographic and socioeconomic characteristics of a population, especially when stock data are the focus.

Like other surveys, the decision as to whether or not to pursue a medium-term survey is dictated by the research problem(s), the data and analytical requirements, and time and resource constraints. If some flow data (e.g., labor, expenditures, and sales) are required to be gathered, it might be

prudent to think of a multiple-visit survey, even if time limitations do not allow visits to be spaced more than 2-3 months apart. While this will not fully deal with the issue of seasonality, it will give a much better sense of how flow data changes from month-to-month, will shorten the length of recall time required by informants, and allow for the first-round data to be cross-checked. A two-visit survey will give a much better assessment of monthly and annual incomes, sales, and expenditures than a one-shot survey.

When two visits are possible during a medium-term survey, it is not necessary to repeat stock questions on asset ownership, type of household, education, and other base-line information. The questions that should be repeated are those measuring variables that are likely to change, or where the informant is likely to have a short span for recall (such as information on the use of family labor in agriculture). Because only a limited number of questions are repeated during the second visit, the time required for the second interview is considerably less than for initial interviews. While a multiple-visit survey may raise logistical and administrative problems, we would recommend pursuing it when income, expenditure, labor, and marketing data are required.

The proposed baseline survey in Tanzania by REDSO might be a good case where multiple-visits could be attempted. This survey plans to collect certain household income, expenditure, and consumption data, as well as other kinds of socioeconomic data.

The length of time for the study (7 months) is sufficient that certain questions from the initial interview could be repeated in each of the two sites, approximately three months after the initial survey. The time between the two visits can be used to enter and clean-up data and begin data analysis. When you visit the household a second time, you can phrase questions beginning with . . . "since my last visit, how many . . . . did you sell?" This gives the informant a very easy reference point for recalling certain kinds of data.

d. Recurrent, Multiple-Visit Surveys

This type of survey is carried out usually to monitor the impact of a certain policy or program. In contrast to the other surveys described above, time is not usually the limiting constraint in this kind of research. These systems involve the recurrent collection of data, usually at a frequency of one observation per month. The data could include observations of physical change (river flow, vegetation cover, housing construction), as well as interview data on income or other indicators of welfare.

In collecting multiple waves of interview data the number of questions should be kept small. The goal of this kind of study is very different than the goal of a baseline socioeconomic survey; it is to measure change in a small number of policy-relevant indicators. Typically, these would include data on prices, quality of life indicators, production quantities, and other key socioeconomic indicators. With recurrent surveys a

decision has to be made as to whether to select a panel of households for repeated interviews or whether to select a new random sample of households for each wave of the survey. The advantage of the panel approach is that one can make more powerful measurements of change, since you know precisely what units are changing. The disadvantages are that the sample may be subject to maturation bias (defined above) and become skewed over time because of attrition from the panel. Suppose there is a very negative impact from a policy which hits poor families worse than wealthy families, so that a high percentage of the poor families migrate out of the community. Over time the panel sample will become skewed towards wealthy people, who are not as heavily impacted by the policy. Hence, the bias will be to underestimate negative impacts. With a recurrent survey, stratified across income level, one can maintain the representation of poor families over successive stages of the survey.

We strongly recommend that socioeconomic monitoring be built into every major policy reform program that has an impact on large segments of the population. It is unlikely that even with a 6-8 month design period that all the important questions about impacts on different social groups can be answered. Recognizing that there often are strong pressures to begin implementation of a policy program, a monitoring system is a way of insuring that data on critical variables, which may not be well understood, are collected during the program. The monitoring exercise should be

preceded by a baseline survey, which provides an initial time-point to measure impact on some critical variables. The monitoring system can serve as an "early warning" system to project management; for example, if the intended impacts of a policy program are not being achieved, or if serious social/political problems are emerging from the policy change.

B. Sampling

Good discussions of sampling for field research are found in Casley and Lury (1982) and Bernard (1988).

1. Types of Samples

There are two basic kinds of samples -- probability samples and nonprobability samples. While probability samples are preferable to nonprobability samples, there may be valid reasons for obtaining a nonprobability sample. Any sample that is designed to systematically tap variability within a population will achieve part of the goal of sampling, which is to represent in a meaningful way the variability within some population. We will discuss probability sampling methods first, then nonprobability sampling methods.

a. Probability Samples

These are designed so that each unit has an equal probability of being in the sample.

i. Simple Random Sample

This requires a sampling frame -- a list of the units (individuals, households, communities) in the larger universe. It is not always possible to obtain a meaningful sampling frame,

and is the preferred sampling procedure when such lists can be constructed accurately and for a reasonable cost. Many sampling frames will underrepresent poor people. For this reason a simple random sample may not produce the most valid data. Area samples, quota samples, or network samples (see below) may do a better job of representing low income people.

The procedure for simple random sampling is as follows: (1) assign a number to each unit in the frame; (2) decide how many units to sample (N); (3) pick a number at random from a random number table; (4) put the unit with that number in the sample; and (5) continue this process until N units have been selected.

ii. Systematic Sampling

This is a variant on simple random sampling. The procedure is to pick a random starting point, and then select units at that interval. For example, suppose you wanted to sample 50 households from a community of 500 households. The desired interval would be 500/50 = 10. Pick a number at random between 1 and 10. Suppose this came up as 3. Then you would sample households number 3, 13, 23, 33, 43, 53, etc.

Systematic sampling can be useful when you know approximately how many households there are within the community but don't have them all enumerated. Simply walk through the community in some direct path that will traverse the entire community. Select houses at the desired interval until you have traversed the entire community. Since you don't know exactly how many households there are, you might end up with an N of 53 when

you had intended 50 because the community had 531 households rather than your estimate of 500. This level of error will have a minimal impact on your survey results, and you will be ensured of a random sample of households. The main possible problem with interval sampling would occur if there is some phenomena in the society that recurs at the interval you have chosen. This is an unlikely prospect but it must be checked for.

iii. Stratified Sampling

Here the population is divided into categories, and random sampling is done within each of the categories. If the categories are more homogeneous than the general population with respect to the variables in your model stratified sampling will reduce variance, allowing for lower sample sizes. For example, women may be more similar to each other than they are to men with respect to farming practices. Stratified sampling within the categories of male and female will reduce the total variance on farming systems variables below the level that would be obtained with simple random sampling.

A second reason to use stratified sampling is to ensure adequate numbers of cases from each category. This cannot be ensured with simple random sampling, and becomes especially problematic if some social category is relatively rare within the general population. With stratified sampling you can overrepresent that category in your sample, and correct for the overrepresentation in your statistical analysis using weighting procedures.

Stratified sampling should only be used if the categories are relevant to the substantive issues you are studying and if they are relatively homogeneous. Otherwise, stratified sampling may increase variance rather than reduce it. A weakness of stratified sampling is that it requires knowledge of the proportions of the strata in the general population. This requirement lessens the utility of stratified sampling for many field-oriented studies.

iv. Cluster Sampling

Here there are two levels of units. Suppose there were 50 villages in a region, and you wanted a total sample of 200 households. The cluster sample would have two stages -- a) select a subset of the villages at random and b) select households at random from the villages.

Cluster sampling saves research costs in two ways. First, rather than having to enumerate all of the households in all 50 villages, you only have to enumerate households in the villages selected. Second, cluster sampling will save transportation costs, since you only have to travel to a small subset of the villages.

Cluster sampling can have a number of stages, for example, districts within a region, villages within districts, households within villages, and individuals within households. It has considerable appeal in development planning and evaluation, and several of the AID surveys that we reviewed used cluster sampling.

Cluster sampling can be combined with stratified sampling. Suppose there were 5 coffee growing villages in a region with 50 villages. If you were to select 5 villages at random from the 50 villages you might obtain no coffee growing villages. So, you could select one of the 5 coffee growing villages at random and 4 of the 45 noncoffee villages.

With cluster sampling each of the lowest level units should have equal probability of being selected. In order to accomplish this, units will be selected with a probability equal to their population. Suppose you have selected 5 out of 50 villages, you want a total of 500 respondents, and the populations of the 5 villages were as follows:

a.	1,000
b.	4,000
c.	2,000
d.	500
e.	2,500
total	10,000

Then district (a) will have 10% of the sample (50 households), district (b) will have 40% of the sample (200 households), etc.

Bernard (1988) discusses the issue of numbers of units to be selected at each level of a multistage sample. His advice is to have as many units as possible at the higher levels, and fewer units at the lower levels. For example, it would be better to select 10 out of 50 villages than to select 5 out of 50 villages

with fewer households per village. Bernard also recommends against selecting more than one individual per household, given the high degree of relationship among people within households. Rather than always selecting the "head of household", or the male adult, cluster sampling should pick an adult household member at random to interview.

v. Area Sampling

Here, rather than selecting individuals, households, or communities at random, units of land are selected at random. This will only ensure that households have an equal probability of being selected if population density is invariant across the area sampled. Hence, in most cases area sampling does not provide a true probability sample. While it has the advantage over simple random sampling of ensuring an adequate sample of people who live in remote areas, it is biased toward areas of low population density.

One way to correct for this bias of area sampling is to divide the area into regions according to population density and to do area sampling within each region. For example, it is common to sample separately from the one town in a region, then do area sampling from the rural portion of the region. In doing this it will be essential to have estimates of the population of each of the sampling areas so you can know how many households to select from each. Area sampling can be combined with cluster samples. For example, the Meru health survey used area sampling for the last stage of a multistage cluster sample.

Area sampling involves picking points at random from a defined area, and selecting the nearest household to the point chosen. One method for doing this is to place a grid over the map of the area, enumerate the subareas created by the grid, select a subset of these subareas at random, and then pick one household from each subarea. A second method is to draw several transects at random across the region, enumerate the households along each transect, and draw households at random. This was done in the Meru study. By centering the transects in the middle of each village, the Meru sample gave households near the center a higher probability of being selected. This is desirable whenever there is higher population density near the center of the village.

vi. Missing Respondents

In any probability sample the problem will arise of what to do if the person selected is not at home, and not available for a repeat visit (for example, men who are absent for long periods of time as labor migrants). Replacing this person with another member of the household or with members of a neighboring household will introduce undesirable dependencies into your sample. For example, interviewing the wives of the men who are absent on long-term labor migration can cause you to oversample female headed households. The preferable procedure is to select a new person at random to substitute for the missing person.

b. Nonprobability Samples

Nonprobability samples are chosen when the time or money are not available to do a proper probability sample. A well-chosen nonprobability sample may provide better data than a poor quality probability sample.

Recent advances in permutation statistics (also called randomization statistics) have made probability samples less essential to statistical inference. These statistical procedures are not yet incorporated into standard statistical packages so the user must take the trouble to find the appropriate computer program.

i. Quota Samples

These are similar to stratified samples in that the sampling is done within categories that are of substantive relevance to the study. The difference is that there is no sampling frame within each category. If care is taken to select individuals within each category without bias, then the results from quota samples can be very close to the results from stratified samples. Major bias problems can arise if interviewers select persons whom they feel comfortable with, or who are most willing to be interviewed. As with stratified sampling, it is essential to the analysis to have accurate estimates of the proportions of each social category within the general population.

ii. Network (snowball) Sampling

This begins with a small group of individuals, who are asked to name other people to be included in the sample. Network

sampling produces a bias toward people who are better known, more sociable, or more socially acceptable. It is used to sample members of rare categories of individuals (e.g., members of unusual occupational specializations), migrants of any kind (especially illegal migrants), members of small ethnic groups living in a city, or people who are connected with one another through a social network (e.g., grain traders). In some cases the goal of network sampling would be to identify all of the members of a small social category. If that goal is achieved, then the problems associated with a nonprobability sampling procedure are obviated by having the complete population.

2. Sample Size

The sample size needed for a study varies directly with the variance in the phenomena studied, and inversely with the acceptable sampling error.

In many field studies, sampling error will be a small proportion of total error. Errors due to poor memory, misinterpretation of questions and coding problems will be much greater. Hence, small increases in sampling error may have a minimal effect on total error. For this reason Scott (1985:15) recommends acceptable sampling errors of 5% to 10%. Further reduction in sampling error would have a negligible effect on the accuracy of the data, and the great increase in sample size could cause increases in other kinds of error, more than cancelling the gains from increased sample size.

Scott (1985:20) provides a useful formula for computing

sample sizes. With 5% acceptable error (95% two-sided confidence interval) and a dichotomous variable of maximum variance, Scott's formula shows a sample size of 384. With 10% acceptable error (90% confidence interval), the required sample size drops to 67. In many cases, the difference between these two levels of acceptable error will be important. With limited time, this may be the difference between a feasible study and a study which can not be done. Since Scott's table is for variables with maximum variance, the numbers should be taken as upper limits on required sample size.

It is useful to distinguish two situations -- low variance situations and high variance situations.

a. Low Variance (high consensus)

Some kinds of cultural variables are highly shared within a population. When there is low variability on an item (high consensus), then the sample size that is required to obtain accurate data can be very small. Romney, Weller, and Batchelder (1988:77) show that with a consensus level of .70 (average correlation between each respondent and the cultural model is .70), then the number of respondents required to produce reliable data (95% confidence level) is 10.

This finding has important consequences for the use of rapid assessment data. If the rapid assessment is directed at substantive areas where there is low variability then the common rapid assessment practice of interviewing a small number of people is justified. It is possible to analyze data from a small

number of informants to measure the degree of interrespondent variability. Romney, Weller, and Batchelder (1986) describe how to do this. The software for doing this is available in the ANTHROPAK program for PC's (see Appendix 2).

b. High Variance

Social surveys often measure social characteristics that are not highly shared between people, such as income, land ownership, what crops are grown, and participation in wage labor. On such variables consensus can be zero, or even negative. With these kinds of data much larger sample sizes are required. Scott's sample size formula, discussed above, assumes high variance survey data.

c. Effects of Stratified Sampling on Sample Size

If the categories for stratified sampling are relatively homogeneous, stratified sampling will reduce the required sample size. Scott estimates a reduction in sampling size through stratification in will usually be in the range of 10-20 percent.

d. Multistage Cluster Sampling

This will increase the required sample size. Scott (1985:25) provides a formula for computing the optimal number of units per cluster, based on the relative costs of (a) transportation between clusters and (b) data collection within clusters. As the ratio of (a)-to-(b) increases the number of clusters decreases and the number of units per cluster increases. The loss in efficiency due to cluster sampling is directly proportional to the number of units sampled per cluster. With

the optimal number of clusters, Scott estimates the increase in sample size due to two-stage clustering to be 70%. Hence, with a 5% acceptable sampling error, the sample of 67 would increase to 114. In Scott's example there would be 23 clusters with 5 units per cluster.

Having a large number of clusters with a relatively small number of units per cluster is the opposite of the way cluster sampling is often down. Both Scott and Bernard (1988) recommend having a larger number of clusters and a smaller number of units per cluster. However, it should be emphasized that situations of very high transportation costs will require smaller numbers of clusters. In those cases, great efforts should be made to produce representative clusters, for example, by using stratification when selecting clusters. The sample size benefits of stratification will cancel some of the loss due to having a small number of clusters.

C. Preparation of Interview Schedules

The final step in survey design is the preparation of survey instruments. This section of the chapter assesses the strengths and weaknesses of several different interview schedules; the design of survey forms to minimize difficulties in data entry; the phrasing of questions; and ways to get at difficult measurements/issues through survey questions.

1. Types of Survey Instruments

a. Group Interview Guides

Group interviews are often an efficient means of obtaining data during short, exploratory surveys. They have been used successfully in farming systems research through informal surveys. The group interview technique also can be used to provide contextual background for evaluating the results of a formal household survey.

A group interview has both advantages and disadvantages. On the positive side it is a quick means of acquiring more than one viewpoint on a particular topic; of instigating debates (and even competition) among a group of informants on a topic that may be complex with several possible explanations (e.g., why do farmers in the area not grow a certain crop?); and of collecting community data that can be used to compare with information from other communities. In some cases answers may be more accurate in a group interview than in an individual one, because respondents may fear being corrected if their answers are untrue (Casley and Kumar 1988:27).

On the negative side group interviews can end up being dominated by one or two important spokesmen who may intimidate others from speaking; may not attract individuals from all segments of a community's population (e.g., widows, women, or poor individuals); are difficult to discuss issues that may be controversial (e.g., informal marketing behavior) but could be discussed in one-on-one interviews; and produce only limited

quantitative data for analysis.

An interview guide for group discussions can be used to direct the discussion but it should be limited to a very small set of topics. The advantage of a group interview is that it can lead to open exchange on a series of topics related to the initial query. Under these circumstances one would not want to impose a rigorous set of questions that might inhibit a smooth flow of conversation. A group interview guideline should only include a few general topics that the researcher wishes to cover and leave it up to his/her discretion as to how one should direct the group to respond it. The success of a group interview depends very much on the skill and experience of the interviewer, perhaps more than for any other type of interview schedule. It is not the kind of exercise that is easily delegated to a research assistant or enumerator.

b. Interview Guides for Key Actors

Many surveys require information from key individuals under conditions where a formal questionnaire may not be appropriate. Businessmen, traders, and many types of public officials are difficult to solicit information from, especially when they see a long, formal questionnaire. They are unlikely to be forthcoming, especially about their informal activities, when confronted with a formal questionnaire. The use of an interview guide is a way to acquire some standardization of data collection without the use of a rigid questionnaire. The interview guide can list up to 10 to 12 important points that the interviewer wishes to cover,

while leaving plenty of room for the discussion to go in unforseen (but important) directions. Since interview guides are usually for key individuals, such as an important wholesaler or cooperative official, it is important that the conversation be allowed to flow without too many impediments.

Interview guides can be important supplements to formal questionnaire work. They are often used together with formal survey instruments in studies of marketing systems. For example, in SARSA's work on livestock marketing in southern Somalia interview guides were used for important export traders, middlemen/brokers, and butchers, while a formal questionnaire for household marketing and expenditure behavior was used at the same time. By collecting data at both the household and trader levels, one acquired a better assessment of how the regional livestock marketing system operated, than would have been possible through only a formal survey of either households or traders. Again, the shortcoming of the key interview guides is that they often have to be administered by a knowledgeable professional, although in some cases a well-trained research assistant can handle relatively simple interview guidelines.

c. Formal Household Questionnaires

Formal household questionnaires are used to quantify variation in economic, social, or agroecological characteristics in a systematically-sampled population. If AID needs to know, for example, not just the qualitative range of attitudes toward user fees in government health centers (which can be ascertained

in an informal survey), but also the frequency of particular opinions and their correlation with other traits such as individual economic status, then a formal survey is necessary.

Before the questionnaire is developed, specific data and forms of analysis required should be well-defined. Questionnaires should not require more than 45 to 60 minutes to administer. Restricting them to this length requires careful advance planning and pretesting.

A preceding informal survey and pretesting phase should identify whether males or females are most likely to have particular types of information required in the survey. These patterns are not necessarily uniform across households, so flexibility in choice of respondents must be maintained. In some rural households, for example, women are better informed about crop varieties and practices than are men. In others, men may play a more active role in farming than women. Such variation depends on alternative economic activities, as well as on unpredictable interpersonal dynamics. For some questions, appropriate sex of respondent of course can be predicted in advance (e.g., fertility data, food preparation). Thus separate questionnaires for men and women sometimes are practical. In some parts of rural Africa, it works best to interview the male respondent in a household first. After he sees the line of questioning and completes his portion of the interview, he is likely to be bored and leave. Interviews with women often are more successful in the absence of their husbands, who sometimes

reply out of pride with inaccurate assertions about subjects on which they are poorly informed.

d. Multiple-Visit Questionnaires

The multiple-visit questionnaire often is used to monitor a particular policy/program impact or to collect continuous data. These data usually deal with labor, consumption, expenditures, marketing, and production. Appendix (3) presents a multiple-visit form used by SARSA in looking at seasonal expenditure and marketing activities in the Kismayo region, Somalia. It was administered during each of the four major seasons at approximately three month intervals. The questions on the form distinguish data according to whether it is likely to be recalled in a three-month or two-week period. Questions asking for a three month recall addressed livestock sales and purchases of "slow-moving" household goods (e.g., flashlights, clothing, etc.). Data collected on a two-week period dealt with "fast-moving" purchases, such as purchases of cereals and sugar; and frequent sales, such as marketing of milk. Each time the recurrent form was used, the size of the household was checked to see if there had been changes in composition.

A multiple-visit form for monitoring the socioeconomic impact of a particular policy should include only a small set of questions directed at three sets of data (a good discussion of data requirements for recurrent monitoring is found in Casley and Kumar 1987). The first relates to the responses of policy beneficiaries to the changes that have occurred as a result of

the program? What has been the reaction to the changes; what is the local interpretation of the policy change; and what have been measurable changes in adoption rates of certain aspects of the program? For example, in the Kenya Health Program case, what has been the actual use of public hospital facilities following the imposition of user fees? A second set of data that could be gathered relate to the socioeconomic welfare of recipients, including changes in income, expenditures, consumption, and other measures of living standards. The difficult question here is to try to relate these kinds of changes to a particular policy rather than to other aspects of the environment. Cause-and-effect relationships are easier to assess over a 5-6 year period than in a 2-3 year period. As Casley and Kumar (1987:3) note, "such data raise the most complex issues of all the data requirements, which is why we advocate selectivity in conducting such studies and practical, limited objectives for them." A final set of data for monitoring relate to measurable changes in marketing and production. If it is a change in the marketing policy of a certain crop that has been implemented, has production and sales of that commodity increased during the period? Again, this type of query raises issues about causality and should be carefully assessed vis-à-vis alternative explanations for any production/marketing changes.

2. Physical Design of Survey Forms

The physical layout of a survey form should help accomplish two things: accurate recording of the answers to each question on

the form, and the efficient keying of that information into the computer for storage and analysis. In fact both of these objectives can be attained by following the same rules of organization.

a. Sequence of Questions

Each question should be numbered and the number should be located in the left margin to make it easily found. Many surveys contain questions which have multiple parts, these should be numbered as separate questions. To illustrate this point the following question, number 25, is taken from the Nairobi Area Study.

25. Does your household get any income from the following members?
0 = No
1 = Yes
2 = Don't know
3 = No such person in household
1. Husband/self ..... ___
2. Wife/self ..... ___
3. Remittances from children ..... ___
4. Remittances from relatives/friends other ..... ___

In fact you can see that this is really four separate questions and could be rewritten as:

For the following questions answer:
0 = No
1 = Yes
2 = Don't know
3 = No such person in household

25. Does your household get any income from Husband/self... ___
26. Does your household get any income from Wife/self ..... ___
27. Does your household get any remittances from children.. ___
28. Does your household get any remittances from relatives, friends or other..... ___

b. Proper Spacing

Leave plenty of open space around each question so it is easy to read and to find the appropriate place to record the response. Trying to cram as much as possible on a page, just to shorten the length of a survey form is asking for trouble.

c. Format of Questions

Try to follow a format of alternating numbers with letters, so there is no possibility of confusing a question with a choice of answers. For example:

1. What is your religion?
   1. Christian
   2. Moslem
   3. Hindu
2. Next question . . . .

Should be written as:

1. What is your religion:
   a) Christian
   b) Moslem
   c) Hindu

2. Next question . . . .

d. Labelling

Whenever possible label and list the possible answers, and then rather than writing the answers in a box simply circle the correct choice. For example:

24. What is your marital status?
    a) Married
    b) Single
    c) Widowed
    d) Divorced
    e) Separated
    f) Other (specify) _____

This will eliminate the problem of poor or unreadable hand written responses.

e. Use of Tables

For tables that are to be filled in always draw a grid into which answers can be written. A complex or lengthy table may become confusing and answers can be transcribed into the wrong cells if there is no grid to follow. When no grid is used it is easy to see how errors could be made at both the interview and data entry stages (see question #57 of the Burundi household survey for an example). If special coding sheets are used for tables, again as in the Burundi household survey, they should be placed in order within the actual survey not in a separate place or at the end of the survey where they can be lost or coded out of sequence. Tables or forms which are out of sequence can be a headache for the data entry operator, they certainly add to the time it will take for entry and flipping pages back and forth to find the next question is inefficient.

f. The "Other (specify)" Category

The "other" category which is often used in multiple choice lists should always be the last item in the list. This is so new codes may be added after data collection if sufficient similar "others" justify it. It is not realistic to expect the researcher to enumerate every potential answer to each question, nor is it appropriate for the data entry operator to make a decision to group similar respohses into new categories. The data entry operator can make a list for each question that has an "other" field and whenever a new response is made simply add it to the bottom of the list. After grouping these new responses a

new code can be assigned and the original database updated. If more than one person collects the data it is not possible to add and code these responses at the time of data collection. If only one person is collecting data then the new categories may be assigned a code as they are encountered to save time.

g. Confusing Questions

Avoid using IF-THEN-ELSE questions which require the interviewer to skip forward or not answer some questions. Confusion may result from this on the part of both the interviewer and interviewee, and it requires the interviewer to make an evaluation which he/she may not be capable of making. It is better to gather more data than needed and allow the analysis to weed out unwanted or unusable answers. An example of where skipping questions based on answers to prior questions has no real advantage can be seen in the Nairobi Area Study, questions 38 to 45 and 46 to 49. Here is the example using questions 46 to 49:

46. How would you rate the services at this facility?
    1. Good
    2. Fair
    3. Bad
    4. Don't know

If answer is "fair" or "bad", ask question 47. If "good" go to question 48. If "don't know" go to 49.

47. What is the most serious problem at this facility? (Choose one only)
    1. Staff not courteous
    2. No drugs
    3. Staff not qualified
    etc . . .

48. What is the most important thing you would want to see improved at this facility?
    1. Drug supply
    2. Staff attitude
    etc . . .

49. Do you ever go to see a traditional healer?
    1 = Yes
    2 = No
    If "No" go to question 56.

There is no reason to skip question 47 if the respondent answered "good" to question 46, the respondent may still think there is a serious problem at the facility even if the overall rating is good. The construction of this IF-THEN-ELSE appears to serve no purpose and introduces the possibility of errors. The same IF-THEN-ELSE criteria may be implemented during computer processing much more efficiently, if it is really needed.

3. Phrasing of Questions

This section and the following one address issues related to question formulation, including the use of local terms and the translation of questionnaires.

a. Use of Local Terminology and Translations

Socioeconomic surveys should incorporate local concepts and terms, even if it is decided not to translate the questionnaire into the local language. Local terms are especially important for defining residential and family units, landholdings and tenure concepts, and certain types of occupations. At a minimum questions related to these issues should use the local terminology rather than English or French versions that may only approximate their true meaning.

On the question of complete translation into a local

vernacular several rules of thumb should be followed. First, is the content of the questionnaire complex enough that interpretations would be difficult without translation. A series of straightforward questions requiring only yes/no answers may not need to be translated. A second consideration is what are the linguistic skills of the interviewer. Is s/he able to understand English well enough, that questions can be translated into the local language as they are being asked? This is likely to be possible if the questions are relatively straightforward, but may be difficult if they are hypothetical/attitudinal questions. Even when the questions remain in a European language, the interviewer should record the answers in the local language and not try to carry out translations on the spot. When this happens, the interviewer often shortens the response and neglects information that s/he feels is not important. Third, is the survey intended to cover several communities where different languages are spoken. In this case translating the survey into several local languages would be neither time- or cost-effective. A survey of several different districts in Kenya would be an example where translation into local languages (except for important local terms/concepts) probably would not be warranted. In the case of Kenya the questionnaire should probably be translated into Swahili if it is a comparative survey of different districts; and the answers recorded in Swahili or the local language.

Finally, in cases where a local vernacular approaches the

status of a "national" language, then the survey instrument should be translated. This would apply to countries like Burundi, Somalia, Botswana, and Lesotho. In doing translations, the questionnaire should be converted into the local language and then translated back into English, to check for inaccuracies. Since data entry and analysis may not be carried out by native speakers, it is best if the translated questionnaire presents questions in both the European and local language (see Appendix 3, for example).

b. Controversial/Sensitive Questions

Appendix 4 shows a questionnaire where the researcher separated out sensitive questions with special instructions to the interviewer. Most questions that are very sensitive -- for example, queries about abortion, death, or "unofficial" economic activities -- should be placed at the end of the questionnaire when the respondent may feel more comfortable about answering them.

Obviously, what is considered to be controversial in a certain country depends on local circumstances. Because of local political rivalries, questions regarding clan affiliations are against the law in Somalia, while in Kenya clan-related questions are nonproblematic. Questions regarding residence history and migration patterns are usually quite sensitive among refugee populations and among nomads that move across international boundaries, although they may appear to be relatively benign inquiries. In short, there are likely to be several sensitive

topical areas in a particular culture or region, which should be acknowledged prior to the design of the questionnaire. If sensitive questions are essential to the research, they should be placed near the end of the interview.

c. Use of Measurement Units

A common mistake in the design of survey forms is to ask questions that require the answer in a predetermined time period or unit of measurement (e.g., kilograms or hectares). Questions regarding land size, yields, expenditures per time period, etc, should leave room on the survey form to allow the interviewer to record exactly what the respondent says, in his/her units of time/measurement. For example, if you ask about expenditures per week and the respondent gives purchases on a twice-weekly basis, then this should be recorded exactly as given. The questionnaire can have a code for equating certain measurement units to standard units.

No transformations of the data should take place at the time of data collection as this requires the collector to make value judgments and/or arithmetic calculations both of which can introduce errors. An example of this is taken from the Meru District Study. The following question was posed and a table was to be filled in by the Interviewer:

How much money did you spend on the following items over the last two weeks?

Name of Item	Quantity (Kgs)	Price per unit
Sugar		
Tea		
Salt		
etc . . .		

The problem here is that answers are expected in Kgs and that the interviewee is expected to know the per unit price. It is more likely that the interviewee would know the total price paid for some quantity of goods and thus the interviewer must calculate the price per unit. It would be far better to change the table so that the interviewer can record exactly what is given without any transformations of the data, for example:

Name of Item	Quantity	Units	Price
Sugar	2	Kgs	Ksh 60
Salt	1	Bag	Ksh 10
etc . . .			

Now of course a definition of a bag is needed but at least the data collector has no calculations to perform which could corrupt the data.

Prior to analysis conversions to standard units can take place, the procedure would be as follows:

Step 1, create a separate data file, lets call it a unit conversion file UNITCONV. This file can be created in ASCII by a word processor or in whatever database software you decide to use. It will contain only four variables, input quantity, input units, output quantity, and output units. An example follows:

File = UNITCONV

Input Quantity	Input Unit	Output Quantity	Output Unit
1	years	12	months
1	bag	5	Kgs
1	Kgs	2.2	Lbs
2.2	Lbs	1	Kgs

Step 2, create a file, called ENDUNIT, which lists what units you want the final analysis to be done in. There are

several ways of specifying this, it could be done for each question, or for all questions having a specific variable (such as age or distance), or for all variables reduced to their lowest common units. This file might look like the following:

File = ENDUNIT

Input unit	output unit
years	months
kgs	lbs

This means that in the original survey data file, units must be specified where they are used, this must be done anyway if you are allowing mixed units in a single field.

Step 3, a program must be written which reads as input the original survey data file, the UNITCONV file and the ENDUNIT file and performs the necessary transformations and creates as output a new survey data file which will be used for analysis. The process of transforming the survey data file is straight forward multiplication or division and need not be detailed here. It will however require a trained programmer to write this program. Once written it can be used over and over as a subroutine for all surveys, if the input format and output format are made general.

4. Designing Questions for Difficult Issues/Measurements

Data on wealth differences, labor, and farm income levels and sources may be required as a baseline from which to assess the local impact of development projects. Such data may be relevant to projects aimed at increasing and diversifying rural incomes, or those that introduce new roads, user fees or services. These data are often difficult to obtain, and involve

special problems discussed in this section. Considerations about seasonality are included where relevant.

The incomes of agricultural households are difficult to measure, in part because they come from a wide range of unrecorded sources, many of which are intermittent (e.g., sales of crops, handicrafts, charcoal, livestock, casual labor, beer, gifts, loans, remittances). It is difficult to estimate the value of food produced and consumed at home. One problematic issue is whether it is net or gross production returns. If the former, how are production costs to be calculated? Do they include family labor as well as hired labor and purchased inputs such as seed and fertilizer? Also problematic is whether production should be valued at its farm-gate, rural market, or official price, and how to take into account substantial seasonal price variations.

Income sources and their relative importance may be more easily identified than absolute amounts. Sometimes this information is as useful to policy analysis as actual income levels. For example, to assess the extent and nature of farm households' participation in the cash economy, it is useful to know the percentage of households whose cash income comes primarily from sales of food crops, from nonedible cash crops, from a small business, from white collar employment, or from remittances from a relative working in the city. Obtaining accurate inventories of household income sources requires a carefully structured set of questions that includes specific

mention of a wide range of local income-earning activities identified earlier in an exploratory survey or in questionnaire pretesting. Even so, substantial interviewer skill and rapport (and credible assurances of confidentiality) are required, particularly to capture significant illegal income-earning activities (e.g., charcoal production, beer-brewing). Acquiring income data is often most difficult at the upper ends of the earnings scale. Obtaining assessments of the relative importance of each income source is easier than absolute amounts.

Given the difficulty of accurately measuring rural incomes, a useful alternative is proxy wealth scores based on ownership of a range of observable assets. An exploratory survey can identify important material assets whose ownership defines economic status. Household inventories of such assets can then be used to construct wealth scores (e.g., weighting each item according to its retail value). Gini coefficients (see Casley and Lury 1982:119-122) can be calculated to permit comparative analysis across communities. In central Kenya, for example, the following items might be included in a wealth assessment: house type (mud, wood, stone); roof type (thatch, mabati, tile); furniture; home lighting (candles, hurricane lamps, pressure lamps); cooking facilities (three-stone fire, charcoal, kerosene, gas); bicycle; radio; motorcycle; automobile; plow. Such questions and observations are sensitive nonetheless, and require skillful interviewers and careful explanations to survey households.

Data on <u>expenditures</u> are not as sensitive as income data,

though obtaining accurate estimates based on recall poses difficulties. Recall is short for daily expenditures to meet small household consumption needs. In some areas, literate adults or school children in the household can be recruited to record such expenditures. Some farmers keep their own records of purchased production inputs such as seed, fertilizer, and hired labor, as well as of larger harvested quantities sold (e.g., coffee, tea, cotton, or sacks of maize or beans).

For cash expenditure data, as with family labor use data, generalized experience may substitute for recall of specific days or weeks. As noted earlier, such recall is less reliable in a one-shot survey, and the alternative frequent-visit survey is more costly. A rural woman is likely to know about how long a kilo of sugar or litre of kerosene lasts in her household. Once an accurate inventory of common local expenditure items is obtained in the presurvey phase, researchers can derive estimates of monthly or annual expenditures by questioning respondents about the general frequency of such purchases.

Seasonal variations in expenditure patterns may be probed by asking if there are certain times of the year when cash is insufficient for minor luxuries such as sugar purchases and for basics such as maize or beans.

Information on <u>land tenure</u> is best obtained initially through reviews of existing literature and through semistructured interviews with well-informed farmers and officials. Understanding how individuals acquire access to farm land, and

the manner in which various rights of use are defined can be important to projects attempting agricultural innovations that may alter inter- or intrafamily dynamics in the area. It is important to distinguish, for example, between rights associated with seasonal and perennial crops, grazing and watering livestock, trees (e.g., rights to burn them for charcoal production, or access to firewood, fruit, etc.), building, renting, nonmonetary lending, exchanges, and purchases.

Interviews on land tenure, whether directed at general institutional issues or at the situation of individual households require considerable skill and prior knowledge. In areas of high population density, land is frequently a focus of interpersonal conflict and political sensitivity. Interviewers should be aware of planned or rumored government land tenure reforms, as these arouse intense local concerns and sensitivities (e.g., rumors of villagization or issuing of title deeds).

Assessing total agricultural production or output can be as difficult as assessing total cash income. Researchers should reduce the number of crops and crop combinations whose output is to be assessed to a manageable number (e.g., the three or four crops which account for most output). They must then weigh the costs and benefits of the increase in accuracy obtainable by different types of measurement.

Standard input-output studies of the type agricultural economists use in production function analysis and linear programming are unlikely to be necessary or worth the cost to AID

program planning and assessment. The large number of crop combinations found in a single community or farm, together with indistinct and changeable plot boundaries, make it difficult to disaggregate inputs and outputs by crop and plot. Plant densities vary and both planting and harvesting dates may be staggered over weeks or months. Units of output are idiosyncratic and time-consuming to standardize. Farmers are likely to report output in volume rather than weight, and researchers must then make the appropriate conversions and standardization of units (by weighing a sample of customary measures). Harvests of many common food crops occur at irregular intervals, in small quantities for which recall is difficult, instead of in bulk at predictable intervals that would be more easily recalled. For example, a few green maize cobs may be harvested casually each day on the way home; sweet potatoes are harvested as required for immediate consumption and the remainder "stored" in the ground; potatoes are selectively harvested according to tuber size over a period of weeks. The leaves of crops such as cowpeas and sweet potatoes are also intermittently harvested and their yields difficult to estimate.

Weighing all crop output is usually too costly in time, money, and supervisory requirements. Yield plot samples (e.g., 100-square meter quadrants) are an alternative to recording the entire harvest, though these too carry substantial supervisory and time requirements. Their validity depends in part on sample size and heterogeneity of growing conditions both within and

between fields. Steps necessary to reduce sampling and nonsampling error can be costly (see Casley and Lury 1987). In addition, it is necessary to estimate piecemeal harvesting that occurs before the sample crop cut is taken. Agricultural economists' experience suggests the yield plot technique usually produces overestimates of output (Kearl 1976:96; Casley and Lury 1987:197).

Given the drawbacks of each output measure taken alone, the best method is a combination of approaches defined according to essential data requirements and cost constraints. When plant densities, crop mixtures, and planting and harvesting dates are highly heterogeneous, the best option for yield plots may be to opportunistically sample some fields that appear to capture the range of local variation in soil or land types. This will roughly define patterns of variation in output of key crops. The yield plot method should then be supplemented by other means of assessing output and yield, including use of secondary data, farmer estimates, and farmers' reported general experience.

Farmers' own estimates of production in a field where the crop is still standing have been shown to be as accurate as subplot crop cut samples in a controlled trial in Nigeria (Casley and Lury 1987:198). Similarly, in Kenya, the Philippines, and Thailand, farmers' advance estimates of crop output have been shown to be reasonably valid (Casley and Lury 1987:198). Farmers' estimates of course must be elicited in meaningful local units of measure and later converted to standard units. Pilot

tests comparing direct measurement and farmers' estimates can be conducted to determine whether objective measures are worth the additional cost.

Another option is to rely on farmer recall of harvested quantities in recurrent-visit surveys, or recall of the previous season's harvest in single-visit surveys. Here farmers estimate in local units the quantities harvested during the reference period. The interviewer weighs several samples of such units in order to convert volume to standard weights. Recall figures will be most useful when combined with some yield plot samples and farmers' output estimates of standing crops.

To take seasonal variation into account, researchers should always consult secondary data on rainfall over previous decades, in order to assess how "typical" is the current season. Such data should be combined with farmers' own comparisons of relative differences in rainfall over several seasons, and their assessment of current crops (or prices) in relation to other seasons and years.

Information on <u>labor</u> in agricultural systems may be collected in three ways: direct measurement, recall via single-visit interviews, and recall via recurrent-visit interviews. In aggregating labor data into person-hours or days, individual labor contributions are usually weighted according to age, sex, and local custom (e.g., 1.0 for adult women and men, 0.5 for children under the age of 14 years).

Time allocation can be assessed through direct observation

of a sample of households at randomized times (Johnson 1975). Borgerhoff-Mulder and Caro offer a useful discussion of conceptual, coding, and logistical issues involved in use of this technique (e.g., how to handle varying work intensity and arduousness).

Single-visit surveys are best used to obtain data on respondents' generalized labor experience, rather than attempting to reconstruct or recall specific use in the weeks immediately preceding the survey. Information can be reported on a crop- and task-specific basis, estimating, for example, average required labor inputs for a particular crop or crop combination on a particular field. Farmers may estimate the number of weeks spent on particular operations for particular crops. They may also give estimates of the proportional amount and seasonal timing of hired and cooperative labor used to supplement family labor. These generalized data are sufficient for many policy planning purposes.

Multiple-visit labor surveys rely on farmers' recall over a reference period of a few days. Such time allocation interviews record activities of all family members over the age of seven or eight years during all waking or daylight hours. They use local time units such as intervals between Muslim prayer times, or customary divisions of the day. An alternative is to lend farmers clocks to obtain more accurate estimates, a skill they can learn quickly. This method of assessing time allocation is useful in agricultural economists' formal models, but is likely

to be unnecessary for AID's purposes.

5. Pretesting Questionnaires

Pretesting questionnaires is an essential stage in survey design. It allows the researcher to refine and sharpen questions, to clarify linguistic or translation problems, to determine whether each question should be open-ended or closed, and to define response categories and codes for closed questions. In farm surveys, the pretest phase allows identification and coding of nonstandardized local units of measure (e.g., baskets, debes, gunny sacks, bottles), and their conversion to standardized measures (kilos, litres, metres, hectares). Volume/weight conversion ratios may need to be recalculated seasonally and from one farm to another. In most surveys, it is an advantage to minimize open-ended questions, since these require highly skilled, trained, and honest interviewers if stereotyped, generalized, or ambiguous responses are to be avoided. Extra time invested in pretesting questionnaires and defining response codes therefore is likely to improve the survey's analytical usefulness.

CHAPTER III

SURVEY MANAGEMENT

This section examines the steps involved in setting up and managing a survey. It begins with presurvey publicity and public sample selection, and then considers recruiting, training, and supervising interviewers.

A. Publicity

Each of the four types of surveys discussed here benefits from careful advance work to inform residents and officials of the study's objectives, to introduce them to the survey team, and to explain how survey respondents will be selected. These steps are usually abbreviated in short exploratory surveys, when research teams enter and leave a community quickly. In short- and medium-term surveys, however, they are essential to good data quality.

A public meeting addressed by local leaders and survey organizers, with time for questions from community residents, is a useful early step in most formal surveys. Questions answered publicly at this stage can clarify misconceptions and reduce misgivings that otherwise negatively affect data quality. The meeting should include clear presentation of the survey objectives and of how the sample is to be chosen. Public sampling in the style of a lottery is an effective means of demonstrating the impartiality of the procedure. Otherwise community residents may assume the selection involves positive or

negative traits in which the government has an interest. The principal researchers should explain how they will preserve confidentiality of responses. Interviewers' inability to effect policy changes or direct improvements in local life should be made clear.

Letters of introduction from the principal researchers and associated government officials to local officials should also be sent in advance of a formal survey. For example, the director of a national agricultural research institute writes a form letter to the head of each district in which research is to be conducted. This letter introduces the local interviewers, and outlines the study's purposes, and its relationship to national policy goals.

National publicity by radio or print media may be important in censuses and large surveys, but otherwise local publicity by letters and public meetings suffices.

B. Selection of Interviewers

Interviewers may be recruited through local secondary schools, officials, or news media. The best-qualified individuals available often are students during school vacations or unemployed school leavers. Otherwise, project personnel may work with extension agents or interviewers permanently employed by local research organizations.

Use of extension agents as interviewers is sometimes advantageous, but can bias agricultural survey results in a number of ways. Extension agents accustomed to teaching rather

than learning from farmers may be less open-minded about knowledge to be gained from farmers, though such attitudes can be modified during interviewer training. Respondents interviewed by extension agents may be more likely to report adoption or acceptance of modern farming practices. Where survey objectives are not likely to carry such risks, extension agents' knowledge and experience may be an asset to a survey.

School leavers seeking permanent employment may leave in the middle of a survey to take other work. Vacationing students therefore are a more reliable work force for short-term surveys (assuming the survey can be scheduled during school holidays). In areas served by good secondary schools, teachers and headmasters can announce the interviewer recruitment effort in a school assembly and then help to screen suitable candidates, providing useful assessments of character, motivation, academic performance, and special talents.

Both written tests and interviews are recommended for screening applicants. Brief examinations can test the numerical and linguistic skills necessary to the survey. In addition, having each applicant write a brief paragraph on any topic gives some insight into character, personality, and communication skills. Interviews provide an opportunity to assess how suitable the individual's personality is to fieldwork conditions and its demands of physical stamina, tact, patience for repetitive work, and (in agricultural surveys) genuine friendliness toward and interest in rural people.

The question of how local an interviewer should be depends in part on the nature of the survey. Because many studies include some personal data (e.g., on wealth, income, or marriage history), interviewers from a village other than the one surveyed are an asset, since those interviewed are likely to be more willing to confide in an outsider than in someone caught up in their own personal and political networks. Moreover, it is more difficult to dismiss ineffective interviewers from the survey community. Complete strangers to the region, on the other hand, may encounter problems of local acceptance. Experience in densely-settled farming areas of Kenya suggests that interviewers should come from the same administrative district and location, but not the same sublocation as those interviewed. Where possible, interviewers should share the same first language and ethnic group as those interviewed. When this is not possible, special care should be taken to be sure that interviewers' interpersonal skills override any history of tension between local or ethnic groups.

The <u>education level</u> of interviewers in closed-ended questionnaire surveys is less important than other personal characteristics. Successful surveys of this type have used interviewers with education ranging from completion of primary school to postgraduate university degrees. More important than formal education <u>per se</u> is that any skills necessary to the survey, such as use of compasses, calculation of angles in measuring fields, or recording observations on crop diseases be

tested before final hiring decisions are made. Moreover, as students proceed through the educational system, they become further removed from the hard realities of rural life. This means that secondary school students of rural background, rather than university students may be more effective interviewers of farmers. For open-ended questionnaire surveys, however, interviewers must have more education, higher passes on exams, and greater intelligence so that they understand the aims of the questions and can accurately record responses. Experience in Kenya suggests that outstanding secondary school graduates waiting to enter the university or those early in their university career, can handle open-ended questions on rural economic surveys.

Where possible, interviewers' age and sex should be matched to interview topics and respondents according to local cultural norms. In some societies it is an advantage to have middle-aged interviewers rather than young students talk with older respondents. Where women play a primary role in farming, it is useful to have female interviewers in agricultural surveys. Special skills are required for cross-sex interviewing, especially in many African societies where, for example, rural husbands might be less reluctant to have their wives speak with unknown women than with unknown men. In some settings, it is also difficult for young females to interview older men.

Finally, about ten percent more than the required number of interviewers should be hired, since some attrition is likely and

retraining of individuals is costly. It is often useful to offer interviewers incentives to remain on the job throughout the survey. These can be salary bonuses at the end of the survey, or material items such as bicycles or watches.

C. Training Interviewers

The time required for fully effective interviewer training is often underestimated It is best to allow a week or two for this activity. Training should include both classroom and field practice. In addition to its obvious function, the training period provides a final opportunity to identify and correct problems with questionnaire design, concepts, and translation. Indeed it is useful to involve interviewers in questionnaire development, since this increases their understanding of the conceptual basis of the survey and is likely to increase their effectiveness in posing questions and recording responses. Including interviewers in survey design and conceptualization helps to reduce the likelihood of cheating and unreliability, since interviewers become "coresearchers" with a greater sense of involvement in accomplishing survey objectives (Kearl 1976:136).

In agricultural surveys, interviewer training must emphasize the value of farmers' own knowledge, and the importance of careful questioning about beliefs or practices that at first may seem irrational to those with much formal education.

Interviewers should practice conversational warm-ups and introductory remarks that clearly identify survey objectives, officials authorizing the study, and cooperating institutions.

Enumerators should assure respondents of the confidentiality of their replies, and emphasize that the study is not connected to tax assessment or other possibly unpopular undertakings. They should thank respondents for generously giving their time to reply to questions. Interviewers should avoid abruptly beginning the interview without exchanging the customary local greetings and preliminary small talk. When surveyors interrupt respondents' work tasks, a few minutes spent helping to weed a field, for example, can be a welcome gesture that improves interviewees' responsiveness.

Any display of reluctance or suspicion on the part of a respondent should be dealt with promptly, even if it means falling behind schedule. The respondent should be allowed to ask questions about the project and should she or he not be satisfied with the answers, the interviewer should alert the supervisor or principal researcher, who should visit in person to resolve them.

During training for questionnaire surveys, each question and code of course must be gone over in detail, and examples given of how to enter all data on the form. Using a written case study description of one family, each interviewer should practice filling out a complete form alone and then have it checked and corrected. This exercise should be repeated until complete accuracy is achieved. In some agricultural surveys, training responsibilities may be shared by agronomists, soil specialists, and plant pathologists, as well as social scientists. Trainees may require field instruction and practice in identifying

particular crops, cultivars, crop diseases, or soil types; or in estimating single crop proportions in mixed stands.

Trial interviews and translation exercises in the classroom are the next step. The instructor can play the role of a respondent who presents difficulties such as those encountered in the field (indirect responses, suspicion, reticence, talkativeness, etc.). Translation practice should be included here, even if the questionnaire form itself uses both the field language and the researcher's language. Such practice helps to correct distortions and misinterpretations. Any technical measures (e.g., plot size or individual height, weight, mid-arm circumference) should be practiced before attempting field interviews.

Trial interviews and measures under field conditions should follow classroom trials. Interview respondents used during the training period should be properly briefed first about the purpose of the exercise.

Classroom discussion and careful correction of forms after field trials can help to identify any final problems with the questionnaire. This is particularly useful if questionnaire pretesting time has been insufficient.

Interviewers should be encouraged to record unsolicited or qualitative ethnographic information that is pertinent to the study's objectives or to the interpretation of questionnaire data. Section II,C of this report discusses how questionnaire and data entry procedures can allow for incorporation of such

data.

Types of information that are useful in this regard can be pointed out during the trial field interviews and during regular monitoring of field interviews by the principal researcher. For example, in recording items such as livestock sales, the interviewer might note special circumstances such as unexpected medical expenses that have prompted the sale. Interviewers can place an asterisk next to any question for which they have additional information and then record it on a separate sheet. In addition, interviewers should be trained to record notes concerning any signs of reluctance, hostility, distraction, or intoxication on the part of respondents when someone else answers for or interrupts her; anything that causes the interview to be interrupted (e.g., downpour, visitors); and disruptions in the household due to interpersonal conflict that leads some members to move out temporarily (e.g., a wife and children return to her parents' home following a quarrel with her husband). All such notes later can be coded for confidentiality to protect informants.

To develop good rapport between principal investigators and interviewers, all training participants should reside at the same site and share leisure hours and casual conversation. In agricultural surveys, suitable training sites are away from the capital city in settings that allow easy access to farmers.

In rapid rural assessments, higher levels of education and field experience are required of interviewers using

semistructured interview guides with open-ended questions. Interviewers should be able to make judgments about intra- and intercommunity variability (e.g., with respect to wealth, social rank, occupational specialization), and creatively combine participant-observation with more structured data collection techniques. They must possess social skills effective to approach a wide range of officials and community residents, to conduct both groups and individual interviews, and to work effectively in interdisciplinary teams. Useful in training are simulation exercises in the classroom, including some with farmers or traders invited to the training session (and compensated for their time). (Chambers 1987 includes a number of suggestions on such techniques.) As Grandstaff et al. (1987:27) note, however, the extent to which rapid rural appraisal can be taught is debatable. Such skills ultimately must be developed through years of field experience. One effective means of training is for one trainee to be included on a team of experienced researchers. The drawback to this approach of course is the heavy cost in experienced researchers' time in relation to the number of new practitioners produced.

A final evaluation and screening of interviewers can be done at the end of the training period, and unsuitable individuals weeded out. All trainees, however, should be paid for the entire period of their instruction.

D. Supervision of Surveys

Even questionnaires whose design has included careful pretesting often benefit from further modification once a survey is underway. It is important that survey supervisors and principal researchers stay in close communication with interviewers so that both questionnaires and work and travel timetables can be readjusted as unforeseen circumstances arise. Although it is sometimes necessary for principal investigators to hire field supervisors in large surveys, it is essential that researchers themselves remain directly involved in all stages of a survey. They should live in the survey area, rather than occasionally visiting from the capital city. The researcher should be available to visit respondents whose morale declines or those who have unanswered questions about survey objectives or benefits. Such visits help to reduce dropouts from the sample. Researchers should regularly sit in on some of each enumerator's interviews; these should include surprise visits as well as scheduled ones. In addition to being an essential check on interviewers' general skill, accuracy, and interpersonal style, this demonstration of interest helps to keep interviewers' morale high and discourages shortcuts and cheating in completing questionnaire forms.

Some researchers have found that in addition to supervisory monitoring, two-person interviewer teams are effective in checking each other's work at the end of the day. This reduces loneliness and helps to keep morale, motivation, and accuracy

high.

Supervisors and principal investigators should also stay in regular contact with local officials, both to keep them informed of the progress of the survey and to learn of any local issues that may require attention.

Questionnaires should be checked daily in the first days of a survey until interviewers perform at a high level of accuracy, and then checked often enough to allow timely revisits of respondents to correct errors or collect missing data. Checking all questionnaires often is not feasible, but a subset should be checked regularly to keep interviewers vigilant.

Data should be entered on a computer as early as possible, so that error checks can be run in time to correct serious problems by re isiting some respondents, or if necessary weeding out interviewers whose data displays systematic biases.

E. Setting Up and Supervising Low-Cost Monitoring Systems

These systems involve the recurrent collection of data. The data could include observations of physical change (river flow, vegetation cover, housing construction), as well as interview data.

In order to be effective, a monitoring system should use local people who have a long-term stake in the community. Otherwise, discontinuities in monitoring staff may pose a serious threat to the validity of the data. A monitoring system using local people is also highly cost-effective, compared with bringing in U.S.-based professional staff for each wave of a

survey. A potential problem with local monitoring staff is that they may lose touch with the goals of the project and begin to define their mission in idiosyncratic terms. To avoid this problem we recommend that the monitoring staff be clustered. Rather than dispersing monitoring stations evenly over a nation or region, multistage cluster sampling should be used to select a small sample of regions. Then a group of monitoring people should be placed within each of the regions, in close enough proximity that they can communicate with each other. Each monitoring cluster would be required to meet at regular intervals (perhaps once a month) to discuss the goals and methods of the project. In addition, an AID staff person would visit each cluster at regular intervals to troubleshoot.

CHAPTER IV

DATA MANAGEMENT AND DATA ANALYSIS

This chapter will describe methods for organization and analysis of data. We will discuss three kinds of data -- data from rapid assessments, cross-sectional data from surveys, and longitudinal data from monitoring.

A. Rapid Assessment Data

1. Kinds of Data

Rapid social assessments will produce four kinds of data:

a. Background Data About Each Community

These may have been obtained in the exploratory research phase or during the rapid assessment phase. Background data could include census data, historical information, descriptions of administrative structures and procedures, aerial photos, satellite data, information about ethnic composition and other pertinent information.

b. Qualitative Data Obtained Through Unstructured Interview

Examples are descriptions of social institutions, responses to open-ended questions about farming practices, responses to questions about marketing problems, or descriptions of community responses to drought. Since these are usually responses to open-ended questions, it may not be desirable or possible to code them into preset categories. Rather, it will be desirable to use a good text processing system such as ASK SAM or PCFILE (discussed

below).

c. Nominal Data, Involving Categorization of Each Community on Some Variable

Examples are presence or absence of a given crop, gender division of labor in cultivating given crop, presence or absence of a market place, and whether there are seasonal labor shortages. In a more detailed social survey these kinds of data might be quantitative -- amounts of a crop that are grown, hours per week that men and women spend on planting or harvesting, number of shops in the market place, or numbers of migrant laborers hired during the season of labor shortage. In a rapid assessment this degree of precision may not be possible. The nominal data has considerable value in itself.

d. Quantitative Data

While many variables of interest can not be quantified accurately within the time frame of a rapid assessment, some kinds of quantitative data can be collected. Examples include prices, wages, and rough estimates of percentages of land given over to different crops.

2. Data Entry and Management

The information management system for a rapid assessment should allow for use of the four kinds of data described above. It should allow for easy entry, sorting, and retrieval of text, and for simple statistical tests.

It is important for data entry to take place at the end of every day. Typically in a rapid assessment the team only spends

a few days in each community. Data must be entered before the team has become immersed in the next community. The best procedure is for each researcher to take a laptop computer to the field, with clear delegation of responsibility for note taking and data entry. One plan would be for each topical area to be covered by a two person team. While one researcher conducted interviews, the second would take notes on the interview. In the evening the note-taker would be responsible for entering text into the computer, while the interviewer would code the community with respect to nominal and quantitative variables.

3. Analysis of Rapid Assessment Data

a. Analysis of ext Data

Write up and analysis of a rapid assessment study will take two forms -- analysis of text data and analysis of nominal or quantitative data. Systematic analysis of text data will require data management software that allows for easy retrieval and encoding of text phrases. For example, it would be desirable to be able to retrieve from a 20 community marketing assessment every interview in which a person referred to a given commodity. Two programs that will do this are ASK SAM and PCFILE (described below). SAS, REFLEX, and with more work, dBASE III, can be programmed to do this. Using dBASE II would require a professional programmer.

Besides aiding in the retrieval of text data, a program like ASK SAM can aid in coding communities with respect to nominal variables. For example, a nominal variable could be whether

people in the community are selling livestock for cash. ASK SAM can be instructed to mark all interviews in all communities that refer to livestock and also refer to cash transactions. Those communities can then be coded as to whether or not livestock were sold for cash.

b. Frequencies and Cross-Tabulations

The bulk of rapid assessment analysis will consist of frequencies and cross-tabulations with respect to the nominal variables. This could be done using any of the many statistical programs for the PC, such as SAS, SYSTAT, of PCGIVE. However, rather than using a separate statistical software program, it would be preferable to use a single data base management system that can do the text analysis and also compute frequencies, cross-tabulations, measures of association for cross-tabulations, and statistical tests for cross-tabulations.

Examples of frequencies would be number of the communities that produce coffee for the market, number of communities on a paved road, number of communities where there is a women's cooperative, and number of communities where seasonal labor shortages are a constraint to production.

Examples of cross-tabulations would include involvement in coffee production by ecological zone, women's involvement in food marketing food (high, medium, or low) by type of food crop, presence of seasonal labor constraints by presence of cash crops, and use of rural credit (high, medium, or low) by the importance of cash crops (high, medium, or low). Presentation of policy

oriented cross-tabulations in rural assessment reports can provide much more information than the common practice of presenting only the frequencies.

The variables that are included in the cross-tabulations should be directly linked to the policy concerns of the study. If the study is concerned with the effects of removing restrictions of interdistrict movement on maize, then the variables in the cross-tabulation could include: a) importance of maize production in the community (high, medium, low); b) maize export from the community (high, medium, low); c) maize import from the community (high, medium, low); d) reliability of transportation system, importance of other exports or imports from the community (wage labor, coffee, pyrethrum, consumer goods; and e) whether it appears that people are now moving maize across district boundaries. Information on infant diseases or bride price payments would be unlikely to be relevant to this assessment of maize marketing.

It seems to be common practice in writing reports based on rapid assessments to present tables without statistical tests. This can be misleading, and it is highly desirable that presentation of cross-tabulations be accompanied by the appropriate statistical tests (Chi-squared, Fisher's exact test, or log-linear analysis). Otherwise, policy decisions may be based on apparent patterns of association that could have been obtained through chance variation.

c. Intracommunity Variation

Studies that code communities on nominal variables have been criticized for failing to deal adequately with intracommunity variability with respect to gender, ethnicity, class or caste, and occupational specialization. As a partial answer to this valid criticism, rapid assessment studies should pay careful attention to intracommunity variability. It is unlikely that this can be done quantitatively, given that the time frame of a rapid assessment does not allow for sampling households within each community. However, it should be possible to develop separate codes for the important variables of internal variation. For example, a marketing study could have separate nominal variables for degree of women's participation in marketing and degree of men's participation in marketing, based on informal interviews with women and men. Similarity, nominal data on types of crops grown could be collected at three levels of social rank. Rather than a single variable as to degree of coffee production within the community (high, medium, low), there would be three variables -- degree of coffee production by wealthy farmers, degree of coffee production by medium rank farmers, degree of coffee production by poor farmers.

d. Regional Variation

Rapid assessments are often addressed to regional policy issues. One of the advantages of rapid assessments that are based on valid samples is that they can be used to provide information about regional variation across ecological zones,

with respect to location on a transportation network, and with respect to administrative boundaries. This can be done by cross-tabulating the variables of interest with regional variables such as agroecological zone, administrative district, or distance from urban centers.

B. Cross-Sectional Data

1. Summary Statistics

For many baseline surveys it will be useful to present frequency distributions. We have noted a tendency in REDSO's surveys to go no further than summary statistics. While it may be useful for some purposes to know that 80% of the farmers in a given country grow maize; far more useful is to know how maize growing covaries with anything that may be affected by policy. Only in cases where the existing knowledge of a region or nation is minimal will frequency distributions by themselves be of great value.

2. Cross-Tabulations

Much useful data about covariation can be represented by means of cross-tabulations. In standard statistics books it is the norm to find a description of the Pearson Chi-squared test for a two-variable cross-tabulation. We have discussed cross-tabulations in the preceding section in rapid assessments.

As with rapid assessment data, cross-tabulations from surveys should be motivated by the project of policy goals of the study. The worst offender that we read on this score was the Juba Valley study. Here the goal of the study was to assess the

probable effects of building a dam and relocating people. The report had tables on topics such as amount of bridewealth payment by number of marriages and where people take a bath (in town, in the river, in the bush) by type of subsistence mode (farmer, pastoralist, wage laborer).

In the past, use of cross-tabulations was limited to the bivariate case -- it was difficult to control for the effects of a third variable. Within the past 25 years a class of models have been developed for multivariate analysis of cross-tabulations -- the log-linear models. These should be employed where they are relevant. SYSTAT and other PC statistical packages can do log-linear analysis. One circumstance that would require a log-linear model is when the researcher is interested in the relationship between two variables, while controlling for regional differences. An example would be the relationship a) whether a household grows coffee, and b) whether the same household borrows money to buy agricultural inputs, controlling for c) district membership. This three-way table allows for testing three distinct hypotheses: 1) whether there is a significant relationship between coffee production and use of credit, controlling for district membership; 2) whether there is a significant relationship between district membership and coffee production, controlling for access to credit; and 3) whether there is a significant relationship between district membership and access to credit, controlling for the importance of coffee.

Another example of a log-linear model would be a study of

the relationships among a) gender, b) marital status (never married/married/divorced or widowed), and c) participation in wage labor. Here one can test three hypotheses: 1) whether there is a relationship between gender and marital status, controlling for participation in wage labor; 2) whether there is a relationship between gender and participation in wage labor, controlling for marital status; and 3) whether there is a relationship between marital status and participation in wage labor, controlling for gender.

In the past, it was common to analyze this kind of three-way interaction using three separate bivariate tables. Doing so is a statistically invalid procedure which can lead to misleading conclusions.

3. Building Multivariate Models

Cross-sectional data are often used to make projections about the effects of policy changes. While projections based on short- or medium-term surveys do not have the power of projections based on longitudinal data, these kinds of surveys are usually the best that one can do in the policy planning stage, and their use is better than planning based only on exploratory or rapid assessment data.

Projections are based on the analysis of the effects of change in a policy variable. For example, what will happen to maize production if the price to producers is to increase by 20% or what will happen to usage of government health services if the fee for services is to be increased (Meru health survey). Here

the policy change is an independent variable, and the analyst is interested in effects of the independent variable on one or more dependent variables, while controlling for other variables.

This kind of assessment requires construction of a multivariate model. It is only through a multivariate model that one can examine interrelationships among a system of variables and ask what the effect of a policy change might be when controlling for effects of other variables. We have described above one important class of multivariate models, the log-linear models, which should be used when all variables are measured at the nominal level.

a. Multivariate Cross-Sectional Models

The most common kind of multivariate cross-sectional model is ordinary least squares regression (often referred to as OLS). This has a single dependent (outcome) variable which must be measured on the interval level. An example would be amount of maize sold per household. The regression model has one or more independent variables. These can be measured at the nominal or interval level. One of the independent variables will be the policy variable (e.g., maize price). Policy variables are often dichotomous variables representing presence or absence of the policy. The other independent variables will be all of the variables that are hypothesized to affect the dependent variables. In the case of maize production these could include land quality, availability of household labor, and rainfall.

In order to make a policy assessment from cross-sectional

data, there must be meaningful variation on the policy variable within the cross-sectional sample. In the case of maize prices, if these are set by the government, then there would be no variation within a cross-sectional survey. However, if the prices are determined by a free market, then there may be intraregional variation in prices at a given point in time, allowing for an estimation of the effects of maize prices on other variables.

In the Meru study, variability on health care prices existed because people had a choice between government facilities and private facilities that charged fees. From these data on variation in user fees, and from estimates of the portion of health costs due to travel, it was possible to estimate the effects of user fees and other variables upon the choice of a health care facility.

Besides being concerned with the aggregate effect of a changing policy variable on the dependent (outcome) variables, the analyst may be concerned with whether the policy change will have differential effects on several categories of people. For example, will the maize price increase have more effect on rich farmers than on poor farmers? Will the introduction of a health fee of 20 shillings have different impacts on women than on men? Assessment of the differential impact of a policy change on different categories of people can be done in two ways using regression models. First, the categories of people can be entered into a multivariate model as an independent variable. If

a policy variable has different effects on men than on women, then the analysis should show a strong interaction term for gender. Second, a separate multivariate model can be estimated for each category of person. This could be a good thing do with estimation of production functions (described below) where people at different income levels may have different price elasticities of demand.

b. Autocorrelation Models

Ordinary least squares regression analysis assumes that the units are independent of one another. In many social surveys this is not a valid assumption. A simple example would be the case of two levels of data -- individuals and the households they live in. The different members of a household are not independent of one another -- they share resources and space, and the behavior of any one of them is directly affected by the behavior of others. A second example would be the selection of communities within a region, where some pairs of communities are linked by a road and others are not. The pairs of communities that are linked by a road may share social attributes because of the great ease of communication between them, not because of the effects of the independent variables that one has measured.

When individuals or communities are nonindependent because of spatially-based linkages the statistical problem is called spatial autocorrelation. Statistical models for spatial autocorrelation have been developed within economic geography during the past 20 years. These models require two kinds of

data: 1) the data on dependent and independent variables that would be used in an OLS regression model and 2) data on the spatial linkages between pairs of communities. The latter data can take one of two forms. First, it might simply be a measure of the physical distance between the two communities. Second, it might be a measure of the presence or absence of some linking feature between the two communities, such as a paved road. Given these data, the spatial autocorrelation model estimates the separate effects on the dependent variable of the independent variables and of the spatial linkages among societies. Two societies may be similar with respect to the dependent variable, because they share values on the independent variables, or because they are spatially linked.

Recently the spatial autocorrelation model has been generalized to a wide variety of linkages between societies, including common culture history, membership in a common administrative unit, kinship linkages, and spatial proximity. This model is called network autocorrelation analysis (see appendix 2).

c. Logistic and Multinomial Choice Models

While ordinary least squares models can handle nominal independent variables, they are not appropriate for use with nominal dependent variables. A commonly-occurring instance of the nominal dependent variable is the choice model, where the goal is to explain choices by individuals among a small number of discrete options. For example, in the Meru study the dependent

variable was the choice between a government facility and a matched (equidistant) private facility. There are a variety of regression models for nominal dependent variables. The LIMDEP program calls these qualitative response models. One of these, logistic regression, is related to log-linear analysis.

The Meru study used two qualitative response models -- the multinomial model, where the choice involved more than two alternatives, and the probit model, a logistic regression model, where the choice involves just two alternatives. Statistical packages for PC's that will compute these models include LIMDEP, and SYSTAT.

d. Production Function Models

Production functions are a specialized kind of choice model. Here the decision (dependent variable) is the amount of a good produced by an individual or a household. The independent variables are the factor prices and factor quantities. Estimating the production function allows for measurement of elasticities. Production functions are easily estimated from cross-sectional data; their use in development surveys is limited due to the difficulties in obtaining accurate price and production data.

Estimating production functions and computing elasticities is one of the most widely used methods for predicting the effects of policy changes. We should note, as did the Meru study, that the model assumes a homogeneous production function across social categories (ethnicity, class, gender). In many circumstances it

will be wise to check for variations in elasticities across important social categories.

4. Preferences or Values

It is possible to measure directly individuals' values or preferences with respect to work activities, consumer goods, kinds of foods, and other decision alternatives. This is done by asking people to make systematic judgments. The methodology for so doing is based on research in cognitive psychology and cognitive anthropology. The most advanced models have been developed by Romney and Batchelder at UCI. These kinds of data can be a valuable supplement to the cross-sectional survey data that we have discussed above. For example, suppose we want to know how much people will consume of a given crop if prices for it were to increase. Besides collecting cross-sectional survey data on existing consumption patterns, it would be useful to elicit judgments about the relative desirability of food items.

There are two different statistical models for eliciting preference judgments in a systematic way. The first is the paired-comparison model. Here the respondent is presented with all possible pairs of items and asked to choose which one he/she prefers (e.g., which do you prefer to eat -- maize or millet). With N items there are N(N-1)/2 choices. The second model is the triadic ranking model. Here respondents are presented with three items at a time and asked to rank order the items. A complete design for triadic rankings will produce N(N-1)N-2)/3 judgments -- a large number if there are many items.

Systematic judgement tasks would be too time consuming for use in development assessments were it not for the existence of balanced block designs for paired-comparison and triads data. These allow for presentation of a subset of pairs of triads so that each pair is presented the same number of times. Balanced block designs (Burton and Nerlove 1976) allow one to elicit systematic judgments of values and preferences with a small number of questions.

Besides their use in constructing aggregated preference scales, triadic rankings can be used to estimate the cultural consensus model (Romney, Batchelder, and Weller 1986). This model allows for systematic exploration of internal variability in values or preferences. For example, do people's preferences for a particular kind of food vary systematically with respect to social rank?

The cognitive judgement models described above can be estimated using the ANTHROPAK software, available from A. K. Romney, UCI. With this software it is possible to collect and analyze triads data from a group of 30 people within an hour. Hence, the time taken by this kind of data collection is minimal.

C. Longitudinal Data

1. Data from Before/After Comparisons

In the absence of a control group, data from two points in time will be virtually useless. Observed changes in the outcome could be subject to any of the threats to validity described above.

With the use of a control group that has been matched in some meaningful way with the treatment group, it is possible to make inferences about change. Here the hypothesis is that the change in some variable in communities subject to the treatment (policy intervention) will be greater than the change in the same variable in communities not subject to the treatment. For example, cash sales of coffee will increase more in communities given access to a new credit system than in communities not given access to the system. Here the comparison is between gain scores for the two groups of communities; a simple t-test for differences between mean gain scores can be used.

2. Data from Several Points in Time

Here we have a number of individuals or communities observed several times. With individual or household surveys there are two different situations. One is the panel study where the same individuals or households are observed repeatedly. The second is the multiwave random sample survey, where a new sample of households or individuals are drawn each time. If there are high rates of movement of people in or out of the community, or if there is concern about maturation effects (described above), then a multiwave survey may be preferable to an individual level panel study. However, this will shift the level of analysis upward. It will no longer be possible to do time series analysis with the individual as the unit; rather the analysis will be with the community as the unit. With a sufficiently large sample of time intervals, one can use an econometric program such as LIMDEP to

estimate relationships between variables. In the LIMDEP manual these models are described under the heading "analysis of panel data." With a smaller number of variables it may be preferable to use cross-lagged correlation analysis, described by Cook and Campbell (1979). This model allows for causal inferences. Suppose you have hypothesized that change in variable X causes changes in variable Y, and you have observations for each variable at four points in time. Then your observations are X(1) X(2), X(3), X(4), Y(1), Y(2), Y(3), and Y(4). If changes in X cause changes in Y, then you would expect to find the following patterns:

a) Positive correlation between X measured at one point in time and Y measured at the next point in time.

b) A lower correlation between Y measured at one point in time and X measured at the next point in time.

Cross-lagged correlation analysis is based on testing for differences between the correlations where X leads Y and the correlations where Y leads X.

For the four data points there would be three comparisons:

a) Correlation between X(1) and Y(2) compared to correlation between Y(1) and X(2).

b) Correlation between X(2) and Y(3) compared to correlation between Y(2) and X(3).

c) Correlation between X(3) and Y(4) compared to correlation between Y(3) and X(4).

3. Time Series Data

This is a basic model for econometric analysis. Data are measured on a number of variables for a single unit (community, household, nation) for a number of points in time. The most important methodological consideration for time series analysis is the problem of temporal autocorrelation -- most variables measured over time will be strongly intercorrelated because of temporal autocorrelation.

LIMDEP and other econometric packages allow for analysis of data on several variables for a number of communities over time. It should be noted that these kinds of analyses can accept different numbers of observations per community. Hence, an imperfect monitoring system, where some communities did not get observed at a given point in time could still be subject to time series analysis.

4. Measuring Changes in Inequality Over Time

One important goal of development assessments is to measure changes in social inequality over time. In order to do this, one has to have valid data on some measure of inequality, such as income. Assuming that this is possible (often it won't be possible), then income equality for some given point in time can be measured with a Gini coefficient. Casley and Lury (1982:119-122) describe how to compute Gini coefficients.

D. Data Management (Data Entry, Coding and Management)

There is perhaps nothing more tedious and boring to the researcher than managing data, in fact most researchers do not

even attempt to do it in any consistent or methodical way. The purpose of data management is to reduce errors, allow easy access to data at all phases of the research, and to allow replication of the research.

1. Minimizing Errors

A well known and respected research group at Columbia University recently announced that they were "recalling" over 100 published papers and reports due to unacceptably high data error rates. The research based on this faulty data is to be redone. This group is to be commended for that decision but the problem could probably have been avoided in the first place with better data handling methods.

a. Collection of Data

Never leave a question unanswered or blank; always require a positive response so there is no doubt whether the question was asked or inadvertently skipped. If the answer is "don't know" be prepared to code an answer which has that as its meaning; this can be done by using answers which are outside the range of possible correct answers, such as negatives for numbers of things or 99999 for temperatures. Remember to leave enough room in the data field for these cases.

Another problem often encountered during data collection, precipitated by poorly formed questions, is round off error. An example of this is taken from the Nairobi Area Study, question number 16 which was:

16. AGE a) in years ___
b) in months if less than 5 years old ___

Why a distinction was made for ages less than 5 years and greater than 5 years is unclear but it certainly limits the resolution of the data in category a). Allowing age to be specified in months or in years and months for both categories would give a much finer resolution; if someone is 10 years and 11 months are they recorded as 10 years or 11 years old? This type of error can have serious effects on cluster analysis for instance. (People have difficulty remembering ages and the best resolution may be a year +/- a year for this question). The solution in this case is to reform the question as:

16. AGE # of years ___
# of months ___

This question can now be answered in several ways: 24 months, 10 years 2 months, 5 years, or even 120 months. In general it is always better to gather the most concise data available and then consolidate or categorize during a preanalysis step.

This same example points up another related problem, mixing types of measurement or coding. Coding should be consistent within a single question, that is the answer should be either years or months. Where it is not possible to keep the units consistent or when the respondent does not know an answer in the units asked for, then record the answer in the units given by the respondent and use a preanalysis step to change back to the standard unit (see Section II,3,a).

b. Coding and Recoding

A significant number of errors are introduced during the transfer of data from the original survey forms to coding sheets often used for data entry. Whenever possible avoid recoding and transferring data. The simplest means of doing this is to take the data directly off of the original survey form and enter it into the computer using a screen which mimics as closely as possible the original form. If recoding cannot be avoided then try to have a single person do all of the coding to insure consistency.

c. Key Entry

Whether or not the data is recoded eventually it must be entered into the computer. There are several traditional methods of checking data for errors during this phase.

Key entry errors can be detected by double entry, where two persons enter the same data into two different files and then the files are compared for differences. Where differences are found the original survey form should be checked to see which is correct.

Triple entry is also used and where any two out of three match the two in agreement are accepted as correct. This method is obviously more time consuming and expensive. Visual inspection of a single entry by a second person who compares a print out of the data file to the original survey form is the most often used, and is the least expensive and probably the fastest method.

The best method, however, is a combination of computer assisted error detection and then visual inspection. The computer can be used to test each data field as it is entered for certain kinds of errors such as non-numeric characters in a number only field, numbers which are outside of defined limits and maximum field lengths. Where a field is based on some mathematical relationship to other fields the equation for that relationship can also be programed as part of the data checking. Textual data presents a unique set of problems for error handling. There are no limits which can be checked against and no rules as to the construction of the data. About the best that can be hoped for is that by running a spelling checker/corrector against the file all misspellings can be corrected. That way when a search is done for some particular word or phrase all of its occurrences can be found. There is currently no software available, running on a microcomputer which can process natural language for meaning with any degree of accuracy. However, most word processors now contain a thesaurus which can be used to find words with the same or similar meanings. During a preprocessing step all references to any set of words could then be found and used to build a keyword index. So to get useful information from textual data it is still necessary for someone very familiar with the field to build a keyword index for cross referencing. It should be mentioned that current research in the field of artificial intelligence may soon make the processing of textual data relatively straight forward.

d. Management of Data Files

Keeping files as simple and straight forward as possible is another means of reducing errors. Flat files or two dimensional tables are much easier to check for errors than a complex hierarchical database or a relational database. Flat files lend themselves well to normal statistical processing and can be sorted, merged or subsetted. The variables and records selected can be output in a format acceptable for input to an analysis package. Each step in the manipulation of data files should be run separately so that verification of the results is possible.

e. Testing the Analysis

While computers are not supposed to make mistakes they do after all only what we tell them to do. It is critical that all analysis procedures which are to be run against the database should first be run against a very small subset of the data. These runs should then be checked by hand for correctness. While it's rare that "canned" software packages are in error, it is sometimes the case that the manipulations made prior to analysis produce results which are incorrect. Merging two datasets on some common field may or may not give the expected results. Suppose there are uneven numbers of records in each of the two datasets being merged, or missing observations, or duplicate records. If a straight one to one merge of records in two datasets gets out of sync, all resulting records will be in error. An easy way to check this is to print a small umber of records from each data file, run the procedure and print the

results. Do this at each intermediate step and verification is straight forward.

2. Data Base Management

A database manager is used to keep track of a related group of files; there can be many files in a single database. This is different from managing a single data file and has nothing to do with the editing or verification of the data in the file. Specific software used for this purpose is discussed in Annex 1. An analogy is a librarian who maintains the card catalog in a library versus the books and periodicals stored in the library. The books may be thought of as the individual files containing data and the librarian is the database manager. While software such as dBASE III and ORACLE are referred to as database managers they are really data file managers. They keep track of the variables in files not the files themselves.

a. Establish a Catalog of Files

A card catalog in a library is organized various ways, by title, author, or subject for ease of retrieval of the books, and to help find books related by some attribute. Data files should be similarly organized and there are several ways of doing this. There are of course software packages specific to this purpose, but other more general purpose software is probably a better value. PCFILE III is a list processing package well suited to the function of cataloging. Fields can be set up for author, title, subject, publisher, date, keywords and so on, this is the data structure. Each new data file (or program) can be entered

into a reference file by filling in values for each item in the data structure. Searching for a record in the file is very simple. On a screen showing the data structure input just the fields to search on and all occurrences are found and presented. Boolean functions can be used to narrow the range of choices.

There are other means to help organize files; DOS, Disk Operating System either MS-DOS or PC-DOS have built in tree structures implemented using directories and subdirectories for organizing files on disk. There are utility programs such as XTREE which perform the same functions but are menu driven and much easier to use. Once set up finding a specific file is quick and painless. The following is a simple example of a tree structure using DOS subdirectories:

```
C:\                          The root level of a hard disk
!
!---DATA                      subdirectory for data files
!    !
!    !---INTPGMS              subdirectory for int. programs
!    !     !
!    !     !---EGERTON        subdirectory for egerton project
!    !     !
!    !     !---REDSO          subdirectory for REDSO project
!    !     !    !
!    !     !    !---info      general information files
!    !     !    !
!    !     !    !---memos     memos about the project
!    !     !    !
!    !     !    !---report    files containing the report
```

Using XTREE or the newest version called XTPRO you would see the tree structure in graphic form (shown above) on the screen. All DOS commands are available via a menu to operate on the tree, make subdirectories, delete files or directories, and so on. Within each level of the tree (subdirectory) other subdirectories

or files can exist. At the lowest level you would have various files which are related to each other, in this case by project type. Word processing files, spreadsheet files, data base files all exists together in one subdirectory and are accessed by their respective software regardless of where the software resides. To do this the appropriate "path" command must be in the AUTOEXEC.BAT file at the root level.

The only problem is that most people do not take the time to properly catalog and file things. Just ask the average researcher to produce something he/she worked on several years ago and watch the process they go through, usually starting with a quick scan of the piles of paper on their desk. We are all guilty of this and it is just a matter of getting into the habit to make the system work, whether or not it is computerized. There are other ways to organize files and the best structure is the one which makes the most sense to you. Some people keep all their word processing files in a WP subdirectory and their spreadsheet files in a SPREADSH subdirectory, however this can become very confusing when trying to locate a particular file. It is better to keep files in subdirectories related to projects, people, or tasks.

b. Maintain Data Integrity

Suppose you went to the library to look for a specific book, found the reference in the card catalog and then got to the appropriate shelf only to find the entire section missing. Upon questioning the librarian you found that last week they

rearranged the shelves and the book you are looking for is now on a different floor. Unfortunately the card catalog was not updated at the same time so the system is almost useless. The same thing goes on all the time in research. For instance a researcher collects data from a survey, enters the data into a file and then proceeds to manipulate and transform that data, storing the results back into the same file. Some time goes by and another researcher wants to gain access to the original data to perform some other analysis. But guess what, the original data is no longer where it is supposed to be, in fact it may be retrievable only by reentering from the original survey forms. The integrity of the data has been compromised.

The procedure to get around this is very simple. First of all original data files should be made READ ONLY (see Norton under UTILITIES in Section IV,F,1,e) and stored someplace secure. Secondly, never operate on the original file, make a copy of the original to a temporary file and perform any manipulations on the temporary. Each time a set of transformations is performed, the data file and the program which performed the transformation should be cataloged and stored. Using a combination of subdirectories and file names, such as DATA01.CAL which would be the first transformation of a SuperCalc file, the entire process the researcher takes can be reconstructed and the original data is safe. The entire sequence of events, starting with the raw data file and all manipulations should be documented in a file containing the names of the data files, program file names and

the software used to perform each, this constitutes the database. It would also be good to annotate the list so there is a basic understanding of how and why each step was taken and the results it produced.

c. Archive

Archiving is a means of securing data files and programs against loss. There should always be a minimum of two copies of all files, data and programs. If you use a hard disk then you should make backup copies of individual files onto a floppy disk often, say every day, and a complete backup of the hard disk once a week or once a month depending on how much work you do. To be even safer, there should be three copies made, the one on the hard disk, a copy which is stored on site (i.e., in your office), and one stored off site just in case the office gets robbed or destroyed. This may seem to be more than is necessary but disaster planning as it is called is used to cover extreme circumstances. And after all the cost in time and effort to make and store the copies is nothing compared to starting from scratch; imagine having to collect the data a second time!

E. Software and Hardware Definitions and Recommendations

1. Software

One of the goals mentioned throughout this paper is to identify a completely integrated information management system which can store background data, qualitative textual data and quantitative data, allow easy retrieval of any subset of that data, and perform appropriate statistical analysis. There is no

such single piece of software available, to our knowledge, which will satisfactorily perform all those functions. So the performance of such tasks requires a variety of software packages which can be used in combination and which must necessarily share data files.

What follows is a description of general categories of software, along with a discussion of some specific packages which are in use by AID/REDSO or can be purchased fairly inexpensively. Then a look at how each package might fit into an information management system for accomplishing research goals. First some definitions:

Data Record -- A collection of individual variables, related to each other by some functional definition. For example the questions on questionnaires are variables, the answers to those questions are values of the variables.

Datafile -- A collection of individual records all of the same format. The collection of all answers to all the questionnaires in a survey are a datafile.

Database -- A collection of related files. The original survey datafile, the unit conversion file (UNITCONV), the ENDUNIT file (see section II,3,a) and any transformation files (DATA01, etc, see section IV,E,2,b) together make up the database.

These definitions are functional or working definitions and they do not necessarily agree with the "traditional" ones now popular in computer literature. The difference between this definition of a database and the traditional one is a prime

example. The PCFILE + User Guide for Version 1.0, page 9 defines database as "a collection of all individual records which you are keeping on file." A confusing definition which seems to equivalence a file and a database.

a. Spreadsheet Programs

Electronic spreadsheet programs such as LOTUS 1-2-3 and SuperCalc all perform similar functions. They are used to make simple numeric calculations, modeling of systems using mathematical and statistical functions and to automate numeric tables. They all tend to offer some type of datafile functions, look-up tables, tax tables and the like but they are very limited in this function. Most require that the entire datafile be loaded into memory to be worked on, thus severely restricting the size of the datafile. Then to, datafile functions implemented in spreadsheets are of a format that is somewhat foreign to most of us, the form of queries for instance is not at all natural language like. On the positive side, most spreadsheet programs offer decent graphing functions which can aid in the presentation of numerical data and help to find errors in the data. For instance a quick scatter plot can show up outlyers in the data, summation functions can be used to check totals across fields and so on. Most packages have excellent statistical and mathematical functions, better than most database software.

REDSO is currently using LOTUS, but there is no longer any reason to be locked into a single package as most now offer a translate or Import/Export function which allows the use of a

variety of formats. SuperCalc 5 for instance can read, execute, and write LOTUS compatible files. In the worst case, and it is not at all bad or hard to do, ASCII files can be produced for exchange between dissimilar systems. ASCII files are the accepted standard for all types of software, not just spreadsheets.

b. Word Processing

Word processing software is normally used as a replacement for the typewriter, and to check spelling, a very worthwhile function especially when large documents are produced with many drafts between the first and final form of the document. AID/REDSO has settled on Word Perfect for its use, but again there are many others to choose from, WordStar and PCWRITE being two of the more popular ones after Word Perfect. Here too ASCII is the standard for file exchange and all word processing software can produce text or ASCII output files. Because of this standard there is really no need to require or even suggest that everyone use the same word processor.

One of the more interesting functions of word processors and one which has applicability to this report is FIND, or FIND and REPLACE. Textual data stored in paragraph form within a word processing file can be scanned to find occurrences of words and phrases and the paragraphs containing them can then be written to another file for inclusion in a document. Automatic indexing from within a word processor can be used to extract keywords from a file. Every word may be indexed or the index may be built from

an inclusion or exclusion list. The draw back is that only one file may be processed at a time and of course you would have to know which files to look through. The section on utilities offers some alternatives.

c. Database Software

i. Database Functions

There are basically two types of database software, those that operate interactively and those with programming languages which can operate in batch mode. Batch mode simply means that programs can be written and stored on disk to be run at a later time, or many times. Interactive means that commands are executed as they are entered and cannot be stored for reuse. Some software incorporate both methods of operation. There are times when interactive mode is sufficient, such as when looking up a phone number in a phone number list, or finding a reference in a bibliography list or performing functions which will not be performed again. There are other times when it is essential to have a stored program which can be executed over and over again. This is mainly a feature which is used in business applications and not in research.

One often hears the term "relational database" used as a major selling point of a software package. The term is often used simply to confuse people, and the definition often kept secret, or couched in technical terms which no one really understands. Truth is it is a very simple concept; a relational database is one which has variables or data fields which are

shared between more than one data file. The data is only stored in one place but referenced as a member of more than one, so it has the appearance of being duplicated. All of the database software discussed herein have the ability to link fields or relate fields between data files. They are therefore, even if not specifically advertised that way, relational database software. Database software sometimes have financial, mathematical, and statistical functions built in as part of their programming language or as functions which can be associated with a data field. This is not an essential function but is often a convenience; for survey work of the type described above it is not.

Most database software provide a means of checking data either at the time of input or through functions which can be written into a checking program. It is most convenient when data checking can be done at the time of input.

Screen generators allow for creation of forms on the computer screen into which data can be input and sometimes output. This is very good for reducing errors.

Report generation facilities allow predefined forms to be used for output, whether or not there is a programming language built into the software. Variables are associated with "holes" on the screen and their values inserted into those spots when printed.

Sorting and searching are one of the most often used functions for operating on a datafile. A good database program

will have Boolean functions (and, or, not, equal to, etc.) which allow a combination of operations to take place at one time.

Calculated fields are allowed in almost, if not, all database software, for totaling any other mathematical operations.

Menus for basic operation of any software package are a big help though not essential if the manual is well written and organized. Having an Import/Export utility will help transfer datafiles between various packages, though again it is not essential as long as the software can produce text files

There is usually an inverse correlation between level of functionality of a piece of software and ease of use or learning time; the more the software does, the harder it is to learn and use is a generally excepted rule.

ii. Specific Database Packages

ASK SAM -- Ask Sam is a free form text oriented datafile system, which combines quantitative and qualitative functions. It has received high reviews because of the flexibility of its text fields and because it can search through text fields without having to first mark key works. Quantitative data is entered with spaces between fields and text may be entered into any word processor which is capable of producing ASCII output. Weaknesses are that the syntax is rather inflexible, it is difficult to learn, and errors may not be easy to find and verify.

DBASE III -- dBASE III is a flexible piece of software which can be made to do most of what we need for the type of work

described elsewhere in this paper. However, learning it is difficult, and there are anomalies within the software which only experience will bring to light. In its interactive mode dBASE III is not too hard to learn, but the programming language can take years to master. Any serious systems development using dBASE III should be undertaken only by a skilled computer programmer. Attempts at programming by novices can lead to results which are suspect since even if the program runs with no errors the results may not be what they are supposed to be. A second problem with dBASE III is it lacks very sophisticated built-in statistical procedures; complex routines can be programmed but again it is not something a casual user would want to attempt.

PCFILE + -- PCFILE + is a very easy to learn and use datafile package. A computer literate person, someone who already uses a computer for say word processing or electronic spreadsheet work, could learn most of PCFILE + in less than a week. It has all the necessary functions except financial and statistical, although it will do simple means and sums. It is also very inexpensive, around $75. It can format the screen for input and do data checks while you enter data. PCFILE + would be perfect for a cross reference system where textual data has had key words extracted. Searches can be performed quickly on a variety of fields and the output saved for further processing.

REFLEX -- REFLEX is an interactive datafile program similar to PCFILE +, with no programming language, and short learning

time. It handles text data better than most and has very good on-screen data input capabilities. All of the above datafile software has the ability to format a screen to look like a survey form and to do data checking at the time of entry. Not all of them are as easy to use in that way as are PCFILE + and REFLEX.

SAS -- SAS, statistical analysis system, was originally a mainframe program but has recently been ported to the microcomputer. Far from being only a statistical package it is perhaps the only true database (as opposed to datafile) management software mentioned here. It contains built in functions for managing sets of files as well as excellent graphing and mapping functions. While the learning time for the entire system is fairly high, it can be learned in small pieces as they are needed. The biggest problem with SAS is that it requires massive amounts of disk storage, up to 20 MB for the entire system and runs slowly on anything but a 80386 microcomputer system. Cost is high, about $1,500, however, universities normally have a site license which reduces the cost to about $100 per computer; AID could purchase a site license and reduce the cost. Because it is used so widely by universities, most researchers are already familiar with it. Because of its versatility, good user support, excellent training guides and manuals it is highly recommended.

d. Statistical Software

There are many PC based statistical packages, but only a few which have all the necessary functions. SPSS-PC which was

adapted from the mainframe SPSS is widely used, probably because it was one of the first statistical packages available on the mainframe. Having already taken the time to learn it no one likes to change to another and go through the learning process again. It is not the best or the easiest to use, its data structures are archaic FORTRANish. Still it does the job at a low cost.

SAS is far and away the most versatile statistical package on mainframe or PC. Coupled with its excellent data management and graphics it is a "BEST BUY" and should be seriously considered, if the hardware is available to run it.

LIMDEP is a new econometric package. It will do descriptive statistics, cross-tabulations, log-linear analysis, ordinary least squares, 2 stage least squares, time series analysis, probit analysis, and logit analysis. The manual is very well written, and refers to an econometrics text book by the same author.

SYSTAT is one of the most widely used statistical packages for the social sciences. It is divided into several modules, each one comes on a separate diskette and can be run on the most primitive of PC's. The modules are DATA (for data transformations), TABLES (cross-tabulations and log-linear analysis, MGLH (regressions, analysis of variance, analysis of covariance, canonical correlation analysis), CORR (pearson and other kinds of correlation measures), and STATS (a variety of statistical tests, including nonparametric tests). SYSTAT has a

very easy command language and is easy to use and run. The latest version includes an excellent graphics package.

e. Utilities

There are many general utility packages on the market, but two are especially worth mentioning, NORTON UTILITIES and XTREE. If you have ever erased a file by mistake you have needed NORTON UTILITIES. It is a very inexpensive package which gives control of screen attributes such as color and highlighting, can unerase files, change the attributes of files (make files READ ONLY or HIDDEN), optimize hard disk space and much more.

XTREE, is basically disk management software which puts DOS commands on one keystroke. It gives a visual representation of your disk layout which is very helpful in managing files and subdirectories (see section IV,E,2,a for a sample). Both of these packages are less than $100, are extremely easy to learn and use.

f. Complete Information Management Systems

An Information Management System must handle all of the functions referred to in this paper, data input, verification, editing, storage, transformation, retrieval, and analysis. This is made especially hard because of the combination of qualitative and quantitative data needed for various types of questions. Two different sets of software are recommended for the two types of data. Presented here are alternative sets of software which will perform those functions.

i. Quantitative

Quantitative data is well understood and there are many alternatives for its management:

Choice 1) dBASE III for database and datafile management along with SPSS-PC or SYSTAT and LIMDEP for statistical processing would provide a complete management system. DBASE II would require computer programmer expertise for the initial setup. Thereafter the researcher could perform all necessary functions.

Choice 2) PCFILE + or REFLEX for database and datafile management along with SYSTAT or SPSS-PC and LIMDEP for statistical processing would also be sufficient although not as flexible as Choice 1) above. It could be used without a programmer if the researcher was willing to spend some more time learning the database software.

Choice 3) SAS alone would provide flexibility on the database side and complete analysis capability. It would require a programmer for setting up procedures to handle the database functions as well as a commitment to purchase 80386 computer hardware.

Choice 3) SAS is highly recommended as the single package to accomplish this work. No other software comes close to matching SAS, in functions for database or statistical processing. Choice 2) provides an intermediate solution based on existing hardware.

ii. Qualitative

Qualitative data is much harder to manage and analyze and there are fewer software choices available.

Choice 1) A word processor and a list processor, WordPerfect or WordStar and PCFILE + or REFLEX, although not specifically designed for qualitative analysis would allow for the input, storage, transformation and retrieval of textual data. It has the advantage of being a combination which is normally already available (word processing) and can be used for quantitative data also. The disadvantage is that to use this combination effectively the researcher must operate in a completely interactive mode. To search a textual file there are only two options; to use the word processor LOCATE function and then block and write the located text out to a file, or to perform a keyword search using the list processor. This requires that a keyword extraction process be performed on each file in the system either by hand or with the index function of a word processor. This can be a very time consuming task but also very effective.

Choice 2) Ask Sam is a free form text oriented datafile system which has some appeal over option 1) above. Text may be entered into any word processor which is capable of producing ASCII output and queries are made without the need of producing a keyword data file. This may speed up the time it takes to process textual data. On the other hand there is a rather inflexible syntax required to do anything with this software, and errors are likely to be made which may or may not be easy to find

and verify.

The choice between these two options is a hard one. The recommendation is to go with option 1) and hope for rapid development of a truly Artificial Intelligent text processor in the near future.

2. Data

Since there is no single piece of software which will handle all of the functions discussed in this paper there must be a way to easily exchange data and text files between software programs. The solution is simply a matter of creating TEXT files which have no special control characters embedded within them. If you can type a file to the screen and read it, and it contains no unreadable characters then you probably have an TEXT file. All of the packages referred to above can create TEXT files, although not all call them text files. WordPerfect for example refers to them as SYSTEM files.

3. Hardware

a. What is Available at the AID Missions

AID made the decision some time ago to purchase WANG personal computers for all its offices. Fortunately WANG has changed its product line to be compatible with MS-DOS (IBM compatible) and the newer machines being purchased are of this type. The 80286 or AT style machines are the fastest now in use in the REDSO office. It will certainly be necessary to purchase some 20Mhz or 25Mhz 80386 machines if any serious database, statistical or AI programs are to be run. The recommendation is

to get at least 2 MB of RAM and a 70 MB hard disk. For field use 80286 and even 8086 based machines are sufficient for data entry, validation and some analysis.

APPENDIX 1

FUNCTIONAL COMPARISON FOR DATABASE SOFTWARE

Functional Comparison for Database Software

Software---> / Function	ASKSAM	dBASE3	PCFILE	REFLEX	SAS PC *
Interactive	Y	Y	Y	Y	Y
Batch	Y	Y	N	N	Y
Relational	Y	Y	L	L	N
Math	Y	Y	N	N	Y
Stat	N	N	N	N	Y
Financial	N	N	N	N	N
Data Check	N	Y	Y	Y	Y
Input Screen	N	Y	Y	Y	Y
Report Screen	N	Y	Y	Y	Y
Mail Merge	N	Y	Y	Y	N
Sort	Y	Y	Y	Y	Y
Search	Y	Y	Y	Y	Y
Merge	Y	Y	Y	Y	Y
Subset Rec.	Y	Y	Y	Y	Y
Subset Vars.	Y	Y	Y	Y	Y
Calc. Fields	Y	Y	Y	Y	Y
Import	Y	Y	Y	A	A
Export	Y	A	Y	A	A
Menus	N	[illegible]	Y	N	N
Cost	200	495	125	80	1500
Learning	I	H	E	E	H
Use	I	H	E	E	E
Tutorial	N	Y	N	N	N

Y = YES

N = NO

A = ASCII or TEXT

H = HARD

I = INTERMEDIATE

E = EASY

* SAS is also a statistical package so price comparison is not strictly valid.

APPENDIX 2

LIST OF SOFTWARE

List of Software

Name	Publisher/Manufacturer	Cost
ANTHROPAK	Professor A. K. Romney Department of Anthropology University of California Irvine, CA 92717	Minimal
ASK SAM	Seaside Software (approx.) 538 Parade Dr. Corpus Christi, TX 78412	$ 250.00
dBase III + Version 1.1	Ashton-Tate 20101 Hamilton Ave. Torrance, CA 90502 (800) 437-4329	$ 695.00
LIMDEP Version 5.1	William H. Greene, Ph.D. Econometric Software, Inc. Box 3526 Church Street Station New York, NY 10008-3526 (516) 822-2389	$ 300.00
Lotus 1-2-3 Release 2.2	Lotus Development Corp. 55 Cambridge Parkway Cambridge, MA 02142 (800) 345-1043	$ 495.00
Norton Utilities Advanced Edition Version 4.5	Peter Norton Computing Inc. 100 Wilshire Blvd., 9th Floor Santa Monica, CA 90401-1104 (800) 365-1010	$ 150.00
PC File + Version 3.0	Buttonware, Inc. P.O. Box 5786 Bellevue, WA 98006 (800) 528-8866	$ 69.95
PC SAS BASE Version 6	SAS Institute Inc. Software Sales Department SAS Circle renewal/year Box 8000 Cary, NC 27512-8000 (919) 467-8000 attn: Jerry Leonard add on packages, e.g., STATS, GRAPH, etc. renewal/year (STATS are necessary for your purposes as added to BASE)	$ 620.00 $ 315.00 $ 495.00 $ 250.00

REFLEX Version 2.0	Borland International Customer Service P.O. Box 660001 Scotts Valley, CA 95066 (408) 438-5300	$ 249.95
SuperCalc 5	Computer Associates 1240 McKay Drive San Jose, CA 95131 (800) 531-5236	$ 495.00
Systat Version 4.0	Systat Inc. statistics & graphics 1800 Sherman Ave. Evanston, IL 60201 (312) 864-5670 statistics only graphics only	$ 795.00 $ 595.00 $ 495.00
WordPerfect Version 4.2 Version 5.0	WordPerfect Corp. 1555 N. Technology Way Orem, UT 84057 (801) 225-5000	 $ 435.00 $ 495.00
WordStar Professional Release 5.5	MicroPro International Corp. Computer Sales P.O. Box 7079 San Rafael, CA 94912-7079 (800) 828-2858	 $ 495.00
XTreePro Version 1.0	Executive Systems Inc. 4330 Santa Fe Road San Louis Obisbo, CA 93401 (805) 541-0604	$ 129.00
1st Class Fusion/HT	1st Class Expert Systems Inc. One Longfellow Center 526 Boston Post Road - 150 East Wayland, MA 01778 (800) 872-8812	$2,495.00

APPENDIX 3

SAMPLE OF SOMALIA QUESTIONNAIRE BY PETER LITTLE

KISMAYO RURAL-URBAN DYNAMICS STUDY
HERDER EXPENDITURE AND MARKETING FORM
Foomka Suugeynta iyo Kharash-galka Xoolo dhaqaha

1. Enumerator: _____
   Xogdoonaha

2. Date _____
   Taariikh

3. Questionnaire No. _____
   Lam. Booqashada

4(**). Location: _____
   Goobta

5(**). Name of Respondent: _____
   Magaca Warceliyaha

6. Name of household Head: _____
   Magaca madaxa reerka:

7. Is the household currently consuming its own grain?
   Reerku iminka ma quutaa midho beeraad uu soo saaray?

   Yes: _____ No: _____
   Haa Maya

8(**). List of household members currently in resident and sharing meals:
Liiska xubnaha reerka hadda jooga ee wadaaga cuntada:

Age Da'	Sex Lab/Dhedig	Age Da'	Sex Lab/Dhedig

9. Number of resident cattle currently being milked: [ ]
Tirada lo'da hadda joogta ee irmaan ee la maalo:

Containers of milk available daily:_____ [ ]
Inta weel oo caano ah ee maalin walba laga helo:

10. Number of resident camels currently being milked: [ ]
Tirada geela hadd jooga ee la maalo:

Units of milk available daily:_____ [ ]
Caanaha maalin walba'laga helo:

11. Number of goats and sheep currently being milked: [ ]
Tirada Ariga hadda jooga ee la maalo:

Units of milk available daily:_____ [ ]
Caanaha maalin walba laga helo:

EXPENDITURES
Kharash-gal

12. Purchases per 2 week period (2 weeks preceding interview)
Wax soo gadasho 2dii todobaadba (2dii todobaad ee ka horeeyey wareysiga)

Item Shayga	Volume Mugga/Cabirka	Price Per unit (shs) Qiimaha(Shs)	Location Goobta
Maize Flour Bur galley			
Maize grain Midho galley			
Cost of milling Qiimaha Shii-dista			
Wheat flour Bur Qamadi			
Pasta Baasto			
Rice Bariis			
Vegetables (specify) Khudrad (caddee)			
Fruits (specify) Khudrad geedmidhood (caddee)			
Milk Caano			
Ghee Subag			
Meat Hilib			
Sugar Sonkor			

12. Purchases per 2 week period...(cont,d)

Item Shayga	Volume Mugga/Cabirka	Price Per unit (shs) Qiimaha(Shs)	Location Goobta
Tea Caleen Shaah			
Detergent(Omo) Oomo			
Tobacco Tubaako			
Kerosene Gaas			

INPUTS
MAALGELIN WAX SOO SAAR

Item Sheyga	Volume Mugga/cabirka	Price per unit (shs) Qiimaha(shs)	Location Goobta
Water Animals Waraabin xoolo			
Hired Labor (Farm) Ijaar Shaqaale (Beerta)			
Hired Labor (Livestock) Ijaar Shaqaale (Xoolaha)			
Other inputs (fodder,etc.) Maalgelin kale (caws,iwm.)			

13. Purchases per 3 month period (or since last interview)
Wax soo gadasho 3 bilood (ama ilaa wareysigii ugu dambeeyey)

Item Sheyga	Volume Mugga/Cabirka	Price Per unit (shs) Qiimaha(Shs)	Location Goobta
Cooking oil Saliid cunto			
Spices Xawash			
Cloth(Specify) Dhar (Caddee nooca)			
Shoes/Sandals Kabo/Dacas			
Flashlight Toosh/Karbuuno			
Cooking Utensils Weel wax karis (maacuun)			
Plastic Water containers Caagag/ Jirikaano biyo			
Omo Oomo			
Soap Saabuun			
Batteries Baateri			
Panga Baangad			
Knife Mindi			

13. Purchases per 3 month period (cont'd)

Item Sheyga	Volume Mugga/cabirka	Price per unit (shs) Qiimaha(shs)	Location Goobta
Vet. Supplies Daawooyin Xoolaad			
Novidium Nofidiyum			
Berenil Berniil			
Dip Medicine Dib			
Other (Specify Type or name of disease) Kuwo kale (caddee nooca ama magaca cudurka)			
Seeds (specify) Abuur (caddee)			
Maize Galley			
Sesame Simsim			
Other. _____ Kuwo kale			
Hired Labor (Farm) Ijaar Shaqaale (Beerta)			
Hired Labor (Livestock) Ijaar Shaqaale (Xoolana)			

ANIMALS
Xoolo

	Number Tirada	Price(shs) Qiimaha(shs)	Location Goobta
Cattle(specify) _____ _____ Lo' (caddee)			
Camels(specify) _____ _____ Geel (caddee)			
Goats/Sheep _____ _____ Ari			

MARKETING
Suuqeyn

14. Sales per 2 week period
Iska gadid 2dii todobaadba

Milk/Ghee
Caano/Subag

	Purchaser Gate	Location Goobta	# of units & Frequency Cabirka & inta jeer	Price per unit (shs) Qiiamaha (Shs)
Cattle Lo' Fresh (Dhay) Sour (dhanaan)				
Camel Geel Fresh (Dhay) Sour (Dhanaan)				
Ghee Subag				

15. Sales per 3 month period (or since last interview)
Iska gadid 3 biloo.J ah (ama ilaa wareysigii ugu dambeeyey)

Cattle (Specify type)
Lo'(caddee nooca)

	Purchaser Gate	Location Goobta	Number Tirada	Price per animal (shs) Qiimaha(shs)
Young Bulls (9 Mo-3 year) Dibi yar yar (9 bilood-3 sano)				
Oxen(castr) Dibi dhufaanan (3+ sanno)				
Bulls (3+ years) Dibi (3+sanno)				
Cows (9mo-3yr) Qaalmo (9bilood - 3 sano)				
Cows (3+ yr) Saco (3+ sano)				
Camels Geel Males (2-5 yr) Qaalimo (2-5 sano)				

15. Sales per 3 month period (Cont'd)

	Purchaser Gate	Location Goobta	Number Tirada	Price per animal (shs) Qiimaha(shs)
Females (2-5 yr) Oaalmo (2-5 sano)				
Males (5+ yr) Awr (5+ sano)				
Female (5+ yr) Halo (5+ sano)				
Sheep Ido				
Goats Riyo				

Hides and Skins (**)
Maqaarro iyo Hargo

	Purchaser Gate	Location Goobta	Number Tirada	Price per unit(shs) Qiimaha(shs)
Cattle Lo'				
Camel Geel				
Sheep Ido				
Goats Riyo				

Agricultural Production
Tacab Beereed

	Purchaser Gate	Location Goob	Amount(unit) Cabirka	Price per Unit (shs) Qiimo(shs)
Maize Galley				
Sesame Simsim				
Other Kuwo kale				

Non-Cash Transactions:
Isdhaafsi aan lacag ahayn:

16(**). Number of other household's animals added to herd in last 3 months (or since last interview):
Tirada xoolo reero kale oo xeradaada ku soo biiray 3dii bilood ee gudubtay (ama ilaa wareysigii ugu dambeeyey):

Animal
Xoolo

Type Nooca Xoolaha	Number Tirada	Location from Meesha aad ka keensatay	Reason Sababta

17(**). Number of animals loaned to, exchanged, or given to other households in last 3 months (or since last interview):
Tirada xoolaha aad leeddhay oo aad amaahisay, aad bedeletey, ama aad siisay reero kale 3dii bilood ee gudbey (ama ilaa wareysigii ugu dambeeyey):

Animal
Xoolo

Type Nooca Xoolaha	Number Tirada	Location to Meesha ay ku sugan yihiin	Reason Sababta

18. Number of own animals consumed or slaughtered in the last 3 months (or since last interview):
Tirada xoolaha aad leedahay ee la qalay 3dii bilood ee gudbey (ama illa wareysigii ugu dambeeyey):

Animal Type Nooca Xoolaha	Reason Sababta

General Comments About Interview:
Aragti guud ka bixi wareysiga

General Comments About Local Conditions:
Aragti guud ka bixi xaaladda deegaanka

APPENDIX 4

RWANDA SURVEY

REMARQUES QUE L'ENQUETEUR DEVRAIT FAIRE

Le conseiller du secteur et les responsables des cellules vous ont déjà dit qu'il y aurait une enquête dans cette cellule. Nous faisons partie du personnel de cette enquête.

Nous voudrions, si possible, vous rendre visite plusieurs fois (jusqu'à la fin de l'année/au cours d'une année jusqu'en septembre 1986) pour vous poser quelques questions. Nous essayerons autant que possible de vous avertir de la date de nos visites et de vous donner l'occasion de nous dire si les dates choisies ne sont pas convenables. Nous vous prions de répondre à nos questions aussi complètement que possible.

Nous voudrions vous expliquer que cette enquête est faite avec l'accord des autorités locales et du Ministère de l'Agriculture. Elle a parmi ses buts d'aider les paysans rwandais en recommandant des politiques basées sur des renseignements précis et complets. Aucune réponse ne sera associée avec le nom du répondant; les noms des répondants ne seront jamais transmis aux autorités. Egalement, nous voudrions que tout répondant sache que cette enquête n'a aucun lien avec les autorités des impôts ou avec l'ONAPO.

Nous vous remercions d'avance de votre généreuse collaboration. Quelqu'un de notre équipe supervisoire se présentera chez vous prochainement.

IBYITONDERWA BIMENYESHA N'UKORESHA ANKETI

Konseye wa segiteri n'abakuru b'amaselire bababurije ko hazakoreshwa anketi muli iyi selire. Tukaba tuli bamwe mu bakozi bagomba gukora uwo mulimo.

Twifuzaga, bishobotse kuzabasura incuro nyinshi (kugeza umwaka urangiye/ho mu mwaka utaha kugeza muli Nzeli 1986) kugira ngo tubabaze ibibazo bimwe na bimwe. Tukaba lero tuzagerageza uko bizashoboka kubamenyesha italiki tuzabazuliraho, no kubaho, umwanya wo kutumenyesha niba ayo matalıki tuzaba twabisemo azaba abatunganiye. Turabasaba dukomeje kuduha ibisubizo byuzuye by'ibibazo byacu.

Twifugaza na none gusobanura ko iyi anketi yemewe na Ministeri y'ubuhinzi kimwe n'ubutegetsi bwa za komini, kandi ikaba igamije gufasha abaturago b'u Rwanda, bishingiye kuli politiki yo kugina ibisobanuro bihagije kandi by'ukuli.

Nta gisubizo kizajyaho izina ly'uwashubije; amazina y'abashubije ntazigera ashyikilizwa ubutegetsi. Ikindi kandi, twifuzaga ko usubije wese yamenya ko iyi anketi ntaho ihuliye n'abategetsi, ibisoro, cyangwa ibya ONAPO.

Tubaye tubashimiye umutima wanyu mwiza n'ubufatanye. Hali umuntu wo mu itsinda ligenzura iyi milimo uzagera hano ubutaha.

Aux enquêteurs: Ne posez pas les questions n°2 et 3 si vous pensez qu'elles sont trop sensibles. // Nti mubaze ibibazo n°2 na n°3 niba mubona byaobabaza nyili urugo.

0|2|3

1. Le chef du ménage (si c'est un homme) a-t-il d'autres femmes? 1=oui; 2=non // Umukuru w'urugo (niba ali umugabo) afite abandi bagore? ☐ 11

2. Est-ce que le chef du ménage est une femme? 1=oui; 2=non // Ese umutware w'urugo n'umugore? ☐ 12

   Si oui, est-elle // Niba alibyo ni: ☐ 13

   1 = veuve // umupfakazi
   2 = divorcée // yatandukanye n'umugabo
   3 = première femme d'un homme polygame // umugore wa mbere
   4 = deuxième (ou 3e, 4e, etc.) femme d'un homme polygame // umugore wa kabili (3, 4, ...)
   5 = autre // ibindi

3. Depuis quand est-ce que le chef du ménage habite ici? // Umutware w'urugo amaze igihe kingana iki atuye aha? 19 ☐ 14 ☐ 15

4. Cultivez-vous du thé 1=oui; 2=non // Ese mufite umulima w'icyayi? ☐ 16

   Si oui, depuis quand? (nombre d'années) // Niba ali yego, kuva lyali? (imyaka) ☐ 17 ☐ 18

   Sinon, avez-vous jamais cultivé du thé? 1=oui; 2=non // Niba ali oya, ese nta na limwe wigeze uhinga icyayi? ☐ 19

   Si oui, quand l'avez-vous abandonné (il y a .....ans) et pendant combien d'années l'aviez-vous eu à ce moment? // Niba ali yego, mwaretse kugihinga lyali? (hashize imyaka .....), mwali mukimaranye igihe kingana iki? ☐ 20 ☐ 21

5. Est-ce que quelqu'un du ménage a travaillé en dehors de l'exploitation en 1985 pour être payé en argent, à part ceux qui ont travaillé pour l'usine a thé? // ☐ 22

   Usibye gukorera uruganda rw'icyayi, hano mu rugo iwanyu, umuntu yaba yarakoreye amafaranga hanze, uretse imilimo ikorerwa iwanyu, muli uyu mwaka ushize wa 1985?

   Si oui, est-ce que c'était du travail en dehors de l'agriculture (c'est-à-dire du travail autre que travailler aux champs)? // ☐ 23

   Niba ali yego, kaba se ali akazi katali ako gukora mu milima?

6. Est-ce que quelqu'un du ménage a travaillé pour l'usine à thé en 1985? 1=oui; 2=non // ☐ 24

   Hali uwaba yarakoreye uruganda rw'icyayi muli uyu mwaka ushize wa 1985?

7. Est-ce que quelqu'un du ménage a cultivé des pommes de terres dans la region de Gishwati en 1985? 1 = oui; 2 = non // ☐ 25

   Muli uru rugo hali uwaba yarahinze ibirayi muli Gishwati mu 1985?

8. Altitude de la maison (m) ☐☐☐☐ 26 - 29

APPENDIX 5

VARIABLES FOR RAPID RURAL ASSESSMENT SURVEYS

Variables for Rapid Rural Assessment Surveys

1) Environment
   topography
   drainage
   rainfall
   seasonal variation
1) Kinds of crops
2) Kinds of fishing and shellfishing
3) Domesticated animals (list; how cared for; who does it; what do they eat; what animal products are used/eaten? grazing patterns, seasonal migrations)
4) Other domestic production
   (crafts, agricultural inputs, etc.)
5) Household
   a) definition of household
   b) household composition
   c) household division of labor
   d) food preparation and consumption
5) Work groups and labor exchanges
6) Constraints or problem areas
   weeds
   insects
   birds
   plant diseases
   fish diseases
   soil quality
7) Seasonal problems
   rainfall
   harvesting
   storage
   purchased inputs
8) Use of government services
9) Capital inputs
   irrigation and drainage systems
   fishing boats and nets
   weirs
   fish ponds
   bore holes or wells
   fences
10) Purchased inputs
    problems with reliability of supply or quality
11) Cash crops
12) Marketing
    coops
    transportation
    prices
    parastatal or other government policies
    storage
    spoilage
    who gets the money; what is done with it?
13) Access to credit

14) Environmental issues
    deforestation
    soil erosion
15) Urbanization
    what percentage of the community has migrated?
        community development check list
        a) petrol station
        b) bank
        c) paved road
        d) development projects
        e) travel time to the urban center
        f) elementary school
        g) secondary school

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