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# Using Social Science Tools in Agroforestry Research

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**Terms of Reference**

1. The contractor will prepare a paper of approximately 30 pages in length that concisely describes, compares, and contrasts research methodologies for assessment of the use of multipurpose tree species in rural Asia. A critical feature of this paper will be a detailed table which outlines attributes, advantages, and disadvantages of each methodology.

2. This paper will include, but not be limited to, the following methodologies:

   Rapid Rural Appraisal
   Farming Systems Research Approach
   Agroecosystem Approach (Conway)
   Design and Diagnosis (ICRAF)

3. The paper will be written to provide information for non-social scientists wishing to understand social science tools for assessment of MPTS use in communities. Since the primary audience for this document will be researchers who are not specialists in rural social science, the document will use a minimum of jargon and will provide a glossary of terms.

4. A thorough use of available literature and a brief literature review is expected as part of this paper, along with a bibliography which includes a listing of all key references on the topic.

The views expressed in this report are those of the author, and do not necessarily reflect those of either USAID or Winrock International.

## 1.0. Introduction

This paper is intended for non-social scientists who wish to learn about tools in the social sciences that may help them assess the use of multipurpose tree species (MPTS) in rural communities. We will compare the use of specific tools in the context of four methodologies. It should be understood, therefore, that a social science tool is selected and used in the framework of an overall research design and strategy. Scientific tools by their nature define a framework for the data that they are used to collect. The attributes and limitations of these social science tools depend on the individuals who employ them, the sequence in which they are used, and how they are adapted to the broader social, economic, and political contexts of the research setting.

A crucial aspect of the state-of-the-art methodologies in **agroforestry** is interdisciplinary exchange. This paper will attempt to clarify and describe research tools that are used primarily to understand people, particularly small-scale farmers and landless rural communities. Recent innovations in "tool kits" stress the need to elicit farmers' knowledge of "their way of doing things" and engage their participation in technology adaptations. These innovations complement the classical tools of social science research. Tool kits are used mainly to collect primary data. However, they also help to determine:

1) the sequence and types of tools used,
2) how data will be assessed for validity and reliability, and
3) the efficacy of research goals.

This paper, then, is a guide to how social science tools are used to collect information on people, events, and things. It is also a guide to understanding how those tools work together as methodology. It is not, however, a complete guide on how to use the tools discussed.

Terms printed in bold type are included in the glossary.

## 1.1. What Is a Social Science Tool?

A social science tool is a mechanism used to collect information either by observation or participation. In sociology and anthropology, a fundamental tool is the combination of observing subject behavior while participating in it. This tool is called **participant observation**. Other terms often associated with *tool* are **technique** and **instrument**. Tools, techniques, and instruments are descriptive procedures for collecting **primary data** that consist of verbal and nonverbal human behaviors occurring in the past or present (see Leedy 1980). The degree of specificity regarding the procedure usually determines the lexical use of the terms *tool, technique,* and *instrument*. Going from the general to the specific: *tool* is usually used to describe procedures for collecting data which span a broad range of behaviors (for example, the tool of participant observation).

*Technique* sometimes refers to a tool that narrows the data field by focussing on a particular set of behaviors. While using the tool of participant observation, a social scientist might employ the technique of **interview probes** for collecting and cross-checking the reliability of data concerning a specific data set. The term *instrument* usually refer to greater specificity in the procedures of a tool. For example, after a period of participant observation (tool) and related probes (techniques) on preferred trees that produce fruit for household consumption, the social scientist can devise more specific procedures for data collection. These would be instruments, such as the construction of an **interview survey**. These terms -- tool, technique, and instrument -- are sometimes used interchangeably, however. The above connotations are garnered from current usage and not from a rigorous axiom. Unfortunately, the terms *method* and *methodology* are also ambiguous.

## 1.2. How Do Social Scientists Use the Terms 'Method' and 'Methodology'?

The term *method* is sometimes used interchangeably with *tool, technique, and instrument*. *Method*, however, often implies a relationship to the logic of research strategies and goals. Feldman, a political scientist, defines *method* as "the way a question is asked and the techniques employed to answer it" (Feldman 1981, p. 9). That is, a method is what the social scientist uses to form a hypothesis and resolve it through formulation of predictive models. A method involves a level of abstract reasoning to determine how tools will be used to collect primary data.

As we shall discuss later in this paper, methods are also devised during the research process when preliminary data analysis suggests the need for a new method or the integration of several methods. Again citing Feldman (1981), *method* implies a choice in deciding upon a problem and the way the researcher goes about solving it.

*Methodology* is similar to *method* in this sense, but carries an added implication of theoretical development. Pelto and Pelto refer to methodology as the "logic in use", that is:

> the structure of procedure and transformational rules whereby the scientist shifts information up and down the ladder of abstraction in order to produce and organize increased knowledge (Pelto and Pelto 1978, p. 3; see Figure 1).

To understand social science tools, it is necessary to view the collection of data as a frequent process characterized by the concurrent use of a number of tools (for example, participant observation used with interview probes).

The complexity of agricultural systems further complicates the problem of clarifying research concepts that are closely interrelated within a discipline and those concepts that cross disciplinary borders. The literature on social science research tools

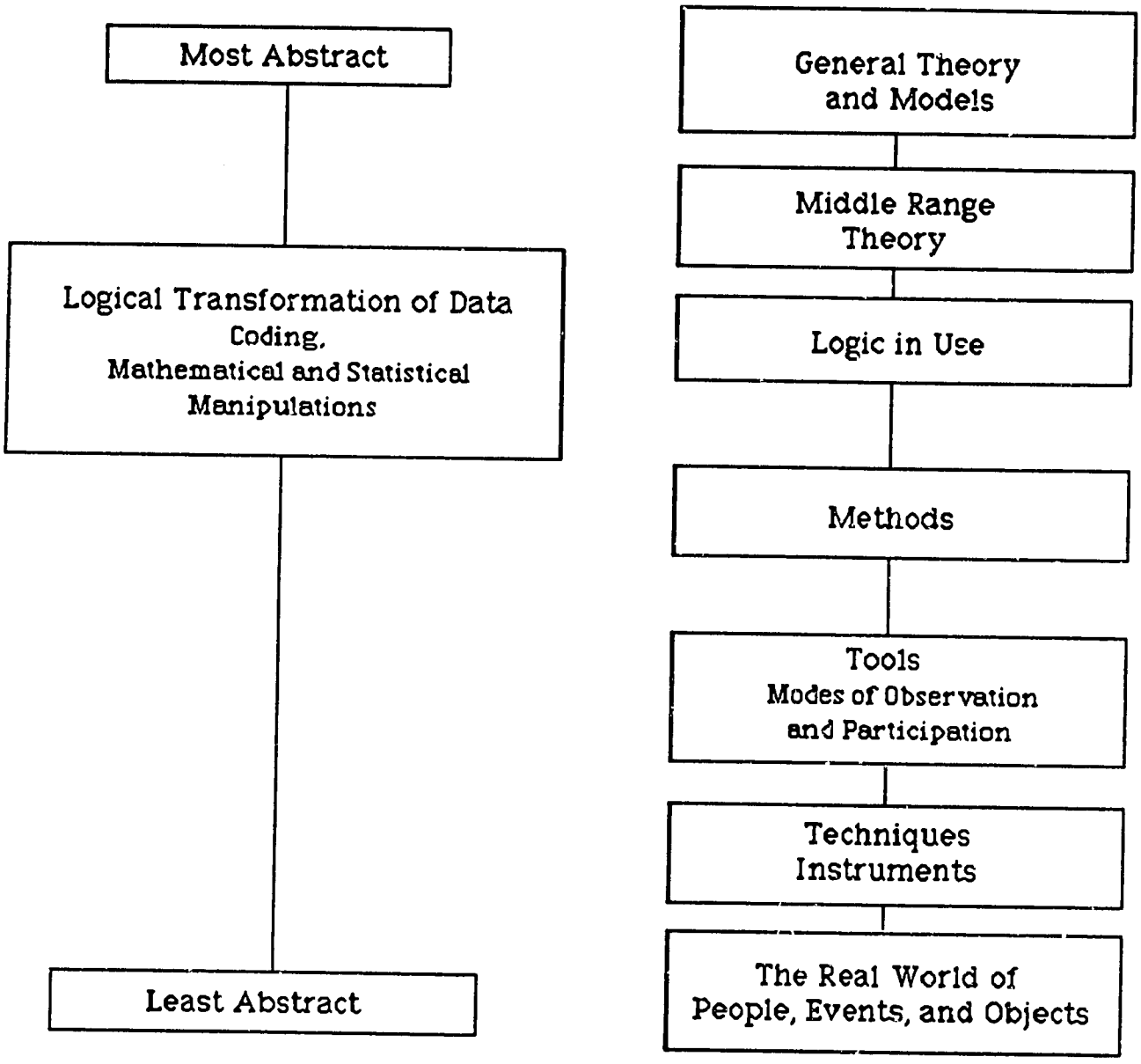


**Figure 1.** Levels of abstraction in research methodologies (modified from Pelto and Pelto 1978).

in agroforestry, and in agricultural development more generally, reflects this challenge. Discussing farming systems development in a resource-limited environment, Harwood states:

> Once a target area has been selected, the systems survey and description begins. This is not only the most crucial phase but the one least successfully accomplished in most systems research. Unfortunately, the systems are so complex and so variable that precise enumeration is extremely difficult if not impossible (Harwood 1982, p. 14).

More recently, at the workshop, "Farmers and Agricultural Research: Complementary Methods" (see *Experimental Agriculture* 1988), Farrington postulated,

"research methods which succeeded in well-endowed areas are rarely appropriate to difficult areas" (1988, p. 271). Particularly, research intended to benefit landless and small-scale farmers requires:

> awareness that successful research will have to take into account the farmer's objectives and constraints, and that it can benefit from his knowledge of local conditions . . . A degree of farmer participation has long been incorporated into the management of **on-farm** trials (Tripp 1982), but recent participatory approaches go much further, involving the farmer in the definition of the research agenda, the conduct of the research, the evaluation of the research results and the dissemination of findings (Farrington 1988, p. 271).

The practical necessity of conducting agroforestry research on farms highlights the critical role of farmers as participatory members in social science research. A significant proportion of the data field of the farming system concerns the human element of the farmer.

The following presentation of social science tools for assessing the use of MPTS emphasizes farmer participation in complex agricultural, biological, social, cultural, economic, and political systems. In this regard, the most prevalent and current methodologies, or "logics in use," are: the Agroecosystem Approach, Farming Systems Research, Rapid Rural Appraisal, and Diagnosis and Design.

As we shall see, these represent a continuum of methodological development. Very briefly, the Agroecosystem Approach involves the greatest degree of abstraction in order to understand the structure and functions of an agroecosystem; Farming Systems Research focuses on the development and adaptation of technology to the farm as a whole system. Experience with these approaches led to the development of Rapid Rural Appraisal for timely collection and analysis of data and greater farmer participation. Finally, Diagnosis & Design developed as a form of Rapid Rural Appraisal adapted to the assessment of land-use systems and agroforestry.

## 2.0. The Agroecosystem Approach

Among these current methodologies, the Agroecosystem Approach developed by Conway (1985) employs the highest level of methodological abstraction relative to theories of agricultural ecology and human ecology. Also referred to as **Agroecosystem Analysis and Development (AAD)**, it developed from a methodology "originally designed for the analysis of natural ecosystems" (Walker et al. 1978 in Conway 1986, p. 31). Because of its theoretical orientation, its focus on analysis, its organizing framework, and a tool kit that encourages cross-disciplinary exchange, AAD functions as a central transformer for agroforesty research to the other major methodologies.

This methodology's distinguishing feature is the way it organizes all levels of data within the complex hierarchies of agroecosytems. Although the tools of AAD are

usually used to collect data at specific levels (such as the farm, village, community, region and nation), the primary activity of AAD is the analysis of interactions among these levels. Thus, the Agroecosystem Approach combines the perspective of the small farm as the basic system for research (with the related emphasis on farmer participation in all stages of research and development) with the perspective of other development projects in the areas of health, education, and community development. This latter perspective, which bridges agriculture with other fields in development, is referred to as Integrated Rural Development. The methodology of **Rapid Rural Appraisal (RRA)** is applied within the framework of the agroecosystem approach as the basic tool kit (Conway 1987).

## 2.1. Basic Assumptions of the Agroecosystem Approach

Four principal, interrelated assumptions form the basic framework of the Agroecosystem Approach (Conway 1986):

1) It is not necessary to know everything about an agroecosystem in order to produce a realistic and useful analysis.

2) Understanding behavior and important properties of an agroecosystem requires knowledge of only a few key functional relationships.

3) Producing significant improvements in the performance of an agroecosystem requires changes in only a few key management decisions.

4) Identification and understanding of these key relationships and decisions require that a limited number of appropriate key questions are defined and answered.

These assumptions are further related to ideas of **productivity, stability, sustainability**, and **equitability** (Conway 1986), which are the assessment criteria for analysis of agroecosystem performance. Conway encourages use of this methodology where there is good communication among the disciplines represented on a multidisciplinary team (Conway 1986).

## 2.2. Tools Used in the Agroecosystem Approach

The Agroecosystem Approach uses the tool kit developed for RRA to collect primary data because "rapid rural appraisal covers a wide range of techniques which have in common the objective of quickly acquiring critical information about an area" (Conway 1986, p. 51). The primary tools are **observation** and **semi-structured interviews** with farmers, local leaders, and officials. In the literature on AAD, there are few definitions or explanations of how these tools are used to collect data (compare Conway 1987). The application of these two tools therefore depend upon the skills of the research team, the period spent collecting data in the field, the dynamics and condition of the field setting, and the research objectives.

## 2.3. Tools for Secondary Data

Since the Agroecosystem Approach offers a broad view of methodological relationships, its main concern is the transformation of primary data into **secondary data.** The forms of secondary data considered essential for **pattern analysis** are the following (from Conway 1986, p. 52):

1) a diagrammatic history of the area
2) a sketch map showing key features and agroecological zones
3) one or two transects with zones and problems
4) a seasonal calendar
5) bar diagram of income sources and marketing
6) flow diagram of production and marketing
7) decision tree for major farming systems
8) Venn diagram of institutional responsibilities for decision making

Using a case study from northern Pakistan, Conway explains the process of collecting primary data for secondary data compilation and presentation. For maps and transects, he relates:

> These were constructed by walking through villages along two transects, chosen by eye to provide a good representation of the variation within the village. During the walks observations were made by eye and farmers who were encountered were questioned (Conway 1987, p. 234).

To further illustrate the relationship of tools for collecting primary data and the process of abstracting secondary data, Conway uses **intensive, structured dialogue.** This appears to be a concurrent use of **informal, structured interviews** with interview probes from which he generates bar diagrams.

> During the transect walks, individual farmers were chosen, subjectively, as representing "large, medium and small farmers" and were engaged in a more intensive, structured dialogue aimed at assessing their holdings by types of crop and livestock. Information was also obtained on the size of the family and the extent to which the subsistence demand was met (Conway 1987, p. 237).

Another tool of primary data collection that must be mentioned in the above example is sample selection--in this case a **representative, convenience sample.** Tables 1 and 2 summarize, respectively, the primary tools and secondary tools employed in the agroecosystem approach.

Table 1. Primary tools used in the Agroecosystem Approach.

| Tool | Skills Employed | Types of Application |
|---|---|---|
| Observation | Non-verbal skills | Participant observation<br>Representative convenience sample |
| Interviews | Verbal skills and non-verbal skills | Semi-structured interviews<br>Structured interviews<br>Formal and informal interviews<br>Probes |

Table 2. Secondary tools used in Agroecosystems Analysis.

| Type of Tool | Includes |
|---|---|
| Sketches | Features of target area |
| Transects | Problem zones |
| Calendars | Seasonal labor demands, climatic factors |
| Diagrams | Historical time line<br>Bar diagram of resources, marketing<br>Flow diagram of resources<br>Decision "tree"<br>Venn diagram of institutional participation |

## 2.4. A Comparison of the Use of Tools in Agricultural Development

Definitions and explanations of social science tools remain ambiguous in most of these major methodologies. This situation of social science tools being "fuzzy" and dependent on the "mysterious, personal skills of seasoned social scientists" may indeed cause communication problems within multidisciplinary teams, and poses a constraint to understanding research tools. A recent monograph on agricultural development in East Africa (Brokensha and Little 1988) contains the following eight excerpts on research tools and their use in "relatively long-term (at least several months) fieldwork in a particular region." The editors note that this represents "a departure from much of development anthropology, which is based on short term consultancies" (Brokensha and Little 1988, p. 2). Social science tools highlighted in these excerpts appear in the glossary and/or Table 3.

> **participant observation, individual and group interviews, questionnaires,** and **survey design** . . . farming-systems research and methodologies were used in **diagnostic surveys, formal interviews,** and **on-farm farmer managed trials** (Spring 1988, p. 16)

- **describe** how politics worked . . . and try to **assess** some of their beneficial and deleterious effects (Bunker 1988, p. 45)

- [description of organizational system analysis, vis a vis] . . . **see** happening within communities . . . within a broader organizational context (P. Fleuret 1988, p. 71).

- **selected** 20 households **randomly** from among the recipients [in a food aid ration program] 5 each on 4 preselected distribution days, and recruited research assistants to **assist in data collection** (A. Fleuret 1988, p. 83)

- Several data-collection methods were used. First, historical data were collected by **scanning government records** . . . Second, a **standard questionnaire** was administered . . . to 345 household heads, of whom 74.5 percent were male and 25.5 percent female. The majority of questions were **open-ended** . . . respondents cover all parts of the district . . . **thematic discussion** with elderly singly or in groups for supportive information was the third method of data collection (Akong'a 1988, p. 100-101)

- **case study** . . . **field interviews** [farm survey] (Haugerud 1988, p. 139, 142). Eighteen students . . . conducted farmer interviews . . . **formal and informal surveys** of farmers . . . direct observation . . . Fields were sketched and measured . . . **[purposeful sample of convenience]** (Haugerud 1988, p. 156-157 see notes, especially 4).

- [**participant observation** with excerpts from field notes] (Udvardy 1988, p. 222).

- Data were collected during field research . . . derived primarily from a series of **detailed interviews** . . . five sample communities . . . ten **enumerators [extracted data]** from record kept by two local mission health centers (Chaiken 1988, p. 238)

One can see from this sample that social science tools used to collect primary and secondary data in agricultural development are broadly oriented by their methodology. In other words, the same tools are frequently used in different methodological approaches. More importantly, these excerpts demonstrate how limited descriptions of how to use these tools can be. This does not imply that a strategy for their use is lacking, but it might reflect the fact that data fields for which they are intended appear fairly explicit. Listing tree species and asking a farmer about the purpose of each might appear to be obvious applications of observational and interviewing tools in agroforestry. In many instances, this type of tool application may be surmised without further explanation. However, additional explanation of how tools are to be used in a study could contribute to better data reliability, both in the statistical sense and in the integrity of empirical content. For example, a description of how to employ observation in a study on the use of trees could usefully specify that on-farm observation of tree species

be conducted with male and female members of a farming household. It could additionally specify that they describe and demonstrate how they use the tree species observed. This process of customizing tools according to the types of data to be studied reduces the "fuzziness" of social science tools and demystifies their use.

Table 3. Social science tools and their various applications in anthropological research on agricultural development (based on Marten 1986).

| Tool | Various Forms of Application |
|---|---|
| Observation | Direct observation, sketches, measurements |
| Participant Observation | Descriptions, visual assessments, field notes, case studies |
| Interview | Individual, group, thematic discussion (individual or group), detailed, formal, informal |
| Survey | Design survey, diagnostic survey, standard survey, questionnaires, open-ended questions |
| Review of Documents | Scanning government records for patterns, extracting data |

In the next section, the Farming Systems Research approach is described as viewing the whole farm as a system, with particular emphasis on the farm household and its systemic interrelationships with agroecosystems (Harwood 1979; Ruthenberg 1980; Shaner et al. 1982; Simmonds 1985; Jones and Wallace 1986). The relationship between AAD and Farming System Research emerged according to a strategy with three emphases:

1) the small farmers' perception of their needs;

2) small farmers' active participation in research on their farms; and

3) communication among disciplines (Whyte and Boynton 1983, p. 157).

## 3.0. The Farming Systems Research Approach

**Farming Systems Research (FSR)** developed as a methodology from an experiential process of conducting and guiding research with farmers (Waugh et al. 1989; see also Harwood 1979). Shaner et al. (1982) consolidated its general perspective in the concept of Farming Systems Research and Development (**FSR/D**). Two corollaries of this are Farming Systems Research and Extension (**FSR/E**) and the Farming Systems approach to Infrastructural Support and Policy (**FSIP**) (Norman 1982, Hildebrand and Waugh 1983 in Waugh et al. 1989). According to Waugh et al., the following four points are "common threads that bound together the early efforts of the farming systems approach and that survive today" (1989, p. 209):

1. A concern with limited-resource farmers and their families who have not adapted high yielding technologies to the agricultural and socioeconomic environments of their farms.

2. Recognition that an understanding of the farmer's situation is essential for developing technology appropriate to the conditions of resource-poor farmers.

3. The use of scientists from more than one discipline working together as a team in order to understand the farm as an entire system rather than studying isolated components within the system.

4. Understanding that new technologies and potential solutions to problems should be evaluated within the systems of production and practiced by the farmers, under their conditions, and with farmer participation (Waugh et al. 1989, p. 209).

Addressing the specific research concerns of agroforestry, Simmonds states that FSR is

> no more likely than conventional agricultural research itself to arrive at what is surely needed, namely, practical and testable visions of **NFSDs** [new farming systems developments] for the wet tropics on poor soils (Simmonds 1985, p. 58).

In this respect, FSR methodology and its use of social science tools does not readily distinguish itself from the other methodologies. The main feature of its development was to effect a policy shift that recognized that the systems of technology development and extension are important interactions affecting small farmers' adoption of agricultural technology. Development of technologies by researchers is sometimes referred to as **upstream, top-down, or research-push**. On the other hand, the way in which farmers' problems are relayed by extension agents to researchers is sometimes referred to as **downstream, bottom-up** or **farmer-pull**.

As we shall see later in this paper, the methodology of Diagnosis and Design attempts to formulate a "logic in use" for the conceptualization of upstream and downstream system interactions in agroforestry. Depending on the nature of the research project and its setting, the decision to involve farmers in formulating research questions tends to be made based on local conditions, and relies particularly on a good rapport between extension personnel and farmers (see Robins 1986, and Wallace and Jones 1986, p. 268-269).

### 3.1. The FSR Tool Kit

Simmonds cautions that the "wide variation in terminology tends to conceal the essential similarity of all the approaches . . ."(1985, p. 32). The FSR tool kit is basic and straightforward.

The first step is to determine the research **target**: a group of farms that satisfies the purpose (also referred to as the **recommendation domain** or **zoning**). One tool for determining the target is **reconnaissance**, or observation of areas to determine whether or not they meet research criteria.

Second, a brief **exploratory survey** determines what questions should be asked to assess baseline data and knowledge, and how they should be asked. For example, variation in dialect and accent within small geographical areas can significantly affect the quality of data, because it may lead to miscommunication among local farmers, extension agents, and other outsiders (see Smith-Hefner 1989). The exploratory survey can help researchers to assess this variation and suggest how to account for it in data collection.

The third step is the design and implementation of a **survey questionnaire**, or an **interview schedule**, for the collection of immediate data needs.

The fourth step is to perform a preliminary analysis of data at hand and construct data designs for time flows of labor, material, inputs, other costs, yields, prices, and other returns. These follow the conventional protocols of farm economics and economic decision-making based on factors of risk and uncertainty (Simmonds 1985, p. 35).

These four steps comprise the descriptive phase of FSR. Previously in our discussion, I cited Harwood's comment that this descriptive phase in FSR is often the least successful. Yet this is a most crucial phase of any research strategy. Inasmuch as the descriptive phase consists of researchers' descriptions and not the farmers' own perceived 'way of doing things,' it is top-down and not bottom-up. Therefore it inhibits, to some degree, the flow of indigenous knowledge that, if recognized by the research process, might aid the successful adaptation of technology.

The other phases of FSR are the design of alternative technologies, the **validation** of these technologies, and the recommendation of validated technologies (Jones and Wallace 1986). Figure 2 illustrates the phases of FSR.

The predominant tool kit for multidisciplinary communication in FSR is the **sondeo** (Hildebrand 1979a). Sondeo uses the basic social science tools of observation, participant observation, and various interviewing techniques. In this respect it is very similar to Rapid Rural Appraisal and will be further compared to RRA below. Sondeo's main emphasis is to pair together different experts in a rotational manner in the course of collecting field data. By this rotational pairing of team members, sondeo increases the

flow of information and a set of working relationships . . . so that information is immediately available to be incorporated into the planning and implementation processes (Jones and Wallace 1986, p. 10).

In using a research tool in situations as complex as farm systems, one must always assess the degree to which it successfully performs its function. It is important to reiterate Conway's point that when using social science tools, one should focus on a few key questions and variables. Huxley and Raintree (1987) also stress that

> The greater space/time dimensions and management complexities of agroforestry systems, as compared with most agricultural ones, means that agroforestry field experiments can only deal with very few variables at a time (Huxley and Raintree 1987).

Again, social science tools need to be defined each time they are used, according to the particular set of variables that define the data field at all phases of research. In other

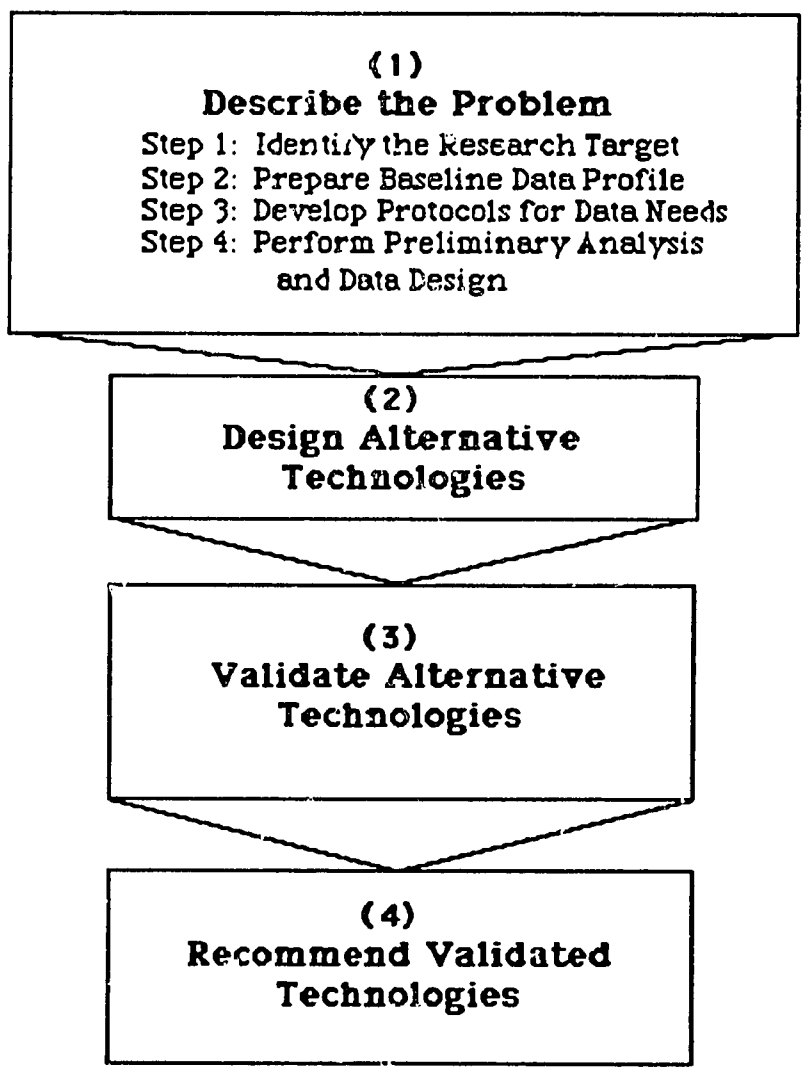


Figure 2. Phases of Farming Systems Research.

words, when using a particular tool to collect data on a few variables, the researcher must define the tool in terms of the context in which it is used. For example, collecting information on environmental factors (seasonal conditions, local occurrences of floods or drought) might require modification of a tool, or how several tools might be used together to obtain and assess local knowledge. This is especially significant for MPTS field experiments, because currently:

> The continuum of on-station to on-farm field experimentation involves an increasing level of farmer participation, but the concept of testing selected variables is still implicit (Huxley and Raintree 1987).

Concerning the selection of landless or small-scale farmers to be included in an experiment, Sutherland notes the potential of numerous biases to affect the use of certain tools, particularly **informal surveys** and **on-farm experimentation.** He characterizes these as "not only the most powerful and widely used tools of FSR, but also those at highest risk of bias during farmer selection" (Sutherland 1988, p. 1). Certainly, awareness of potential biases improves the quality of assessment data. Another important element in the use of these social science tools is the researcher's skill in communication. Communication does not rest solely on language and linguistic capacity (compare Sutherland 1988, pp. 1,4), but also on non-verbal cues, which the researcher should note. Social science tools depend on communication. It is interesting that this crucial aspect remains an enigma. Tools of **purposive sampling** and the **community approach** to selecting farmers for on-farm experiments may compensate for more apparent biases, but neglect of communication skills affects the quality of communication--and therefore data production--among members of multidisciplinary teams, extension agents, and farmers.

In sum, an approach based on the FSR tool kit appears to stress the goal of technology implementation (upstream) more than technology adaptation (downstream) (Raintree and Hoskins 1988; Raros 1987 in Wallace 1988). This is not to say that FSR is limited by the orientation toward developing new technologies, but participation of the farmer at the earliest stages of research is crucial.

### 3.2. FSR and Rapid Rural Appraisal: Interrelationships

Before discussing the next major methodological approach, Rapid Rural Appraisal, it is important to understand the interrelationships of these methodologies in the cyclical process of on-farm experiments. As stated above, the principal tool kit of both FSR/D and FSR/E is the sondeo, which is similar in most respects to RRA.

Perhaps these two methodological approaches differ mainly in their historical and institutional development. For example, Galt (1987) comments that in January and February 1978, team members in Honduras were using similar tools for quick assessments. The term *sondeo*, however, was not coined until 1979, when "the concept was presented by Maria Chinchilla of ICTA, Guatemala, during the 1979 meetings of the PCCMCA (Central American Cooperative Program for the Improvement of Basic Food Groups) in Tegucigalpa, Honduras" (Galt 1987, p. 209). Chambers (1987)

attributes the development of the sondeo method to Peter Hildebrand, in a paper presented at the conference, Integrated Crop and Animal Production to Optimize Resource Utilization on Small Farms in Developing Countries (1979b). This was subsequently published as "Combining Disciplines in Rapid Appraisal: The Sondeo Approach" (1981).

The main point is that most research in fields that have critical socioeconomic applications require systematic, flexible, and timely data collection. Developing social science tools that meet these objectives is a widely recognized priority. Especially in agricultural development, the rate of technological adaptation remains a prime criterion of project evaluation by funding organizations. Conveying the "ways and means" of social science tools, however, remains fairly obscure to non-social scientists and implicitly known, but seldom discussed, among social scientists.

A tool kit's name (sondeo, Rapid Rural Appraisal, Diagnosis and Design, or travel and visit) becomes part of the research methodology. The process of tool selection, name, and procedures of use perhaps should be considered as social science data. Indeed, the development of tool kits as part of a methodology has seldom been studied in the social sciences. The research focus has customarily been on the delivery of a technology and its productive results. Increasingly, though, research strategies are including the activity of researchers as data. This information (the type and number of research participants, areas of specialization represented, the tool kit model, and its local modifications) is particularly relevant to the use of tool kits in research. The major methodologies for agroforestry stress practical tools that can be used by a variety of research assistants, extension agents, government officials, project decision makers, scientists, and farmers. Study of the current methodologies and their corresponding tool kits might indicate emerging perspectives, or the consolidation of key systematic components, such as RRA with Agroecosystem Analysis. Understanding these developments in research requires systematic analysis of the type of data collected using tool kits.

For this paper, our examination of each methodology with its corresponding tool kit indicates a similarity of logic-in-use. However, the step from logic to the application of a tool is not direct and objective in the social sciences. This step, as it is reflected in the major methodologies and tool kits, merits further study. Furthermore, social science tools, when used without care, can greatly skew the data and logic-in-use. Besides the step of data collection, systematic procedures might be skewed when abstract reasoning is used to transform primary data into secondary data and other theoretical positions. Further explanation of the interaction of tools and methodology (especially in relation to FSR and RRA) will be significant from the perspective that

> If Rapid Appraisal is to be recognized as a useful tool, it will be necessary for its present proponents to better define it, understand its limitations as well as potential, and find ways of explaining it to others (Beebe 1987, p. 47).

## 4.0. Rapid Rural Appraisal

Close to 200 reference materials are listed in the "Bibliography on Rapid Rural Appraisal" (Grandstaff and Buranakanonda 1987). This paper will rely on Molnar's very recent review of rapid appraisal tools and its state-of-the-art assessment *vis-a-vis* resource materials, interviews with practitioners of RRA, and review (Molnar 1989). Before proceeding, however, let us examine some developments that had significance for the formulation of RRA (see Beebe 1987).

Nearly a year before the formulation of the sondeo method, the concept of rapid appraisal was presented at a workshop at the Institute of Development Studies, the University of Sussex (October 1978). Other concepts that followed were **rapid reconnaissance** (Honadle 1979), the **exploratory survey** (Collinson 1981), **informal agricultural survey** (Rhoades 1985), **informal methods** and **reconnaissance survey** (Shaner et al. 1982), rapid appraisal or rapid rural appraisal (RA or RRA) (Chambers 1983), **recommendation domains** (Harrington and Tripp 1984), and others (Chambers and Jiggins 1987, Raintree 1987, and Garrett et al. 1987). Like these, RRA has been described (following Beebe 1987) as a modified survey (Hildebrand 1982); a survey undertaken without questionnaires (Shaner et al. 1982); informal, exploratory, largely unstructured interviews combined with observation (Honadle 1979); organized common sense, freed from the chains of inappropriate professionalism (Chambers 1983); and a form of appropriate technology: cheap, practical and fast (Bradfield 1981, in Rhoades 1982).

The large number of terms and descriptions highlights the controversy inherent in new research orientations. According to Molnar, the controversy over RRA revolves around what is meant by the phrases, "properly carried out" and "the applicability of RRA methods to a wide range of purposes during both program planning and project execution" (Molnar 1989, p. 6). Since the RRA approach to a research problem is rapid, eclectic, holistic, and interactive, the quality of an RRA exercise is, not surprisingly,

> highly dependent upon the expertise of the individuals carrying out that exercise. This caveat has led to considerable controversy regarding the extent to which the use of RRA generates reliable information adequate to its purpose (Molnar 1989, p. 6).

Molnar speculates that because RRA is being practiced by so many differently trained personnel, the use of these tools is variable and of questionable quality. This very critique would seem to invalidate a key characteristic of RRA as a tool kit that can be easily learned and applied by a wide range of individuals, especially non-social scientists. Does this indicate little critical analysis of how the tools fit together within the methodology? Or is it because, as Molnar surmises,

> as long as the RRA experts responsible for generating guidelines and conducting training were professional social scientists, it has been assumed that answers to emerging methodological quandaries would fall in the

> category of "common sense" (to quote Robert Chambers)--basic principals of sound data collection learned through academic training and/or through extensive, practical experience in field interview (Molnar 1989, p. 6).

Again we return to the mysterious skills of the seasoned social scientist and fuzzy tools. Before proceeding further into this quandary, let us look at the tools used in RRA.

### 4.1. Tools in the RRA Kit

The basic set of tools in the RRA kit are as follows (Molnar 1989, p. 7, following Khon Kaen University 1987):

1) interview and question-design techniques for individual, **household**, and **key informant interviews**,

2) methods of cross-checking information from different sources,

3) sampling techniques that can be adapted to a particular objective,

4) methods of obtaining quantitative data in a short time frame,

5) group interview techniques, including focus-group interviewing,

6) methods of direct observation at site level, and

7) use of secondary data sources.

These tools are conventionally used by social scientists, particularly in anthropology and sociology. What makes them controversial in agroforestry and agricultural development? Does the confusion center on their "logic-in-use", that is, their methodological application? Molnar (1989) has summarized the application of the RRA tool kit, which I relate below.

### 4.2. The Purposes and Functions of RRA Tools

Although Molnar outlines 72 possible uses of the RRA tool kit, the first purpose in the identification stage and its nine applications gives a good overall view of RRA and the range of its uses. The identification stage resembles that of most research strategies: one states the problem, key issues, data needs and possible interventions. Normally, this stage includes a baseline literature review and takes place in the field during a one- to two-month period. A variety of teams may be composed depending on the particular data needs. Teams may comprise scientific experts, local extension agents, and officials. Social science tools commonly used are direct observation and interviews conducted with key informants, selected groups and households. The data-gathering process is cross-checked by having research members rotate among different teams.

After this initial period of data-gathering, the information is formulated as secondary data with maps, diagrams, and sketches. The transformation of primary data into secondary data and its subsequent analysis provides the framework for further data collection and the formulation of hypotheses. Numerous checklists can serve as guides to normal data-gathering needs. The need to repeat application of tools to obtain results and implement a project is frequently termed a tool kit's **iterative** nature. (This adjective is frequently confused with *interactive*, which refers to communication.)

Variations in how RRA tools are applied depend on the research purpose. After initial formulation of the agroforestry program, these purposes may range from reviewing and finalizing program design, to defining village-level management strategy, to monitoring and evaluating the program, to presenting findings. In her report, Molnar examines many of these purposes and the application of RRA tools. For this paper, we will examine an RRA package specialized for agroforestry, the International Council for Research in Agroforestry's Diagnosis and Design (ICRAF's D&D).

## 5.0. Diagnosis and Design

Diagnosis and Design (D&D) is a methodology for transforming variables into frameworks. Using D&D, for example, the variable of soil erosion becomes transformed into a framework for collecting social science data about soil erosion. The data for analysis might range from perceptions of erosion to local practices that prevent erosion. The D&D approach emphasizes research priorities relevant to the perceived needs of different social groups. These groups range from resource-poor farmers at the village level to policy advisory institutes at the regional level. As in the example with soil erosion, D&D transforms the variables in land management into a framework for diagnosing problems and resolving them through the design of appropriate agroforestry projects.

This methodology does not run counter to the Agroecosystem Approach, the FSR approach, or RRA (Raintree 1987; Raintree and Hoskins 1988). D&D's distinctive feature is its focus on land-use systems in agroforestry, with broad implications for **community forestry.**

## 5.1. The Basic Function of D&D

The basic function of D&D is to implement research actions. A primary emphasis is on strategy. The logic in use for D&D strategy is the procedure for determining research implementation, intervention, or perturbation effects. Such effects are diagnosed through a plan of action that implements an input (for example, multipurpose trees) or a technology to influence broad-based, land-use systems. An understanding of land-use systems, particularly agroforestry, requires an ecological perspective of productivity, sustainability, and adoptability (Raintree 1987, following Conway). Further, the time factor for agroforestry requires an on-farm approach that emphasizes farmer and community involvement in the project, not just for trials input,

but also as participants in the analytic processes of diagnosis and design. Thus, the major objective of D&D is implementation.

D&D is problem-oriented, like the diagnostic procedures used in the field of medicine. In medicine, the Problem Oriented Medical Record (Weed 1968) is used to make a diagnosis by an analysis of specified problems. This approach is effective because it links a problem with a solution, with the recognition that the solution might have corresponding effects on other problems within the total system. This holistic perspective is an established and integral strategy in agroforestry and agricultural development. However, continuing with the medical metaphor above, the establishment of the Problem Oriented Medical Record did not change the process of medical diagnosis or treatment. Rather, this tool facilitated the learning process among a team of professionals and technicians concerning the procedures for determining problems and their solutions. This approach acknowledges the specialization of a practitioner as part of a team. This type of record-keeping also provides a systematic overview of related problems and solutions that treat the whole body -- a composite of different, complex systems -- as an organism itself. Likewise, the process of D&D is a learning experience that attempts to state the problem quickly and clearly (diagnosis), and seek its solution (treatment). The tool is not just a device for record-keeping, but rather a design for learning the relationships among components and procedures for action.

The D&D methodology is **iterative**. The five stages of D&D (see figure 3) are repeated to yield results successively closer to a desired result. Raintree summarizes this:

> the very act of introducing a new technology changes the diagnosed situation and necessitates at least one more round of diagnosis to evaluate the impact of the intervention on the system. In most cases this will suggest ideas for design improvements. Longer exposure to the land use system in the course of the project will inevitably result in a deepening of the initial diagnosis and may even suggest a whole new approach to design (Raintree 1987, p. 9).

In other words, D&D's research methodology for land management is a repeated process that may identify one problem and rapidly act on it. At the same time, the iterative process relates the analysis and evaluation of that particular problem and its solution to the complex of other problems and possible solutions within agroecological systems.

D&D is not unique in its emphasis on farmer and community participation in the statement of the problem and the actions for solution. Like other methodologies discussed in this paper, it recognizes that two-way communication between researcher and farmer is essential for successful technological interventions. Yet this "common sense" approach of communicating with the people who will be the practitioners of MPTS technology requires further systematic research and improvement of social science tools.

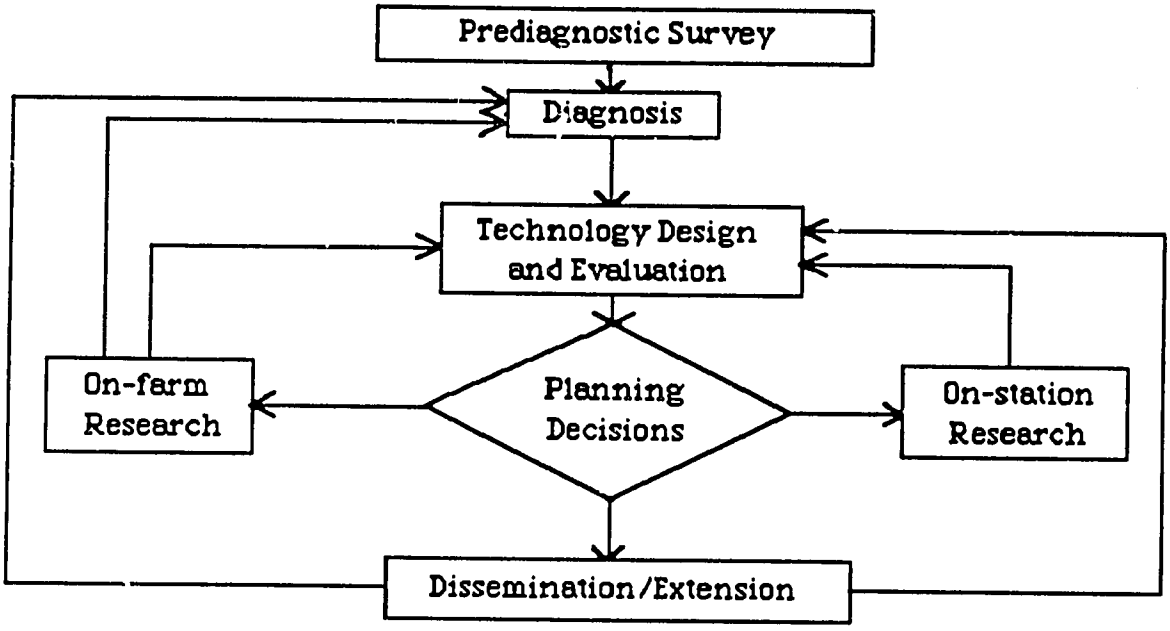


**Figure 3.** Stages of Diagnosis and Design (from Raintree 1987).

The social sciences have only a very brief history in action research, or research for development aims. Social science tools used in research for applied technological or social programs thus have not yet become distinctive or specific. The tools and the context in which they are used seldom become the subject of social science research. Nonetheless, there are some specialized tools that all social scientists use to facilitate communication and improve their understanding of indigenous knowledge.

## 6.0. Specialized Tools for Understanding Indigenous Knowledge

One approach for understanding farmer participation is to measure the effects (Ashby 1987; Baker et al. 1988). But in contexts of problem-focused research aimed at technological adaptation, analysis of factors that influence productivity seldom include complex interrelationships within a system. And yet, as Farrington recently commented,

> In recent fieldwork there has emerged an almost bewildering array of attempts to go beyond the 'transfer of technology' philosophy and identify concepts and methods of agricultural research more relevant to resource-poor farmers (Farrington 1988, p. 271).

Therefore, this section presents specialized social science tools that can help to define concepts of farmers' participation and provide an understanding of ways to communicate mutual needs and benefits.

Data on farmers' local knowledge should not be construed as *de facto* farmer participation. Researchers should regard local knowledge as a necessary vocabulary for communication with farmers. Likewise, if farmer participation is to be realized, then researchers must examine their procedures to ensure that they effectively explain their research needs and development aims to farmers. The use of communication tools improves understanding among participants and increases farmer's adoption of agroforestry and the value of research.

### 6.1. Ethnoscience Tools

**Ethnoscience** tools are useful for collecting data on how local farmers express their knowledge of "what is happening" in their fields (following Sears 1939 in Wallace 1983). Wallace offers an ethno-ecological method for the collection and preliminary analysis of local knowledge (1983). Although Wallace uses tools developed in ethnoscience (see, for example, Conklin 1954; Gumperz and Hymes 1964; Goodenough 1952), he departs from its customary method of listing traits, that is, the vocabulary of local knowledge. Rather, Wallace presents a method for communicating with farmers that acknowledges their own perceptions of ecological interrelationships.

The first step in using an ethnoscience tool is to collect data on terms used by farmers -- for example, the names of preferred trees in a farmer's agroecosystem. The second step is to discover the relationships between types of trees and other components of the agroecosystem. The third step is to formulate the folk model.

A folk model is the farmer's identification of ecological components and their relationships. The farmer's agroecological knowledge is not methodologically transformed into a western (or scientific) model of cause and effect. Instead, as Wallace demonstrates, the folk model becomes significant data for analysis.

The simple tool of asking the farmer a set of questions that contrast different categories "can help a researcher answer the cultural question: How do a people order their . . .[ecological] world?" (Wallace 1983, p. 29). This tool appears simple in its elicitation technique (the manner of asking a question). However, clarifying which contrasting categories are useful and manipulating them for efficient data collection requires skill, particularly if conducted as part of RRA. The utility of this tool in determining how people order their world relative to the purpose of trees should not be minimized.

For example, after obtaining general data in the local language on types of trees (let us call them X, Y, and Z), categories of purpose and other ecological relationship may be determined as follows (after Wallace 1983):

Q: What is an X?
A: aX
Q: What are the aX used for?
A: fodder, fruit, shade, thatch
Q: Is X used for fuel?
A: Yes.
Q: Is aX used for fuel?
A: No.
Q: Is Y used for fuel?
A: Yes.
Q: Is Y an X?
A: Yes.
Q: Is Y used for fruit?
A: No.

This question and answer interaction helps the researcher determine that the class of X trees is a general term for types of trees with multiple purposes. This tool of contrasting categories has also yielded preliminary data on two subclasses within the class of X: aX for fodder, fruit, shade, and thatch purposes, and Y for fuel. The researcher then uses these categorical relationships by which the farmer perceives the types and purposes of trees to form the folk model.

Additional interrelationships in agroforestry, based on classification and function, would complete the model for effective communication. The above schema is somewhat simplified, because in actual field conditions, many of the basic categories may be known. Still, subtle but significant differences in meanings that vary among local settings should not be undervalued. As Marten (1986, p. 331) notes:

> It is important to avoid unproven generalities and stereotypes about the tropics when thinking about natural ecosystems as models for agroecosystem analysis design in Southeast Asia.

Shortcomings such as the "unproven generalities and stereotypes" that Marten mentions are minimized with collaborative research designs that emphasize flexibility and local adaptation of technology. Increasingly, as demonstrated by FSR, RRA, and D&D methodologies, research strategies emphasize on-farm study as a critical step in farmer adoption of technology. This emerging research context (that is, bottom-up, applied interventions with farmers participating actively as researchers) acknowledges the farmer's role as an important decision maker in the productivity, sustainability, equitability, and stability of the agroecosystem. Particularly in farmer-managed, on-farm trials (Waugh et al. 1989), a set of specialized tools might be needed to collect data on farmers' decisions and choices.

## 6.2. Tools for Collecting Data on Decisions and Choices

Tools for collecting primary data about the decision-making process usually examine past actions, that is, certain choices that have already been made. Formerly, those actions were analyzed according to a model that determined whether an individual behaved according to rational, economic principals that maximized their economic advantage. During the past decade, however, agricultural decision research has emphasized the interaction of the natural with the social environment, rather than predictive outcomes evaluated by economic maximization or traditional criteria (Barlett 1980). Much of the new theory is based on secondary or tertiary data, rather than on primary data sets (see Cancian 1979). An understanding of various social and economic (market) environments that influence the context of decisions has been noted (Berry 1980, Bennett 1980, Gladwin and Murtaugh 1980, and DeWalt and DeWalt 1980). In sum, more methodological attention has concerned the transformation of primary data into predictive or explanatory models (see C. Gladwin 1982).

The tools for collecting decision data, particularly primary data, remain relatively obscure and undeveloped. For example, most decision data have been collected using the tools of structured interviews with key informants, which are then followed by formal surveys (see C. Gladwin 1982, Barlett 1977, Young 1981). In most cases, the primary data reflect an individual's evaluation of past behavior. That is, interview data contain not only respondents' perceptions of past behavior but also their present behavior. The complexity of the decision process requires tools and a methodological approach that can gather data based on the primary level of observable actions and considered choices.

Recognizing the limitations of retrospective data collected by most decision-focused studies, Marcucci (1986) defined decisions at the primary data level by prospective actions. In other words, data was collected at the time the decisions were being made. To collect these data, triangulation sets of informal and formal tools were used. These included participant observation, unstructured interviews, thematic discussions, formal surveys, structured and unstructured interviews with key informants, and an interpretive analysis of interventions introduced to the decision process by the researcher himself. The complexity of probable factors in the decision process was categorized by selecting a representative sample of cases that provided the context of definable factors and variables.

The specialized set of tools for collecting decision data based on this definition of primary data has significant implications for research that seeks to increase farmer participation in agroforestry programs. Tools that emphasize present actions and immediate decisions foster collaborative rapport better than those that focus on recollections, which are subject to idealization. The interaction of farmers, extension agents, and field researchers in the decision process would also guide the development of a decision tool kit adapted to specific research goals, and a tool kit for productive communication.

## 7.0. Conclusion

This paper has emphasized the relationship of social science tools to the type of data being collected. In research methodologies and strategies, the selection of tools provides a framework for collecting data. Therefore the process of selecting a tool kit is critical to subsequent data transformations, especially for agroforestry situations requiring methods of appraisal.

The apparent simplicity of social science tools used to collect primary data may spur team specialists to generate more complex levels of secondary or tertiary data for analysis. The literature on agroforestry and agricultural development reflects this tendency. As a result, the basic social science tools of observation and interviewing are frequently presented with little explanation. Yet these tools and the primary data they are used to collect will influence the outcome of a study, and hence will affect a farmer's adoption of any intervention proposed as a result.

The major methodologies presented in this paper represent a continuum of cooperative development, not competitive perspectives. On the most abstract level of the agroecosystem, Conway (1986) stresses that the application of social science tools should be limited to several key questions critical to an understanding of the system's structure and function. The FSR approach focuses on the development and extension of technology to the on-farm agroecosystem. Experience gained in the application of these methodologies highlighted the need for social science tools that could permit timely collection and analysis of data, and promote greater participation by farmers. Hence, Rapid Rural Appraisal and Diagnosis & Design were developed.

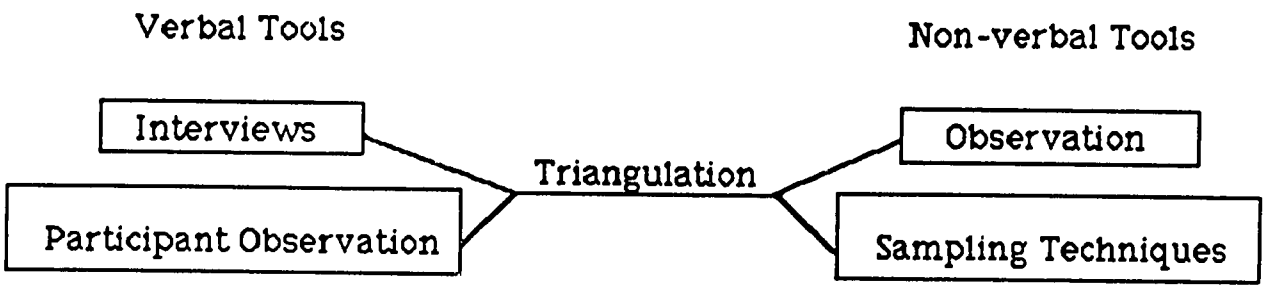


**Figure 4.** Summary of social science tools used to collect primary data.

These developments suggest that future methodologies should include increased participation by farmers, especially resource-poor farmers. Ethnoscience and decision-making tools may have implications for increased use by non-social scientists. Additional implications concern the use of social-science tools for improving communication channels, both within stages of research (for example, at the on-farm site), and between different levels of research (for example, top-down and bottom-up channels).

Summary figures 4 and 5 illustrate the relationship of social science tools to their corresponding types of data and their transformations to greater methodological abstraction. Although the perspective is one of tool use, a framework that begins with a methodology as a means of selecting tools for a field of data would be a valid alternative. But one that tends to dwell on middle-range theories, rather than the practicalities of developing and using tools for collecting a definable set of data, would not be useful.

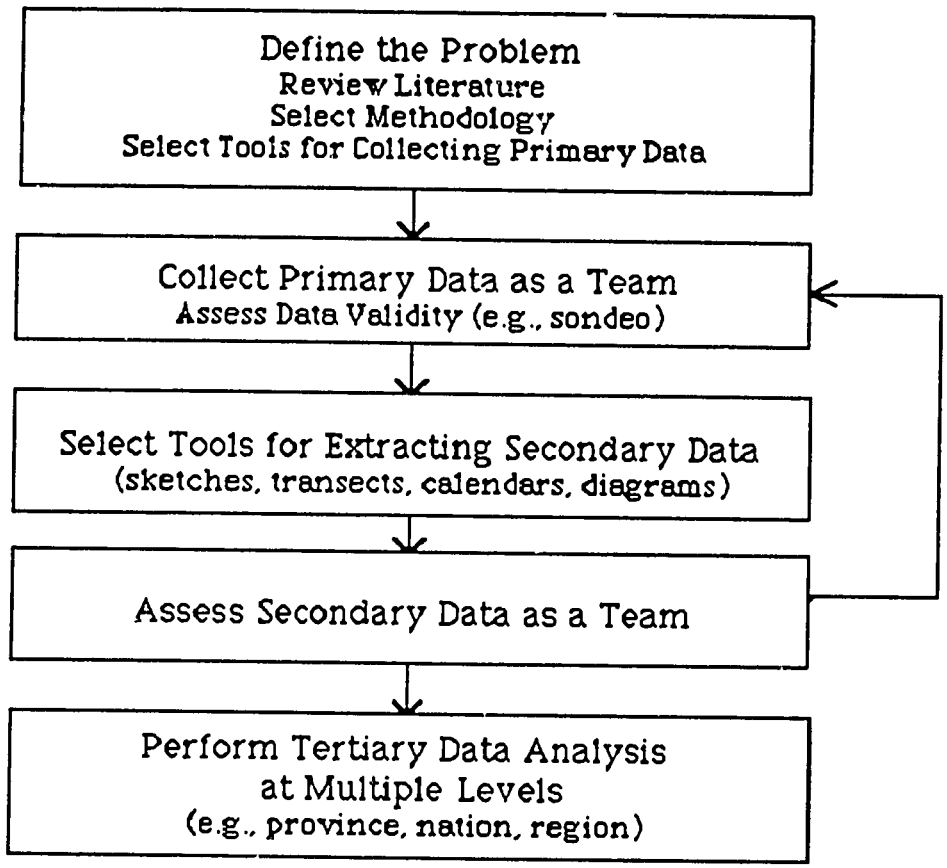


**Figure 5.** Using social science tools in agroforestry research.

An assessment of the advantages and limitations of any particular tool or method by itself does not consider a central feature of social science tools: namely, that the individual who uses one of these tools becomes part of the tool. A researcher's verbal and non-verbal skills have a direct influence on the interactions involved in data collection. Finally, an analytical discussion of discrete advantages and limitations of each tool gives the false impression that a researcher can first use one tool, then another, as one would use mechanical instruments. Use of social science tools is optimized when several are employed in combination to achieve an understanding of a key concept in the complex situation of people and their environment.

## Glossary

**administer** - To apply a set of procedures for data collection. This term is commonly used for tools having specific procedures that are repeated uniformly for each data collection period. For example, an interviewer may administer (or ask) a set of questions to the head of a household. The questions may be organized in an interview format, or schedule.

**agroecosystem analysis and development (AAD)** - A principal methodology of agricultural development that incorporates principals of human ecology and agricultural ecology. This methodology employs the social science tool kit developed for rapid rural appraisal. Another feature of AAD is its broad perspective, which links other major development approaches with agricultural development and agroforestry.

**agroforestry** - Any land-use system that integrates management of woody perennials, herbaceous crops, and/or livestock on the same land unit, either spatially or over time.

**assess** - see **participant observation**

**bottom-up** - In contrast to the top-down approach to research and development (see **top-down**), a bottom-up approach emphasizes the participation of the targeted groups and populations in programming and research decisions.

**broker** - A negotiator between the concerns of two different individuals or groups. A broker is aware of the needs and issues of each party and attempts to mediate for consensus and agreement.

**case study** - An example of a research problem, usually described by a representative unit of the population. The data presented in a case study results from collecting primary and secondary data. Thus, a case study is a second-order abstraction that integrates data sets in order to demonstrate relationships among multiple factors which may be generalized to the research problem (see also **participant observation**).

**community approach** - This is the fundamental understanding that an appreciation of local, or community, adaptation of technology to the environment is part of research methodology.

**community forestry** - Forestry developed in areas marginal to agriculture, with many members of the community being landless or small-scale farmers, often characterized by ecological and cultural diversity and the employment of traditional technologies. Communal land development is basic to this type of forestry.

**data** - Qualitative and quantitative information used as the basis for reasoning and inference.

**primary data** - Observations, measurements, and elicitations obtained directly from the subject population and setting.

**secondary data** - Previously recorded primary data that are categorized or manipulated by other criteria, such as statistical inference.

**describe** - see **observation**

**design** - see **survey**

**detailed interview** - see **interview**

**diagnosis and design (D&D)** - A methodology, developed by the International Council for Research in Agroforestry (ICRAF), which plans and implements research and development projects for land-use systems that incorporate agroforestry.

**downstream** - see **bottom-up**

**enumerators** - see **participatory researchers**

**equitability** - In agroecosystem analysis, this term describes a property of distribution within a system whereby productivity is shared among the human population.

**ethnoscience** - A method in ethnography that involves the use of an interviewing tool by which a series of contrasting questions elicits word categories from the respondent. The resulting categories and their relationships are then studied to understand how members of the subject group perceive their environment and behavior. This method focuses on information based on the respondent's concepts of meaning rather than the researcher's scientific perspective.

**exploratory survey** - see **survey**

**farmer-pull** - see **upstream**

**farming systems research (FSR)** - A methodology used to improve farm production by studying the farm as a whole system. FSR emphasizes the farmer's participation in the early research phases for effective input, feedback, and evaluation of technologies.

**FSR/D** - Farming systems research and development, according to Simmonds (1985), is, in the strict sense, research on farming systems as they exist -- their description, analysis, and classification.

**FSR/E** - Farming systems research and extension is more concerned with generation, evaluation, and delivery of new technologies.

**FSIP** - Farming systems infrastructural support and policy is an approach that integrates micro levels of analysis--from the farm, village, and national region--with macro levels of national and regional world concerns, directions, and implications.

**NFSD** - New farm systems development. The generation of radically new innovations that, although complex, either fit the farmer's economic circumstances, or change the farmer's economic circumstances to fit the innovation.

**household** - A social category that describes a primary social group who customarily share their domicile and meals. It may or may not consist of family members. The type of household that is predominant in a society is determined by cultural beliefs, values, and norms, and is further influenced by economic and political factors.

**interview** - A tool used to collect primary data based on communication involving face-to-face interaction between two or more individuals, some of whom may assist the communication process either by their participatory contributions or interpretations. The categories below describe some of the variation in this tool use as reflected in the agroforestry literature.

**detailed interview** - A detailed interview is one that usually seeks quantifiable data as part of qualitative data. For example, the interviewer may ask a farmer, "How many trees do you have on your farm?" The farmer responds, "More than my neighbor." In a detailed interview, the interviewer would pursue this by requesting, "Please name your trees that produce fruit." This may be followed by questions about the name of the tree, how many the farmer manages, the type of fruit it produces, when it is harvested, its past yield, etc.

**field interview [farm survey]** - An interview conducted at the place or setting that pertains to the respondent, such as the farm. Interviews conducted with government officials may also be referred to as field interviews when their office is located in provincial or rural areas. A farm survey is an interview schedule (see below) administered to a sample of farmers in a defined geographical area.

**group interview** - An interview conducted with two or more respondents. The use of an interpreter is usually not viewed as part of the interview. Depending on the social context of interaction, however, an interpreter might be considered as a respondent and the interview classified as a group interview. Particularly in rural social contexts, few interviews take place without the presence of other observers (family, kin, friends, neighbors). If an interview setting does not include their participatory interactions, either by invitation or decorum, then the interview would be considered an individual interview.

**individual interview** - This is an interview between the research and one individual, or respondent.

**informal, structured interview** - An interview conducted in the style and manner of a conversation. The interview is structured in the sense that a set of questions are used for each respondent, but other topics and concerns might be introduced and collected as data. The set of questions for this type of interview should be limited so as not to appear intrusive or formal.

**intensive, structured dialogue** - This type of interview occurs after an interviewer and respondent have established a rapport that permits discussion of sensitive and detailed information. A respondent in this type of interview is commonly called a key informant and is often familiar with the interviewer's informational needs and protocols.

**probe** - A part of interview techniques. Probes are key words that help elicit responses to specified data needs. A probe might be quantitative (how many) or qualitative (how and why). A probe may be used to clarify or specify a response. A set of probes sometimes serves as the structure of informal interviews.

**schedule [survey questionnaire]** - An interview schedule is a formal interview in the sense that the interviewer administers the same question (using similar wording) to each respondent. This type of interview resembles a written questionnaire.

**semi-structured interview** - This type of interview combines the features of a formal interview, such as an interview schedule, with flexibility that includes informal discussions and probes about other topics not directly related to the structured part of the interview. For example, during the structured portion of an interview about crop yields, the interviewer notices a sick child. This may prompt him or her to use probes to learn about local health care practices and concerns.

**survey** - A formal interview with an implied systematic sample (see schedule-survey questionnaire above).

**thematic discussion [individual or group]** - This type of interview appears to be an informal interview but uses probes concerning a principal topic. It encourages a line of questioning without requiring clearly defined answers, and admits statements without the constraints of normative judgments that recognizes a difference of opinion.

**instrument** - A social science tool designed to ensure uniformity or systematic standardization in its administration (for example, an interview schedule or a questionnaire).

**iterative** - Webster's defines this as "related to or being a computational procedure in which replication of a cycle of operations produces results which approximate the desired result more and more closely" (Webster's 1979). In the context of social science tools, this describes the need to apply tools repeatedly to obtain validity and reliability.

**informant** - An individual who is a respondent in an interview. Observed individuals are not informants.

**observation** - A basic tool used with all other social science tools. However, as with other basic concepts and behaviors, this tool is seldom made explicit in relation to its field of vision.

> **direct observation** - This attempts to describe an operationalized component of the observational tool. Use of this term does not specify the procedures for obtaining direct versus indirect observation.
>
> **measure** - A term used to describe observations that contain quantitative data (for example, land size, yield, capacity).
>
> **unobtrusive observation** - Observation recorded with little notice by the population studied. Unobtrusive observation is possible when the scientist becomes less noticed, or generally accepted as a marginal member of the study population.
>
> **reconnaissance** - An observational tool used in rapid appraisal used to collect data in a brief period of time by sampling large areas and analyzing the areas by defined criteria and characteristics. Reconnaissance is a systematic overview that customarily begins the initial research phase. Normally the focus is feasibility and strategy for a particular study site. Although reconnaissance is primarily observational, it often integrates the tools of informal, structured interviews; construction of maps, transects, and other graphic representations of the site; and other secondary data presentations common to rapid rural appraisal.

NFSD - see **farming systems research**

**on-farm experimentation** - see **participatory researchers**

**open-ended** - see **questionnaire**

**participant observation** - The most unsystematic and unstructured social science tool. It is also one of the more difficult tools to use effectively because the researcher's behavior is part of the observational record. The interactions occurring in the course of applying this tool provide qualitative data of an insightful nature (such as recommendations for further exploration) and of a validating nature (such as participation in activities that confirm interview data). An important factor in the effectiveness of participant observation is the quality of field notes. The researcher's theoretical orientation regarding the conceptual focus of data (that is, how one describes the behavior of individuals in a particular time and place and assesses these relative to the research strategy) is important to the quality of field notes. Other factors are the researcher's rapport with other participants, the type of participatory role, the type of activity, and the frequency of the activity. Data from participant observation may be incorporated at various levels of analysis and abstraction. These data facilitate the construction of

survey questions and probes, and identify interactional features that make interviewing tools more effective.

**case study** - One particular way of presenting participant observer data is the case study, which may be one or a composite of activities that exemplify a set of behaviors in a defined context. Based on primary data collected by participant observation, for example, a researcher describes and assesses an example of a farming household's multiple uses of a particular tree species. Thus, a case study often integrates primary and secondary data with theoretical assessments and analyses. (See also **case study**).

**participatory researchers** - Individuals trained to collect or manipulate data under the supervision of principal researchers.

**enumerators** - Technicians who transform primary and secondary data sets to numerical values using code books that assign numerical values to social science data.

**farmers in farmer-managed, on-farm trials (on-farm experimentation)** - This type of farmer has received at least some training in scientific objectives and how to conduct trials. Farmer-managed trials explore the ecological factors of the farm situation, and especially the social factors of management and adaptation to local knowledge.

**research assistants** - Individuals supervised to perform specific or general tasks for research objectives. One obvious benefit of hiring local research assistants is that language (or dialectical) problems are minimized and rapport with the local population is generally maximized. Both of these enhance the efficacy of social science tools.

**pattern analysis** - Assessment of the regularity of an agroecosystem's structure and function, based on established data categories.

**primary data** - see **data**

**productivity** - According to Conway (1987), this property of agricultural systems is any increase of yield for a given period of time, energy use, and/or resources.

**rapid reconnaissance** - see **rapid rural appraisal**

**questionnaire** - A written tool. A respondent reports their answers to a set of questions.

**standard questionnaire** - This usually refers to a list of questions used in more than one research setting.

**survey questionnaire** - see **survey**

**rapid rural appraisal (RRA)** - A methodology in which an multidisciplinary team of researchers uses social science tools for quick collection of primary data during one or several site visits. The research team transforms the primary data into secondary data for assessment and analysis. The following terms have occasionally been used interchangeably with rapid rural appraisal, but also have more specific connotations.

> **rapid reconnaissance** - An overall observation of the site that focuses on key features and characteristics of interest in formulating the research strategy.
>
> **exploratory survey** - The first questions asked of individuals residing in the research site.
>
> **informal agricultural survey** - A survey administered during visits to farms and farming communities by asking a convenience sample of individuals basic questions to form an initial profile of the farming community.
>
> **informal methods** - Tools are informal when their use is governed only by general guidelines for data collection. One feature of informal methods is flexibility to monitor informant rapport, or in other words being careful not to offend an informant while collecting data. Informal methods are used to help make the informant feel comfortable and thereby provide more accurate data.
>
> **reconnaissance survey** - This resembles rapid reconnaissance in that it is an overview of research site and priorities. A survey, however, might also include interviews with key informants (local officials) and a convenience sample of farmers and other community members.

**recommendation domain** - Another term used for "target", or the research site and its related research problems. It also includes the range of land-use settings for which the results of an experiment could apply.

**representative convenience sample** - see **sample**

**research assistants** - see **participatory researchers**

**research-push** - see **top-down**

**sample** - A group of individuals selected from a population.

> **convenience sample** - A group of individuals selected because of their accessibility and availability to the researcher.
>
> **purposeful (or purposive) sample** - A group selected on the basis of specified criteria pertaining to the purposes of the research. For example, for an understanding of household domestic economies, a purposeful sample may

comprise women who are responsible for domestic economic activities and men who might be secondary participants in such activity.

**random sample** - In a random sample, each individual of the site population has an equal chance of being chosen as a member of the sample group.

**representative sample** - A sample of individuals from one or several categories (for example, age, gender, occupation) that may describe the larger population. A representative sample normally designates a percentage of individuals with certain characteristics that are present in the population. For example, if 40% of the population are paddy-rice farmers who own their land, then 40% of the representative sample should be paddy-rice farmers who own their land.

**stratified sample** - A stratified sample contains individuals from several classes or groups found in the population. A stratified sample is not necessarily a representative sample. For example, a stratified sample might have five levels or strata (representing five different groups in the population), with 20 individuals assigned to each level. This allocation does not necessarily represent that group's actual proportion in the total population. In other words, each of the five groups included in the stratified sample makes up 20% of the sample. By contrast, the size of each group or stratum in a representative sample would vary according to each group's actual proportion in the overall population.

**scanning (government records)** - Similar to rapid reconnaissance. Government records might consist of primary or secondary data. *Scanning* means selecting a sample of data for analysis and assessment.

**secondary data** - see **data**

**selected randomly** - see **sample**

**sketch** - see **observation**

**sondeo** - A set of social science tools used quickly and informally, particularly by researchers with different specializations. The main purpose is to make a comprehensive and integrated assessment of the research problem and site. Another purpose is to include in the assessment the various perspectives of research specialists, agricultural officials, local extension agents, and farmers. The sondeo emphasizes a strategy of research that aims to adapt technologies to local needs.

**stability** - According to Conway (1987), this is a property, or fundamental characteristic, of systems. A stable agricultural system remains constant in productivity during a period of change influenced by factors such as climate or market economy. Stability is measured as the reciprocal of the coefficient of variation in productivity.

**survey** - A basic tool of sociology. It produces a standard set of procedures for the use of tools, such as types of interviews and samples. This is intended to increase validity and reliability of data.

**design** - The type of tools used in a survey and how they are administered.

**exploratory survey** - An initial survey that tests an interview tool, with particular focus on aspects of question validity. Analysis of an exploratory survey serves as data for design modification and its validation as a survey instrument.

**formal** - A formal survey follows a survey design and can be used at multiple sites. This application of the survey design on multiple sites contributes to assessment of the survey's reliability.

**informal** - An informal survey does not follow standard procedures. General guidelines are used to help formulate a broader research perspective, or to gain an understanding of particular site characteristics.

**questionnaire** - A survey that uses only a written form of questions and answers.

**sustainability** - A term that describes an agroecosystem's capability to withstand isolated or recurring attacks on productivity.

**target** - see **recommendation domain**

**technique** - A social science tool requiring a degree of skill that can influence the quality of collected data. For example, the use of certain probes during informal interviews may be a technique that the researcher has developed with a particular population as a result of an understanding of values that that population assigns to particular topics and the sequence in which they usually occur in the course of conversation.

**top-down** - Research strategies and methodologies are described as top-down when research planners or officials make programming decisions without the participation or contribution of individuals at other levels of involvement, particularly the target population.

**triangulation** - The use of a combination of tools, often employed during a rapid rural appraisal. Team members from different disciplines use a variety of tools of observation, interview, and analysis to ensure qualitative validity of data.

**upstream** - see **top-down**

**zoning** - see **recommendation domain**

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