SOCIO-ECONOMIC METHODOLOGIES FOR NATURAL RESOURCES RESEARCH BEST PRACTICE GUIDELINES

COMBINING QUANTITATIVE (FORMAL) AND QUALITATIVE (INFORMAL) SURVEY METHODS

Neil Marsland[1], Ian Wilson[1], Savitri Abeyasekera[2] and Ulrich Kleih[1]

[1]*Natural Resources Institute, The University of Greenwich*

[2]*Statistical Services Centre, The University of Reading*

Published by Natural Resources Institute

DFID Department for International Development

The Natural Resources Institute (NRI) of the University of Greenwich is an internationally recognized centre of expertise in research and consultancy in the environment and natural resources sector. The Institute carries out research and development and training to promote efficient management and use of renewable natural resources in support of sustainable livelihoods.

MARSLAND, N., WILSON, I., ABEYASEKERA, S. and KLEIH, U. (2001) Combining quantitative (formal) and qualitative (informal) survey methods. *Socio-economic Methodologies for Natural Resources Research. Best Practice Guidelines*. Chatham, UK: Natural Resources Institute.

Production of this publication was funded under Project R6800 by the Natural Resources Systems Programme of the United Kingdom's Department for International Development. The Department for International Development can accept no responsibility for any information provided or views expressed.

Copies of this publication can be obtained by writing to NRI Catalogue Services, CAB International, WALLINGFORD, Oxon OX10 8DE, UK. When ordering, please quote BPG10.

Natural Resources Institute
ISBN 0 85954 496–6

INTRODUCTION

Qualitative survey methods started to gain prominence in development projects during the 1980s, primarily in response to the drawbacks of quantitative questionnaire-type surveys, which were considered time-consuming and expensive, and not suitable for providing in-depth understanding of an issue. This led to a polarization in collection and analysis of information with 'formal' quantitative techniques on the one hand and 'informal' qualitative methods on the other. As a result of this polarization of approaches and the associated shortcomings, users of information were often dissatisfied with the quality of data and the analytical conclusions. At the same time, it was recognized that there are areas where the two types of approach can benefit from each other, leading in turn to improved quality of information which is required for appropriate decision-making at the various stages of research projects and programmes.

During the second half of the 1990s, attempts were made to highlight the complementarity of the two approaches. Also, the pros and cons of each type of approach, and the potential for synergy in a general development context, were examined. In the field of renewable natural resources (RNR) research it was realized that although some research practitioners were combining methods, experiences were often not documented and, moreover, several avenues of potential remained untapped. It was in this context that a three-year research project, Methodological Framework Integrating Qualitative and Quantitative Approaches for Socio-economic Survey Work, was commissioned.

This Guide offers practical assistance for field staff and project managers in selecting the most appropriate data collection and analysis methods when faced with information objectives and constraints in data collection and analysis. It aims to address in general terms the question: Given a set of information objectives on the one hand, and constraints such as time, money and expertise on the other, which combinations of qualitative and quantitative approaches will be optimal? The guidelines are relevant for research involving both socio-economic data (e.g. livelihoods, wealth, gender) and natural scientific information (e.g. entomology, epidemiology). They are relevant for data collected within a 'formal' setting as part of an experiment or survey, and also for participatory activities within a research or development context.

PRACTICAL ASPECTS IN SELECTING SURVEY TECHNIQUES

Objectives and constraints

In establishing the most appropriate combinations of methods for a given task, it is necessary to consider both objectives and constraints. Objectives arise in the investigation of a problem or phenomenon. This may be seen as the overall goal of data collection. Researchers need to decide:

- what characteristics (e.g. precision, scope of extrapolating from findings) the information should have
- for whom the information is being collected (e.g. project managers, policy-makers etc.)
- degree of participation needed – in most (many) research activities there will be objectives which relate to how information is collected and analysed

- training objectives which may be attached to the collection and analysis of information guiding the choice of methods.

An important point to note regarding constraints is that objectives interact with each other: having one objective will affect the extent to which other objectives can be achieved and, in this sense, can become a constraint. This is because resources of time, money and expertise are limited – such resources will often shape the parameters of fieldwork just as much as objectives.

Time, costs and required skills

One of the reasons why informal methods became more common in the 1970s and 1980s was that practitioners and managers were dissatisfied with the excessive time taken to conduct, analyse and disseminate formal sample surveys. In practice it is not possible to say unequivocally that participatory exercises are quicker than sample surveys – this depends on specific circumstances – but it does appear that informal work is quicker than formal more often than not. In most projects, time is at least as important as cost per day. For many project managers, the quicker turn-around time of informal approaches is a powerful argument for undertaking such work. However, it is important to compare like with like in terms of quality and quantity of coverage: a weak sample may be a false economy.

A common view is that formal sample surveys are expensive and informal participatory rural appraisal/rapid rural appraisal (PRA/RRA)-type exercises are cheap. Certain 'hidden' costs associated with informal surveys should not, however, be overlooked – it is not easy to arrive at a relatively simple comparison of cost for sample surveys and PRA. There are a host of factors to be considered which can influence both actual cost and imputed cost for undertaking conventional surveys or PRA-type studies. Consequently, it is not possible to say categorically that one type or collection of methods will automatically be more expensive than another type or collection. Thus cost *per se* cannot be reliably used to select methods – each case needs to be taken on its merits.

In general, informal surveys require a greater array of skills per researcher than formal work, which requires a greater number of people to undertake the research process. In addition, the need for multidisciplinarity is greater in informal work, which derives much of its internal consistency from 'triangulation' – including that achieved by the debate between investigators from different disciplines. For informal work, the interviewer will normally need to be highly skilled in interview techniques and, often, to be familiar with a range of 'instruments'. Also he or she will probably be required to analyse the data speedily, much of it in the field itself. Characteristically, in formal work a number of different individuals will be involved in research design, training of enumerators, data collection, design of data entry programmes, analysis and write up.

Trustworthiness of information

The value of information depends on its trustworthiness. Here it is proposed that the trustworthiness of information will be increased if quantitative and qualitative approaches to data collection and analysis are combined rather than used separately. There are four tests of trustworthiness.

- **Internal validity or credibility**[1]**:** The key question here is: How confident can we be about the 'truth' of the findings?
- **External validity or transferability:** Can we apply these findings to other contexts or with other groups of people?
- **Reliability or dependability:** Would the findings be repeated if the inquiry was replicated with the same or similar subjects in the same or similar context?
- **Objectivity or confirmability:** How can we be certain that the findings have been determined by the subjects and context of the inquiry, rather than the biases, motivations and perspectives of the investigators?

Obviously, the size of the target population has a bearing on the importance of these criteria for a particular study. For example, external validity plays a lesser role if the target population is small (e.g. a small number of villages in the case of an NGO-led development project). On the other hand, research projects covering entire regions or countries depend on results representative of these areas. Overall, formal work has probably most to gain from informal in the area of internal validity and objectivity, whereas informal work (if it is to be generalized) can borrow from formal methods to improve external validity.

Types of combinations of survey instruments

This Guide distinguishes three main ways in which quantitative (formal) and qualitative (informal) survey instruments can be combined.

- Merging consists of swapping tools and attitudes from one tradition to the other.
- Sequencing of tools is the alternate use of both formal and informal approaches in data collection.
- Concurrent use of selected tools is the simultaneous but separate use of formal and informal approaches during information gathering.

Within a particular RNR research or development project dealing with the sustainability of livelihoods, any mixture of these types of combination can be used. Whilst aspects of the types shown in Box 1 have undoubtedly been used in the field for some time, it is only relatively recently that examples have been documented and disseminated widely. In the past sequencing, has probably been the most widely practised.

[1] Internal and external validity, reliability and objectivity are the terms used in conventional scientific research. Credibility, transferability, dependability and confirmability are the terms which have been used to describe the equivalent criteria implicitly and routinely used informally in much participatory field research.

BOX 1: Examples of qualitative and quantitative combinations of survey instruments

Merging tools and attitudes

- Thinking about sampling in designing an enquiry based on qualitative methods
- Coding responses to open-ended questions from qualitative enquiries
- Using statistical techniques to analyse unbalanced datasets and binary, categorical and ranked datasets, arising from participatory enquiry
- Creating frequency tables from coded data
- Modelling binary and categorical datasets generated from ranking and scoring exercises
- Using mapping to generate village sampling frames for questionnaire surveys or on-farm trials designed by researchers
- Using attitudes from participatory methods, e.g. to reduce the non-sampling error in questionnaire surveys or farmer/researcher misunderstandings in on-farm trials

Sequencing of tools

- Using participatory techniques in exploratory studies to set up hypotheses, which can then be tested through questionnaire-based sample surveys, or via on-farm trials
- Choosing a random sample and conducting a short questionnaire survey to gain information on key variables which are then investigated in-depth by participatory enquiry

Concurrent use of tools

- Surveying statistically selected sample members, using pre-coded questionnaires to determine target population characteristics of a qualitative (e.g. opinions on a new technology) or quantitative (e.g. crop production) nature
- Setting up scientific experiments (e.g. on-station trials or trials designed and managed by researchers) to study the effects of specific interventions in a controlled environment
- Using aerial photographs, geographic information systems (GIS)

along with:

- Participatory enquiry for attitudes, beliefs and perceptions of the target population
- Farm trials designed and managed by farmers and monitored by researchers

Research objectives and researcher/researched relationships

The different types of combinations need to be seen in relation to the different stages of the research process where they can be applied. Box 2 shows how combinations of survey instruments form part of a continuum in relation to the objectives of a given research project. Although these guidelines focus on survey techniques, it is important not to lose sight of the other stages leading to a research output. Types of formal and informal combinations at the various stages of the research cycle are presented in Table 1, which also demonstrates the link between research objectives and survey techniques, and highlights the researcher/researched relationship.

BOX 2: Continuum of objectives and combinations of instruments

Objectives	Instruments
Derive statistically valid quantitative estimates that are representative of target population	Formal sample survey
Understand the nature (e.g. processes, causes) of quantitative data	Merging Sequencing Mixed Suites
Generate hypotheses	Informal surveys using participatory techniques
Participation for empowerment	Full-blown PRA/PLA

TABLE 1: Information objectives, approaches to data collection and analysis and researcher/researched relationship

Information objectives	Type(s) of instrument(s)	Researcher/researched relationship
To derive quantitative (formal) estimates (number, rate or proportion) of parameters representative of project, regional or national parameters; data to be replicable and verifiable. When quantitative estimates are needed for 'credibility'.	Formal surveys • Random sampling • Some use of secondary data	Researchers design, execute analyse, present Researched are passive
To derive quantitative estimates reflecting the area under consideration, willing to accept lower levels of precision because of resource limits; make maximum use of prior knowledge with purposive sampling.	Formal surveys • Purposive sampling • Greater use of secondary data	As above
To obtain quantitative data with an understanding of processes or causes (diagnosis); data could be used as benchmark data to assess trends, therefore method repeatable with high degree of confidence.	'Merging' or 'concurrent' • Stratification of sample • Use of ranking and scoring and statistics to analyse data • Use of questionnaires • Use of secondary data and grey literature is important	Researchers interact with researched: there is dialogue; semi-structured formats.
To understand the nature (causes, trends, add-ons) of quantitative data already available, either national, regional or project formal surveys.	• As above	As above
When qualitative data (description and analysis of situations, events, people, interactions and observed behaviours) are appropriate to make a decision; when researching characteristics, cultural patterns, motivations and attitudes.	As above – less emphasis necessary on quantification.	As above, but greater use of visualization techniques; longer time period per data collection event; more open-ended structure.
When very little is known about a project area or topic, or wish to move to the next stage of an investment or other action.	As above – less emphasis necessary on quantification.	As above, but greater use of visualization techniques; longer time period per data collection event; more open-ended structure.
When the intention is to introduce a project with a high degree of participation and the local people must be involved at the outset and at all subsequent phases. Quantification still possible.	No necessary requirement for sampling; methodology highly location specific and open-ended.	A range of options – from researchers working as equal partners with researched to researchers acting only to facilitate – translating the wishes of the researched.

MERGING TOOLS AND ATTITUDES

Informal contributions to formal approaches

Informalizing and contextualizing interviews in surveys and experiments

Including semi-structured interviewing in a structured questionnaire can improve the quality of data generated due to increased flexibility and openness, allowing the questionnaire as a whole to adapt better to particular local environments. This adaptation ranges from contextualizing of questionnaires through using appropriate locally specific vocabulary, to being better able to deal with certain types of information within a questionnaire format. To some extent qualitative response is routinely incorporated in many questionnaires, with the inclusion of open-ended questions. The addition of a checklist of points or hints for probing on particular issues takes this process one step further and introduces a greater degree of interaction on the part of the interviewee. Summarizing any substantial number of such responses requires a careful coding exercise.

Using maps to create village sampling frames

Once villages in a region are chosen for a study, based on (say) agro-ecological conditions, social mapping can be used to generate a list of households, together with their physical locations within a village. This can then be used as a sampling frame in sample selection. In a 1993 study, India's National Council of Applied Economic Research (NCAER) found that social mapping compared favourably with standard household listings often employed in sample surveys. An illustration of social mapping in Malawi is given in Box 3.

BOX 3: Use of village mapping to generate sampling frame

The sample design for project households in a study on co-management of forest products in Malawi was based on a single-stage cluster sample within each of the stratified substrata, with villages as clusters. Project villages were stratified first by association with particular co-management blocks in each reserve and then by proximity to the reserve (i.e. near and far). Because of time and resource constraints, a systematic sampling method was used to select households within the selected villages. The sample frame was generated through a process of village mapping, with villagers marking out the number and location of each dwelling unit in the village, together with the name and sex of the household head. All the names and numbers were recorded by the RRA field teams and a systematic sample was taken. This process was found to be useful for three main reasons.

- First, it served as an initial ice-breaker, allowing the RRA team to interact with members of the village.
- Second, and more importantly perhaps, it provided a very rapid and accurate way of generating a comprehensive sampling frame for selected villages. Characteristically, the whole process would take between one and two hours for Chimaliro Extension Planning Area (EPA) and one to three hours for Liwonde EPA. The process was slightly longer in Liwonde than in Chimaliro owing to the larger village sizes in Liwonde.
- Finally, the existence of an accurate village map helped greatly in planning the actual enumeration and dividing tasks between enumerators.

Cluster analysis is a technique, commonly applied to quantitative data by statisticians, in which respondents are grouped on the basis of 'similarity' with respect to responses to a set of survey questions. The starting point is a choice of 'cluster seeds' to which others are then joined in the process of cluster formation. If these seed respondents – core members of groups – have been studied intensively and are well understood through qualitative work, clusters formed on the basis of similarity to the seeds will have an understandable character.

Formal contributions to informal approaches

In some instances, researchers have found it necessary to incorporate more structure into a previously unstructured exercise. For example, one general conclusion of the International Institute for Rural Reconstruction/International Potato Center-funded review of participatory monitoring and evaluation (PM&E) was that:

> *"…with the emphasis on participation and learning processes, much of the PM&E experiences started off with using qualitative and semi-structured methodologies. However, there is an emerging recognition of the need to build into current participatory methodologies some of the quantitative tools to provide for better triangulation of information and greater acceptability of the results when endorsed as inputs to policy. This includes paying greater attention to establishing baseline data to more systematically monitor progress and facilitate ante and post evaluation procedures."* (UPWARD, 1997)

Sampling and stratification

In considerations of the trustworthiness of participatory inquiry, the four characteristics of credibility, transferability, dependability and confirmability are cited (Pretty, 1993). It is important to note, however, that the case for transferability (equivalent to external validity in formal research) appears to be considerably weaker than the one he makes for the other characteristics. It is perhaps in the question of transferability that the most obvious 'Achilles heel' of informal research lies, at least insofar as its practitioners try to generalize their findings in much the same way as sample surveys. Effective and statistically based methods of sampling are needed if the domain of validity of research conclusions is to be extended.

Some of the many important issues that have to be considered in the sample selection process if results are to be generalized to a wider population are:

- a clear identification of the recommendation domain
- use of secondary data and relevant grey literature in assessing the availability of a suitable sampling frame
- where a sampling frame is unavailable, evaluating the feasibility of adopting an hierarchical sampling procedure so that sampling frames can be built up for selected units in the hierarchy
- clearly defining the sampling units most appropriate for study objectives
- methods to be used in sample selection, in particular, including an element of randomness in the procedure
- being open to the possibility of post-stratification at the data analysis stage
- sample size considerations.

Applying statistical analysis to unbalanced, binary, categorical and ranked datasets

During the 1990s, practitioners of informal surveys and PRA-type work in developing countries started to recognize the potential for applying modern statistical methods to unconventional datasets, and some of the ways in which statistical techniques can play a useful role for such data are outlined.

Coding open-ended questions: One starting point is coding open-ended questions from informal work – a common practice in questionnaire work. What is less common is coding of information collected informally. Certain types of information collected during informal work can be coded readily, and others with rather more careful thought. An example of coding is provided by the Farming Systems Integrated Pest Management

Project in Malawi (FSIPM), in which qualitative information from farmer activity diaries was collected, entered into a spreadsheet (Excel) and analysed using a suitable statistics package (e.g. SPSS). Studies that are relatively large may justify the use of specialist software packages (e.g. NUD-IST) for this type of qualitative data, although these may be time-consuming and difficult to use.

Analysis of variance: The principal method for the statistical analysis of data from on-farm participatory trials is the analysis of variance (ANOVA). The power of the method lies in its ability to 'disentangle', 'correct', or in a loose sense, 'explain' the effects of one or more factors (e.g. new technologies) on response variables such as results from participatory scoring exercises. When the data structure is 'balanced' (equivalent to equal numbers of observations in cells of two-way tables concerning factors of interest), ANOVA is relatively straightforward and is quite well known. Although 'balance' is rare in participatory on-farm trials, the technique can allow the simultaneous study of several factors (qualitative as well as quantitative), and the study of interactions between them. The procedures are readily available in many statistics packages, but their use is generally less well known and they appear not to have been widely applied to on-farm trials. Simple treatment means, which suffice for balanced data, can be misleading in the analysis of unbalanced designs.

Generalized linear and multi-level models for binary data: Categorizing farmers' preference rankings of tree species as 'good' or 'poor', allows the resulting binary data to be analysed via a generalized linear modelling approach to determine factors which affect their preference. In particular, the dependence of preference ranking on ethnic groups is demonstrated.

A recent set of statistical developments extends the idea of general linear models to multi-level models which explicitly acknowledge and model hierarchical information, as found for instance where some data are at community level, some at household and some at individual level. The power of the multi-level modelling method lies in 'separating out', 'accounting for', or loosely 'explaining' the effects of several factors at different hierarchy levels. These up-to-date models do not as yet appear to have been applied to data collected using informal methods in developing countries, but there is clear scope to improve the quality of data analysis by doing so. Pending further development, this modelling can be quite technical and is likely to require the use of a professional statistician. With time and funds, however, it should be possible to make modelling more user-friendly to the NR research practitioner.

Qualitative residuals: A general idea which runs through regression and ANOVA modelling as well as generalized and multi-level modelling is that of the 'residual' – the difference between the observed result and that suggested by the model fitted. There is a residual for every observation after a model has been fitted, and the set of residuals corresponds to what is 'left over' or 'unexplained' after 'correcting for' known influencing factors. Summarizing a large body of qualitative data, say from a substantial number of separate informants, is time-consuming and labour-intensive. The analogue of quantitative residual analysis is first to account for common features in the qualitative data in a systematic way, such as the above, then to focus attention specifically on explaining the more individual characteristics.

Ranking and scoring data: Ranking and scoring data arise from activities where precise numerical measurement is inappropriate, including a range of qualitative work, some of

BOX 4: Analysis of ranked data from a study in Tanzania

The Larger Grain Borer (LGB), *Prostephanus truncatus* (Horn), was first reported in Africa in 1981. The beetle, a severe pest of farm-stored maize and dried cassava was initially a major problem to farmers in western Tanzania. The principal objectives of the study were: to assess the role played by *P. truncatus* in determining changes in production, storage and marketing of the maize and cassava crop during the period between the time of the establishment of the beetle and the present, and to assess the factors determining the role played by the beetle in this period, in particular the impact of the insecticide treatment.

A combination of sample survey and rapid rural appraisal (RRA) techniques was required in order to achieve these objectives. In pursuing one component ranking data derived from the RRA exercises were analysed statistically by Chi square tests and variants thereof. In one exercise farmer groups were asked to rank the importance of the pest in comparison to all other storage problems at the time of establishment of the beetle (past) and for the present day (present). The ranks were then compared and analysed using McNemar's test and are summarized as:

		Present	
		Rank = 1	Rank = >1
Past	Rank = 1	24	13
	Rank = >1	2	4

The cells representing no change give no information about how the ranking of LGB has changed over the years – only the bottom left and top right cells give information about change. McNemar's test (sign test in this case), which can be used to test the null hypothesis of no change in attitude, gives a *p*-value of 0.0045, indicating strong evidence for rejecting the null hypothesis. There was a significant increase in the ranking, giving significant evidence for a reduction in the role of LGB as a storage problem.

it participatory. Ranking entails an ordering, for example, between a set of crop varieties in terms of cooking characteristics. For the same task, scoring would entail assessing each variety separately on a fixed scale, say a four-point scale with values 1, 2, 3 and 4. Simple scoring and ranking data can be analysed easily (see Box 4), but where the study has more structure, statistical methods can be used to correct for respondent grouping factors, such as the respondent's ethnic group and gender. In a substantial number of cases, scoring data can be treated by relatively standard statistical methods, so the results can be modelled and simultaneously corrected for a range of 'explanatory factors', even when these occur in an unbalanced fashion.

Bayesian statistics: Bayesian statistics is based on the notion of subjective probability or degree of belief. Briefly, the Bayesian paradigm consists of modelling beliefs **before** observing data, by **prior** probabilities, and using Bayes' theorem to combine information from observations with the prior distribution to obtain a posterior distribution. Thus, an inference about an unknown is a blend of observed data and subjective degrees of belief. There has been much recent research on the so-called elicitation process – of obtaining the prior probabilities. One area where Bayesian ideas show some promise is in the analysis of causal diagrams. These are a popular tool in qualitative enquiries, and recent work has generated 'scored' causal diagrams, where participants generate scores for the importance of cause and effect pathways within the diagrams. One set of such data constitutes a descriptive profile of a problem analysis. The question has arisen of combining or comparing several such diagrams, independently elicited. The Bayesian approach to statistical modelling involves a similar type of elicitation, and recent developments in Bayesian networking methods show promise as a toolkit for comparing and combining structured sets of uncertain information.

Applying statistical analysis to qualitative datasets

A compromise needs to be struck so that informal data can be analysed by using statistical techniques. Some of the flexibility inherent to RRA/PRA exercises needs to

be given up in favour of a minimum of rigour, making the data suitable for cross-site analysis. Nevertheless, if well blended into the exercise, this can be done without seriously restricting participation.

A number of aspects must be taken into account during survey design and data collection when considering the application of statistical analysis to qualitative datasets, particularly if the research is to lead to generalizable results.

- The study group should be adequately large and representative of the target population.
- An element of randomness is required in the selection of the study units.
- The format of the data collection tool should remain the same throughout the survey (e.g. use of the same format of matrix throughout the exercise, use of a uniform scoring system).
- Well-defined consistent recording of information so that, for example, results from individual PRA practitioners can be coded in a coherent way and put together for analysis.
- Clear and complete recording of meta-data, i.e. details of where and how the information was collected, so that information summaries can be based on a clear-cut rationale, and have proper support for any claim to generalizability.

SEQUENCING OF TOOLS

Using informal before formal approaches

Formulating and testing hypotheses

The use of informal tools before structured questionnaires is an accepted and common practice. The reasons for conducting an open-ended enquiry before a more closed but geographically broader one are well known. Open-ended diagnostic studies help in the formulation of hypotheses, which can then be tested rigorously by structured tools such as a questionnaire administered to individuals selected through an unbiased sampling procedure. The primary role of the informal study is to define and refine hypotheses which can then be tested – either formally or informally.

Undertaking informal studies before formal studies has been standard practice in mainstream market research for at least 30 years – the reasons given for this are highly relevant to RNR research and development:

> *"Prior to any large-scale quantitative study particularly in a relatively unknown market, it is strongly recommended that a qualitative phase of research is initially conducted, the main purpose being to understand the vocabulary and language used by customers as well as understanding their motivations and attitudes towards given services, products and usage occasions. The findings of the qualitative research provide invaluable input to the quantitative stage in terms of the line and tone of questioning, and of course the overall structure and content of the quantitative phase."* (Association of British Market Research Companies, ABMRC, 1989)

In the design and implementation of formal scientific experiments, the use of informal studies performs much the same function as in informal survey work. Before starting a programme of on-farm experimentation, it is necessary to gain an understanding of

local farmers' knowledge, perceptions, beliefs and practices, and to 'scope' the range of circumstances which may fall in the recommendation domains of conclusions from formal studies.

Rejecting null-hypotheses

Informal surveys can be used as diagnostic studies (i.e. to build up hypotheses) and also as case studies to reject null hypotheses in survey work by producing counter-examples. Thus Casley and Kumar (1988) note that informal surveys can be used to disprove a null hypothesis (for example, that a certain constraint does not exist) or to indicate that an assumption of the project plan is not holding true in the cases studied. One advantage of the case study method is that it may be possible to make generalizations but may not be possible to reject existing generalizations (Casley and Lury, 1982).

Building up rapport

Formal work, such as on-farm experimentation, requires the development of farmer/researcher understanding and a degree of consensus on the programme of work. This preparatory phase is then likely to provide a pool of potential collaborators who can be 'sampled'. Participatory activities conducted prior to formal work can, irrespective of any other benefits, generate rapport and a degree of confidence between farmers and researchers.

In the selection of participants for a long-term activity, compromises are inevitable. For example, the selection of farmer participants in an on-farm study will depend on the willingness and capability of the candidate farmers. A note of caution is needed here because this may affect the 'population' to which conclusions can be claimed to generalize. If the non-compliant are likely to be more resistant to adopting new processes, the effects of a research intervention may be over-estimated. It may be valuable to carry forward informal estimates of the participation rate, and the type and importance of differences between those willing and those not willing to be involved.

Using formal before informal approaches

Although the use of informal studies before formal work is the most common form of sequencing, in some cases, researchers and practitioners may conduct a questionnaire survey before a more in-depth informal study. This survey acts as a kind of baseline, with the results indicating areas that require further probing and analysis through informal methods. Such sequencing will work best in situations where most of the key issues are known or strongly suspected, but further information is needed on causes, for example, in the context of a project or programme that has been going for some time and for which a lot of information has already been collected through a monitoring and evaluation (M&E) system.

The information from the formal questionnaire both poses the issues which should be addressed in greater depth in follow-up, and provides a basis for selecting individuals whose further participation is solicited. Respondents may be post-stratified or clustered into groups on the basis of information from the questionnaire. This may be done deliberately so that:

- a particular grouping comprises those targeted for follow-up
- the group followed up is broadly representative of all the clusters found in the population, and the follow-up study is made 'representative'

- differences amongst the clusters can be explored – particularly relevant if the cluster definitions lay the foundations of recommendation domains.

Formal and informal methods used in sequence

Through defining and refining hypotheses, correcting misapprehensions, providing depth and causal linkages, the informal survey is used in series with formal methods throughout the project cycle from needs assessment to ex-post evaluation. There are several examples of formal and informal methods being used in concert in both research and development contexts.

- The benefits of a symbiotic relationship between participatory on-farm research and formal on-station research have been commented upon in relation to the Conservation Tillage Project in Zimbabwe (Hagmann *et al*., 1995). Qualitative results from the on-farm research were fed into the on-station work, quantified, modified and then fed back into the on-farm research and so on. The authors report that the process of integration of formal research into participatory technology development enabled "…both farmers and researchers to develop technologies and had the benefits in terms of data (researchers and policy-makers) and a deeper understanding of processes (farmers and researchers)".

- Commenting mainly in relation to development projects, McCracken *et al*. (1987) note that "The advent of RRA has … greatly enriched the availability of methods of analysis for rural development. Techniques can be chosen on the basis of the problem, the local situation and the resources to hand. In particular, different techniques, both formal and informal, can be blended to produce a project cycle…".

CONCURRENT USE OF TOOLS

Survey work

In its evaluation of India's National Programme on Improved Chullah, the National Council of Applied Economic Research (NCAER, 1993) found several benefits in using informal and formal techniques together. The NCAER experience concerned a geographically broadly spread sample in which a questionnaire was used to collect quantitative or quantifiable information on a limited number of variables. Other, mainly qualitative data were collected through RRA/PRA methods from a smaller sample, spread across fewer villages picked from all regions. The questionnaire results provided 'representativeness', whilst the RRA/PRA work provided context, explaining behavioural patterns, and additional in-depth qualitative data which could be helpful during analysis and report writing. Overall, blending the two approaches can lead to a more reliable database (see Box 5).

BOX 5: Combinations of broad formal survey and narrow in-depth study

It often makes sense to think of a combination of a broad shallow study which provides good 'representativeness' and one or more deep narrow studies which provide the depth referred to above. This combination may be thought of as providing a table or platform supporting the research conclusions. When such a combination of studies is planned, it is of course desirable that the sampling structure be planned so that effective merging of conclusions can follow. This implies that the in-depth studies are planned with special attention to how their selection relates to the broad shallow study.

The same point has been made by others who note that we should not attempt to extrapolate from PRAs but, instead, use the findings to stimulate, "a more accurate debate about a policy issue by identifying the diversity of local conditions. By combining PRA with questionnaires or remote sensing techniques which capture broader *spatial* information, one can derive 'an attractive combination of range and depth of information." (Abbott and Guijt, 1997).

Table 2 shows the concurrent use of both PRA exercises and formal household questionnaires, while Box 6 shows a similar exercise used for purposes of triangulation.

TABLE 2: Concurrent use of research tools – LGB study in Tanzania

Thematic area	Research approach
Changes in role of crop production in household food security strategies comparing 1985 with 1998	RRA (groups of men and women – some single gender groups – ranking strategies for 1985 and 1998)
Changes in farmers' perceptions of the importance of maize and cassava, comparing 1985 with 1998	RRA (groups of men and women – some single gender groups – ranking both crops against all other crops for 1985 and 1998)
Influence/role of *P. truncatus* on: • production levels • maize and cassava harvests • choice of maize and cassava varieties • duration of storage and volume of sales at farm level	Household sample questionnaire
Is *P. truncatus* still regarded as a problem in the context of: • major agricultural problems • other storage problems?	RRA (groups of men and women – some single gender groups – ranking strategies for 1985 and 1998)
Coping strategies for *P. truncatus*: • Actellic super dust perceptions • Storage operations and structures	Household sample questionnaire

BOX 6: Concurrent use of tools for triangulation

Formal questionnaire surveys and informal RRA exercises were carried out concurrently in 1998/99 as part of the Department for International Development Forestry Research Programme project Sustainable Management of Miombo Woodland by Local Communities in Malawi. Regarding the importance of the forest products, it can be seen that the results of the RRA confirmed the results of the questionnaire survey:

Comparing responses: importance of different forest products

	Questionnaire survey		RRA exercise
Product	%	Rank	Rank
Firewood	94	1	1
Grass/thatch	84	2	2
Mushroom	70	3	3
Poles/timber	58	4	4
Rope fibres	28	5	5
Medicine/herbals	24	6	6
Fruits	22	7	7

Experimental work

A further type of concurrent combination involves detailed scientific measurements on the one side, and informal investigations of perceptions, beliefs and attitudes on the other. The qualitative and quantitative sorghum loss work conducted in India by NRI, for example, seeks to compare detailed laboratory-based analysis of mycotoxins, and pest damage of stored sorghum with farmers' perceptions of the importance of losses (Nick Hodges, personal communication).

CONCLUSIONS

Qualitative (informal) and quantitative (formal) methods may be combined in a variety of ways to improve the trustworthiness of survey and experiment findings. Several combinations are already known to practitioners in the field, whilst others have not yet found practical expression. The choice of particular instruments and combinations will be conditioned not only by the extent to which they improve trustworthiness, but also by time, money, expertise and other factors which can act as constraints to the process of data collection and analysis.

Clearly, all information objectives need to be resourced and, in many cases, the types of instruments used will be as much – or more – a reflection of resource constraints as they are of objectives. Both objectives and resource constraints have implications for the selection of survey teams. Aside from the typical multidisciplinary combination of social and natural science inputs, there is a need to consider inputs from statisticians, especially in the more complex cases.

Case study exercises have highlighted the importance of survey teams being sufficiently trained and familiar with approaches, and being provided with sufficient resources to achieve their targets. Supervision can be a problem, particularly if exercised over long distances without direct contact. Unforeseen circumstances can push a relatively inexperienced survey team to the limits of its capabilities. If in doubt about the experience of the team and the tasks expected, it may be more appropriate to choose a less demanding survey design.

Well-synthesized survey results are required to enable project leaders or policy decision-makers to make reasoned decisions. A unified set of recommendations should reflect a balanced use of tools, which ultimately will lead to more trustworthy information. As well as swapping tools for the collection and analysis of data (i.e. **merging** of techniques), findings obtained through the use of one approach can be confirmed, enriched, or refuted by research results obtained from the concurrent or sequenced use of the other approach.

All the options identified in this Guide – merging, sequencing and concurrent use of tools – are likely to find increasing application in the field. Experience to date is beginning to suggest that merging perhaps represents the most challenging strategy and, hence, it may be wise to exercise particular caution and care in applying this approach. A range of possible combinations of qualitative and quantitative survey techniques, some of which were tested as part of DFID research, is outlined here. However, the fact that some approaches are relatively untried requires a certain degree of flexibility during design and implementation of research and development projects aiming to improve natural resource use and livelihoods.

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