IMPACT ASSESSMENT PROGRAM

Working Paper Series

Number 41

Developing Forage Technologies with Smallholder Farmers: How to Monitor and Evaluate Impacts

Rob Cramb and Tim Purcell

Australian Centre for International Agricultural Research

The Working Papers have not been refereed and are intended as a means of generating discussion. It is expected that many will, after benefiting from this interaction, be submitted for formal publication.

This series was formerly titled Economic Evaluation Unit Working Paper Series.

Papers in this series represent the views of the author(s) and do not necessarily reflect those of ACIAR.

Communications regarding any aspects of this series should be directed to:

The Manager
Impact Assessment Program
ACIAR
GPO Box 1571
CANBERRA ACT 2601
AUSTRALIA

Distribution queries should be directed to:

The Program Assistant
Impact Assessment Program
ACIAR
GPO Box 1571
CANBERRA ACT 2601
AUSTRALIA

Email: aciar@aciar.gov.au

Developing Forage Technologies with Smallholder Farmers:

How to Monitor and Evaluate Impacts

Rob Cramb and Tim Purcell

Agricultural and Resource Economics Unit
University of Queensland, Brisbane

ISBN 1 86320 318 4

Canberra
August 2001

Contents

Tables

1. Introduction

The practice of farmers and researchers working together to develop new agricultural technologies has been termed 'farmer participatory research' (FPR) or 'participatory technology development' (PTD). According to its advocates, the benefits of this approach are substantial: 'The outcome of PTD is twofold: locally-adapted improved technologies and improved experimental capacities of farmers. Practical field experiences reveal that impressive results can be achieved when farmers and outsiders "join hands"' (Haverkort 1991, 6).

On the other hand, some of those with experience in the area maintain that 'farmer participatory research (the collaboration of farmers and scientists in agricultural research and development) is a promising idea that has not lived up to its promise' (Bentley 1994: 140). The basis for this view is that 'there are still few reports in the literature of technology invented by formal scientist–farmer interaction. Most papers on FPR include no data, no description of technologies generated with farmers and no description of the method used or which scientists participated and how. Some even fail to mention which crop was under study' (Bentley 1994, 142).

The issue is not whether conventional research (e.g. plant breeding) can generate the basis of improved farm technologies – it clearly can (Anderson 1994). Nor is it any longer a question of whether farmers conduct their own experiments and develop technologies on-farm (Sumberg and Okali 1997). The issue is whether farmers and scientists formally working together on research problems can develop technologies more effectively than farmers and scientists working separately (Okali et al. 1994). According to Bentley (1994, 143), 'we cannot judge farmer participatory research by any other standard than its ability to generate useful new techniques for rural people'.

This highlights the need for careful monitoring and evaluation of participatory research projects and programs, both to ensure 'quality control' (Jiggins 1994) and to document and evaluate the impacts of this kind of research activity.

The Forages for Smallholders Project (FSP) is a participatory research program in Southeast Asia that commenced in 1995. The focus of the project is to develop forage technologies in partnership with smallholder farmers in upland areas where forages have the potential to improve livestock feeding and management of natural resources. The FSP is funded by the Australian Agency for International Development (AusAID) and managed by Centro Internacional de Agricultura Tropical (CIAT) and the Commonwealth Scientific and Industrial Research Organisation of Australia (CSIRO). It involves a network of smallholder farmers, development workers and researchers in Indonesia, Lao PDR, Malaysia, Philippines, Thailand, Vietnam and Southern China.

- Faced with a need to develop procedures to monitor and evaluate the impacts of the FSP, in 1999–2000 CIAT collaborated with the University of Queensland (UQ) in a project funded by the Australian Centre for International Agricultural Research (ACIAR). The project was titled 'Participatory Monitoring and Evaluation of New Technologies Developed with Smallholders' and its objectives were to:
- Develop a framework to monitor and assess the on-going and ex-post impacts of new forage technologies developed through farmer participatory research.
- Study the process of farmer technology testing, adaptation, and adoption using participatory monitoring and evaluation methods and taking into account gender and wealth differences among potential adopters.
- Compare participatory and conventional approaches to and impacts of forage technology development.

The project proceeded by conducting fieldwork at two contrasting FSP sites — Malitbog in the Philippines, and M'Drak in Vietnam. Malitbog is located in Bukidnon Province in Mindanao at 8°N latitude, 124°E longitude, and 250–1000 metres above sea level (masl), with average annual precipitation of 2000 mm and 2–4 months of <50 mm rainfall. There is an extensive upland farming system

with soils of pH 5.9 and low–medium soil fertility. The FSP is working with farmer groups to develop forage technologies for intensively managed plots and contour hedgerows. Farmers commenced planting forages on their own land for evaluation in 1997 from species selected from a regional evaluation site established in 1995–96 in the area. M'Drak is located in Daclac Province in the central highlands of Vietnam at 12°N latitude, 109°E longitude, and around 500 masl, with average annual rainfall of 1400 mm and 4 months of <50 mm rainfall. An extensive upland farming system has been developed in the last 15 years to replace *Imperata cylindrica* grassland on soils of pH 4.5–5.5 and of low–medium fertility. On-farm evaluation of forages was commenced by 30 farmers in 1997 from species selected from a regional evaluation site established in 1996. The main interest of farmers is in forages to supplement local feed for cattle.

The ACIAR project worked with FSP farmers, development workers, and researchers at the two sites, experimenting with a range of 'conventional' and 'participatory' techniques, to:

- characterise the farmers' situation (thus establishing a 'baseline')
- decide what were the 'issues' requiring monitoring and evaluation
- select key indicators
- test methods for obtaining information
- test methods for analysing and presenting information
- assess the usefulness of the information for decision-making.

The project presented preliminary findings at a five-day workshop at Cagayan de Oro in the Philippines in August 2000 in which FSP staff and others participated.

This report addresses the first of the three project objectives listed above. That is, it seeks to develop a framework and assess a range of methods and techniques for participatory monitoring and evaluation of the FSP and similar projects. It draws on the site-specific experience gained from the fieldwork in the Philippines and Vietnam and the pooled insights and experience of practitioners at the August workshop, as well as selected literature from the now extensive body of writing on participatory monitoring and evaluation.

The report is organised as follows. In Chapter 2 we consider some of the conceptual and practical issues involved in developing a framework for monitoring and evaluation in the FSP. In the following three chapters we review our experience with a range of techniques for implementing monitoring and evaluation, grouped into mapping, diagramming and other visualisation techniques (Chapter 3), preference ranking and matrix scoring techniques (Chapter 4), and structured and semi-structured interviewing techniques (Chapter 5). In the final chapter we summarise our suggestions for the planning and conduct of monitoring and evaluation in the FSP.

2 Developing a framework

2.1 What is the role of monitoring and evaluation?

Monitoring and evaluation (M&E) is essential to the management of all development activities (projects, programs, organisations). If we are to manage our activities adaptively, responding to changes as they occur, we need feedback. This is true for farmers, local project workers, and staff of research institutes and development organisations, both government and non-government. In relation to the FSP, M&E enables us to document and evaluate progress with new forage technologies and the participatory technology development process itself. Indeed, M&E is an integral part of participatory research, though in practice, as noted in the Introduction, it has not always been given sufficient attention.

In conventional terms, monitoring and evaluation are distinct activities related to the project cycle (Casley and Kumar 1987). Having identified, planned and initiated a project, we need to monitor its implementation and evaluate its achievements. Thus *monitoring* is part of project management and occurs during the life of the project, whereas *evaluation*, while it may begin during the project, will extend beyond the project's life and focus area.

In the present context, however, the primary concern is not with routine monitoring of project activities, such as employment of staff or acquisition and disbursement of inputs, but with the continuous or periodic assessment of *project impacts* — that is, with *impact monitoring* or *ongoing evaluation* —as well as evaluation in the *ex post* sense. Hence the distinction between monitoring and evaluation becomes blurred; the one activity flows naturally into the other.

The scope for M&E activities in projects such as the FSP is potentially enormous:

- There are many possible effects of the project, some of them immediate (e.g. formation of forage groups), some intermediate (e.g. adoption of forage technologies), and some longer term (e.g. improvement in livestock production and farm income). These effects not only appear over different time-frames but form part of a complex causal sequence (e.g. the formation of groups may contribute in part to the adoption of forage technologies which in turn may contribute to improvement in the output of the farming system).
- At any one time there are many different processes underway — adoption and adaptation of forage technologies, formation and growth of forage groups, development of local capacities for adaptive research — all of which are impacts or potential impacts of the project.
- There are many different actors or 'stakeholders' — farmers, development workers, local supervisory staff, project leaders, CIAT, CSIRO, AusAID — each with their own information needs and perspectives. The current emphasis on 'participation' encourages us to involve everyone in M&E activities.
- There are many tools and methodologies available – 'conventional' and 'participatory' — including structured and semi-structured interviews, community resource mapping, wealth ranking, story telling, and so on.

However, our time and resources are limited. Somehow we have to be selective in what we try to measure, how we measure it, and whom we involve in the process.

2.2 Why use participatory monitoring and evaluation?

Participatory approaches to M&E (or PM&E) entail the active involvement of local people (farmers, field staff, and other local stakeholders) in the design, elicitation, analysis, and utilisation of M&E information. PM&E has been motivated by *functional* concerns, i.e. to improve the effectiveness of M&E, as well as by concerns for the *empowerment* of disadvantaged groups. Table 1, adapted from Mikkelsen (1995, 170–1), summarises the differences between conventional and participatory evaluation. In practice, the distinctions are not always so sharp and a blending of the two approaches often occurs.

Table 1. A comparison of conventional and participatory evaluation.

	Conventional	Participatory
Who?	External experts	Farmers, project staff, facilitators
What?	Predetermined indicators of success, e.g. production, income	People identify own indicators of success
How?	Focus on scientific objectivity; distancing of evaluators from other participants; uniform, complex procedures; delayed, limited access to results	Self-evaluation; simple methods adapted to local culture; open, immediate sharing of results through local involvement in evaluation processes
When?	Usually upon completion; sometimes also mid-term	Merging of monitoring and evaluation, hence frequent small-scale evaluations
Why?	Accountability, usually summative, to determine if funding continues	To empower local people to initiate, control and take corrective action

Source: Adapted from Mikkelsen (1995, 170–1).

PM&E is now widely advocated for all forms of development activity (Schonhuth and Kievelitz 1994; Pretty et al. 1995; Van Veldhuizen et al. 1997). Estrella and Gaventa (1998) list five general purposes for which PM&E is being used in practice:

- Impact assessment
- Project management and planning
- Organisational strengthening or institutional learning
- Understanding and negotiating stakeholder perspectives
- Public accountability

As indicated above, the primary emphasis in this report is on impact assessment, though PM&E conducted for this purpose can clearly contribute to one or more of the other functions. PM&E for impact assessment can be characterised as

> … a process of evaluation of the impacts of development interventions which is carried out under the full or joint control of local communities in partnership with professional practitioners … [C]ommunity representatives participate in the definition of impact indicators, the collection of data, the analysis of data, the communication of assessment findings, and, especially, in post-assessment actions designed to improve the impact of development interventions in the locality (Jackson 1995, 6).

Estrella and Gaventa (1998) identify four general principles or characteristics of PM&E:

- *Participation*. There are two main ways to characterise participation in M&E — by whom it is initiated and conducted (externally led, internally led or jointly led); and whose perspectives are particularly emphasised (all major stakeholders, beneficiaries, or marginalised groups).
- *Learning*. The emphasis is on practical or action-oriented learning. PM&E is also seen as a means of local capacity-building.
- *Negotiation*. PM&E is a social process for negotiating between people's different needs, expectations and world-views. It is also a political process which can empower and disempower different stakeholders. Negotiation results in the selective involvement of stakeholders in the design, implementation, reporting, and use of M&E.
- *Flexibility*. PM&E emphasises flexibility and experimentation; there is no blueprint.

Who are the 'participants' in participatory M&E? Farmers, field workers, local project managers, international project managers, donors, other actors outside the immediate project frame (departmental heads, mayors, businessmen) are all potential stakeholders in the project and its activities. A participatory approach can be seen as one which involves all these actors as partners. However, each actor will have his or her own view regarding the benefits and costs of participation. Participation is a form of investment (Johnston and Clark 1982), hence prospective participants will ask:

- What are the benefits of participation?
- What are the (opportunity) costs of committing scarce resources (money, time, energy, freedom from obligations)?
- What are the risks?
- What other means are available?

We cannot assume that everyone will have the time or motivation to be involved in all the PM&E activities we can identify.

2.3 What should we monitor and evaluate?

There are many aspects or effects of a participatory technology development project such as the FSP which we may need to monitor and evaluate — some of them immediate, some intermediate, and some longer term. Following Bennett and Rockwell (1995), the more immediate effects are to do with the *process* we are involved in (Figure 1):

- Resources (e.g. time and money expended to raise farmers' awareness of forages)
- Activities (e.g. awareness-raising activities such as field days and cross-farm visits)
- Participation (e.g. involvement of farmers in these activities)
- Reactions (e.g. what farmers thought about their involvement in these activities).

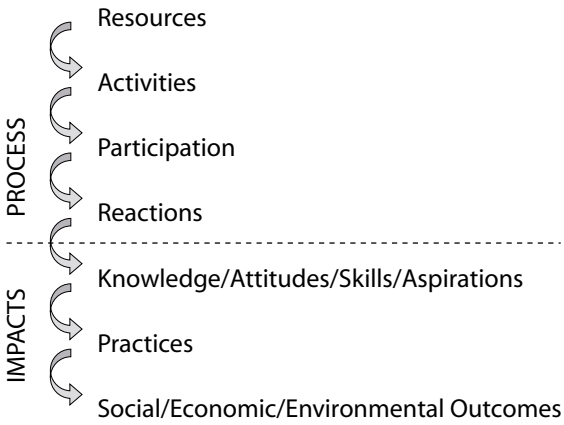


Figure 1. Deciding at what level to monitor and evaluate (from Bennett and Rockwell 1995).

Then there are the *impacts* of the project, that is, the intermediate and longer-term things that happen as a result of the above process:

- Knowledge, attitudes, skills, aspirations (e.g. farmers' *knowledge* about new forage varieties, their *attitude* to experimenting with these varieties, their *skills* in establishing and managing forage plots, their *aspirations* to expand their forage and livestock activities)
- Practices (e.g. farmers' adoption and adaptation of forages and forage systems, such as hedgerows of napier grass)
- Social, economic, and environmental outcomes (e.g. adoption of napier grass hedgerows may result in more work for men to cut and carry the grass (social outcome), more income from the sale of fatter livestock (economic outcome), and less erosion from the field in which the hedgerows are planted (environmental outcome)).

As Bennett and Rockwell (1995) point out, the further down this list we move the longer it takes for the change to occur, the harder it is to measure the change, and the harder it is to attribute the change to the project. We may have to be content to monitor something higher on the list and use this as indirect evidence of producing a change further down the list.

For example, soil erosion and its off-site impacts (such as sedimentation in streams) are very difficult to measure and it may take some time for these impacts to become noticeable. However, we know that hedgerows (even one grass strip) can significantly reduce soil erosion. Hence we may use farmers' *knowledge and skills* regarding hedgerows and the extent to which they actually adopt hedgerows (an observable farming *practice*) as a way of assessing the reduction in soil erosion (a longer-term environmental *outcome*).

Another, complementary way of looking at the different effects or 'products' of a participatory technology development project is as follows (McAllister 1999; McAllister and Vernooy 1999):

- Process — the participatory research approaches used or developed in the project, such as farmer focus groups to identify and rank research needs.
- Outputs — the immediate outputs of project activities, such as the number of people trained in forage technologies or participatory research, the number of research reports produced, or the range of new forage technologies developed.
- Outcomes — the short-term or intermediate effects of the participatory research process, such as farmers planting forage plots and acquiring more animals (a positive outcome), or reduced food crop production due to the use of land for forages (possibly but not necessarily

a negative outcome). Some outcomes (both positive and negative) may have been unexpected when the project began, such as using forages to feed fish in Vietnam, or forage plots harbouring rats and snakes in the Philippines.

- Impacts — the overall, long-term changes in the project area (positive or negative) which result, at least in part, from the participatory research project, such as reduced poverty, greater gender equity, and improved natural resource management. These are very difficult to measure and attribute to the research process, so to evaluate the project we generally have to focus on the outcomes as intermediate measures of impact.
- Reach — the wider, 'ripple' effects induced by the project, such as on the capacity of farmers and local researchers to initiate and implement their own activities and projects to deal with new problems and needs. For example, field workers may use or modify the participatory appraisal methods learned during a forages project to help another group of farmers tackle a completely different problem, e.g. a village water supply problem.

2.4 What is the basis for comparing project effects?

Whichever way we categorise the project effects, there is a fundamental issue in M&E regarding the *basis for comparison*. If we are measuring changes over time (e.g. in livestock productivity) and attributing these changes to the project, we need to be able to answer two questions:

- What was the situation before the project started (i.e. the 'before–after' comparison)?
- What would the situation be now if the project had not intervened (i.e. the 'with–without' comparison)?

Without these comparisons we cannot be sure to what extent the changes we are monitoring are actually effects of the project. For example, we might find that livestock productivity is high. But was it already high before the project started? If not, would it have been higher anyway in the current year because of other factors (e.g. good rainfall resulting in an abundant supply of native grasses)? These questions are relevant whether we are talking about a farmer group monitoring its own progress or a donor agency evaluating the effectiveness of a large research program. Figure 2 gives a hypothetical example of how an indicator of impact might vary before, during, and after a project, as well as with and without a project, illustrating the need for a comparative perspective.

The conventional way of making these comparisons is to conduct a baseline study at the beginning of a project (to permit the before–after comparison) and to monitor change in a non-project or 'control' area (to permit the with–without comparison). However, this need not require an elaborate and time-consuming questionnaire survey; more participatory techniques can be used. For example, as part of project planning, focus groups can be organised during which techniques such as community mapping, time lines, problem ranking, semi-structured interviews etc. are used to establish the current and recent status of key variables, thus establishing a baseline. Even if this has not been

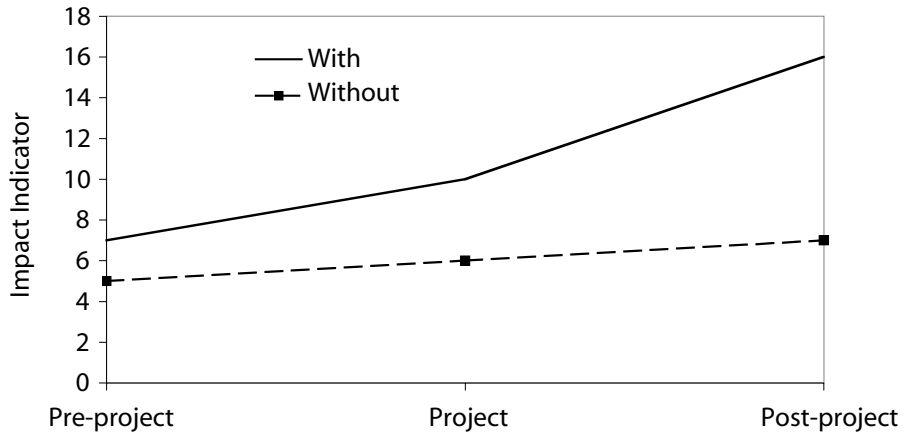


Figure 2. Hypothetical impact data for farmers with and without forage project.

done at the outset of a project it is possible to construct a 'retrospective baseline' in which participants recall their situation immediately before the project commenced.

Moreover, it may not be necessary or desirable to include a 'control' area to obtain a with–without comparison. It is always difficult to find an area which is sufficiently similar to the project area yet unaffected by the changes the project is engaged in. In any case, it is somewhat contrary to the participatory research approach to be monitoring a group of farmers purely to evaluate impacts elsewhere. If the aim is to establish whether a change is due to the project's activities, it may be better to use participatory techniques which draw on the detailed local knowledge and experience of farmers and field workers within the project area. For example, farmer focus groups could identify and weight the factors (project and extra-project) which have led to changes in livestock productivity, using flow-charting and ranking-and-scoring techniques. Farmer case studies using semi-structured interviews might also be used to give an in-depth understanding of the *reasons* for observed impacts.

Such approaches not only give answers to the question: 'To what extent are the observed changes attributable to the project?' They also enhance the understanding and research capability of the project participants.

2.5 How do we develop a monitoring and evaluation plan?

M&E is a complex process in its own right with several distinct aspects. Estrella and Gaventa (1998) outline four major steps in applying participatory M&E:

- Planning or establishing the framework for a PM&E process, including identification of objectives and indicators
- Gathering data
- Analysing the data
- Documenting, reporting, and sharing information.

The first of these steps is clearly critical — to be effective, M&E needs to be carefully planned. Ideally, this planning should take place at the start of the project as part of the whole process of problem diagnosis and development of project activities. In practice, the M&E plan will need to be re-visited several times as the project evolves and as participants become clearer about the key indicators to measure and the feasibility of measuring them.

The steps involved in developing a PM&E plan are indicated by the following list of questions — an adapted and expanded version of those used by the International Potato Centre (CIP) in their participatory research and extension activities:

- What are the project objectives?
- What are the M&E questions that follow from these objectives?
- Who needs answers to these questions?
- What are the best indicators to help us answer these questions?
- What are the units in which these indicators are measured?
- What are the best methods/tools to obtain this information?
- What/who is the source of this information?
- When does this information need to be collected and at what scale?
- How will the information be analysed?
- How will the information be utilised?
- Who is responsible for collecting, analysing, and utilising the information?

These questions can form the column headings in a M&E matrix, which can be a convenient way to develop and record the plan. Table 2 shows a matrix based on these questions. The two completed rows in the matrix give hypothetical (and fairly simple) examples of how a M&E plan might proceed. In practice, as found in workshops to develop M&E plans for the FSP and other projects, it becomes more difficult to develop measurable indicators for less tangible impacts such as 'group self-mobilisation'.

Participatory M&E requires that the development of a M&E plan be itself conducted in a participatory manner. Developing such a plan requires facilitation, using many of the methods and tools described in later sections of this report. It is not simply a question of putting up a blank matrix and asking participants to fill in the cells.

Table 2. Hypothetical example of a monitoring and evaluation matrix for a participatory forages project.

Objectives	M&E questions	Who needs to know?	Indicators	Units	Methods/tools	Sources of information	Timing and scale	How analysed & utilised	Responsible person(s)
Promote adoption of forage plots	What is the extent of adoption?	Farmer groups, development workers, project leaders, donors	Proportion of farmers adopting in each project site	No. of adopters as % of total farmers	Observation and recall, secondary data	Farmer group leaders, village statistics	Six-monthly, for all project areas	% of adopters calculated, recorded on chart, included in half-year report	Farmer group leader, development worker
Promote formation of forage groups	What is the extent of group formation?	Development workers, project leaders, donors	Number of groups per district; proportion of farmers in groups	No. of groups; % of farmers	Observation and recall, secondary data	Development workers	Six-monthly, for all project areas	No. of groups recorded, % of farmers calculated, included in half-year report	Development workers, project leaders
…	…	…	…	…	…	…	…	…	…

For example, to determine the important M&E questions, it may be necessary to form a focus group (or groups) of the key stakeholders and use participatory appraisal techniques to elicit and rank the questions. Then, for a given M&E question, the group could develop a list of potential indicators using flow-charting, and rank these indicators according to agreed criteria, such as those discussed below. The completed matrix is the end-product of these various activities.

The context for many of these M&E activities may be regular farmer, village and project meetings; i.e. they need not be special exercises. As far as possible they should be woven into the normal activities of farmers and project staff.

2.6 What makes a good indicator?

Central to the development of a M&E plan is the identification of appropriate indicators and of procedures to measure them. A good indicator is determined by its usefulness, ease of collection, and the number of stakeholders benefiting from the information it provides. In Figure 3, good indicators are those which fall in the space enclosed by the triangle and the three axes (note that the three dimensions are depicted as increasing towards the 'origin'). The figure implies that there are trade-offs between the three criteria. For example, an indicator which is considered very useful by scientists in the project (such as manure production and composition) might be difficult to measure and of no interest or value to other participants. Compromises will have to be made to ensure appropriate indicators are selected.

Indicators (whether of farm productivity, sustainability, or research capacity) are useful to the extent that they improve farmers' and researchers' state of knowledge (i.e. reduce their uncertainty) and thus improve *decision-making* in such a way as to affect production and resource management. Conversely, indicators which have no bearing on management decisions or outcomes, or which are excessively costly to monitor, are of little value (Pannell and Glenn 2000). The managerial relevance of indicators is related to the question of scale and planning horizon. Short-term indicators at the field or enterprise scale may show negative trends, whereas the activity in question may be contributing to the productivity and sustainability of the whole farm as a management unit (Cramb 1993). Where off-site effects are important, the village or catchment scale may be of more managerial significance (Pachico et al. 1998), assuming of course there is institutional capacity to manage at that scale.

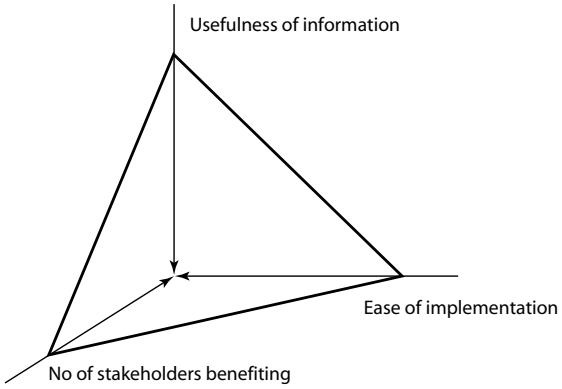


Figure 3. Criteria for monitoring and evaluation indicators.

Estrella and Gaventa (1998) use the acronym SMART to refer to indicators which are:

- specific
- measurable
- action-oriented
- realistic
- time-framed.

For example, a good indicator of the FSP's impact on natural resources in an area of sloping land (such as in the upper parts of Malitbog) may be the number of hectares on which contour hedgerows have been appropriately established, estimated by farmer groups at a given time each year, and collated by the local development worker. This is a specific, measurable indicator; it relates well to the actions undertaken in the project; it is realistic in that it does not take much time to estimate or record, yet we know from research that it is well correlated with reduced soil erosion; and it is time-framed, relating to progress over the preceding 12-month period.

An example of a poor indicator of the impact on natural resources would be improved water quality in rivers downstream from the project area. This is not a very specific or measurable indicator (water quality has many dimensions), nor is it very realistic in that measurement would be time-consuming and costly and would have to be undertaken by others. In any case, changes in downstream water quality will be caused by many factors over a long period

— not just last year's conservation efforts in part of one upstream sub-catchment. Hence this information will be difficult to relate to specific actions undertaken or planned.

In a participatory process, many good ideas for indicators may emerge (e.g. Table 3), but not all should be selected for the M&E plan. It is the role of project leaders and facilitators to help stakeholders agree on a *minimal* set of SMART indicators. In particular, as Pachico et al. (1998) remark, 'indicators need to be theoretically and logically linked, preferably in some causal relationship, with the behaviour of the complex system of interest'. Simply positing a list of indicators, whether or not the list is developed participatively, is unlikely to provide any coherent guide to the desirability of the technological changes taking place. One indicator (e.g. area of forages planted) may be causally related to others (e.g. livestock growth, labour requirements) which in turn affect some larger management objectives (e.g. net farm income, maintenance of resource base). Hence these indicators may be 'intermediate' in two related senses: (1) they reflect changes in intermediate products of the system in question; (2) they give an early indication of outcomes which necessarily take time to emerge. To be useful and credible, therefore, indicators need to be developed within an integrated framework which reflects the structure and dynamics of the management system for which the technology is being developed (e.g. the farm-household system).

Table 3. Possible intermediate indicators for the forages for smallholders project**.**

- **Forage indicators:** area of new forage grown; productivity of forages; contribution of forage towards total feed requirements.
- **Animal indicators:** animal productivity; liveweight gain of small ruminants; girth of cattle; indirect measurements of productivity of large ruminants (sale price, usefulness as draught animal, body condition); reproductive performance; offspring mortality and growth; animal health.
- **Human resource indicators:** labour requirements for land preparation, cutting forages, weeding, herding; labour profile; gender division of labour.
- **Natural resource indicators:** quantity and quality of manure produced; soil fertility; soil structure and biology; weed population; soil erosion.
- **Farm income:** animal sales; manure sales; forage sales; cash flow; net benefits; net present value; intra-household distribution of benefits and costs.

Source: Kerridge and Fujisaka (1998).

Flow-charting is a useful technique for identifying these connections and zeroing in on suitable intermediate indicators. Having developed a flow chart of impacts, a focus group can be asked to rank the impacts in the flow chart in terms of their suitability as indicators. This may require some skilful facilitation. For example, participants could be encouraged to look for impacts which capture or encompass the effects of a sequence of prior impacts (e.g. number and liveweight of cattle in a village might be considered to capture the effect of increased forage area, increased forage production, and changed feeding practices). At the same time, it may be necessary to include combinations of indicators which help to separate out the multiple factors or causes giving rise to an impact. For example, an improvement in the number and liveweight of cattle in a given year may be due to increased availability of planted forages *as well as* increased productivity of natural forages, both of which might be due to a better than average season. A decision would have to be made as to which combination of these variables needs to be monitored in order to assess correctly the effect of new forage technologies — area and yield of planted forages? area and yield of natural forages? rainfall? Participatory techniques could be used to economise on data collection. For example, rather than measuring rainfall directly, farmers could develop a scale for rating seasons; rather than measuring natural and planted forage production, farmers could estimate their relative contribution to livestock feed intake using a matrix scoring technique (e.g. Table 4).

Table 4. Typical matrix scoring of feed sources by farmers in Malitbog.

Feeding system	**Wet season (%)**	**Dry season (%)**
Native pasture (grazing)	**40**	**36**
Improved forages (cut & carry):	**10**	**14**
– *Setaria sphacelata* (Nandi)	1	2
– *Andropogon gayanus*	1	2
– *Panicum maximum* (T-58)	1	2
– *Flemingia macrophylla*	2	3
– *Pennisetum pupureum* (Napier)	2	2
– *Paspalum atratum*	1	1
– *Panicum maximum* (CIAT 6299)	1	1
– *Brachiara brizantha* (CIAT 6780)	1	1

Many of the indicators used to measure productivity effects are simple ratios, e.g. forage yield, livestock growth rate, gross margin per hectare or per head. Yet, taken in isolation, such partial productivity measures may be misleading as indicators of the

overall profitability of an activity (Dillon and Hardaker 1993). For example, a high forage yield may be obtained with expensive fertiliser or excessive use of family labour. There is a need to capture all the benefits and costs of a new technology to assess its impact on economic productivity. Partial budget analysis, if extended to include non-monetary benefits and costs, can do this for a small change in the annual production cycle, such as augmenting feed supply with a small forage plot. The productivity indicator in this case is the net benefit of the change in question. Farm development budgeting extends the same principle to larger and longer term changes, such as investment in an intensive forage management system involving expansion of livestock activities. Here the standard indicator is net present value, derived from the summation of discounted benefits and costs occurring over a specified planning period.

2.7 What methods can be used for monitoring and evaluation?

There are many different methods and tools which can be used in M&E, described in numerous manuals and monographs (Casley and Kumar 1988; Dillon and Hardaker 1993; Fowler 1993; Poate and Daplyn 1993; Dixon et al. 1994; Yin 1994; Bernard 1995; Mikkelsen 1995; Norman et al. 1995). These can help the project's stakeholders to:

- establish and clarify project objectives;
- identify and rank M&E questions;
- develop measurable indicators; and
- obtain and communicate the information needed.

It is not very helpful to label these methods and tools as either 'participatory' or 'conventional'. They are merely techniques which may or may not be used in a participatory way. For example, a community mapping exercise may be used to extract population or land-use information for a national planning agency, with no feedback or immediate benefit to the community concerned. Alternatively, a map may be developed as a community resource, retained in a community meeting room, to help local farmers plan and monitor their own progress in forage and livestock development. Both these uses may have their justification.

It is useful to distinguish between *methods*, that is the overall context or setting in which information is elicited, and *tools*, that is the specific means of eliciting information within that setting (Figure 4). The main methods used in M&E of the FSP have been:

- Focus groups — small groups of farmers sharing a common experience (e.g. farmers in the same location, women farmers, members of a forage work group) who meet together with a facilitator to pool their knowledge and perceptions;
- Farmer case studies — detailed investigation and observation of an individual farm-household system, including all livelihood activities, not only those relating to forages;
- Surveys — systematic elicitation of information from a sample of farmers in a specified region, the sample being obtained by one of a number of methods (e.g. farmers may be randomly selected from a list or those encountered along a transect).

As shown in Figure 4, these methods form a logical sequence – focus groups (or key informants) can provide an overview of farming circumstances in a particular location, case studies can provide an in-depth understanding of the processes underlying these circumstances, and surveys can be used to verify these impressions and assess the range of circumstances existing within and beyond a project area. This is not to say, however, that all three methods are necessary in a M&E process — for many purposes routine reporting by farm leaders and field staff and occasional focus group meetings may suffice.

The main tools used within these methods can be grouped as follows:

- Mapping and diagramming tools (e.g. community maps, time lines, seasonal calendars, flow charts, crop histories)
- Ranking and scoring tools, including techniques for wealth ranking
- Interviews (structured and semi-structured)

These methods and tools can be combined in various ways, depending on the task at hand (Figure 4). For example, mapping is a tool, which can be used in a variety of settings:

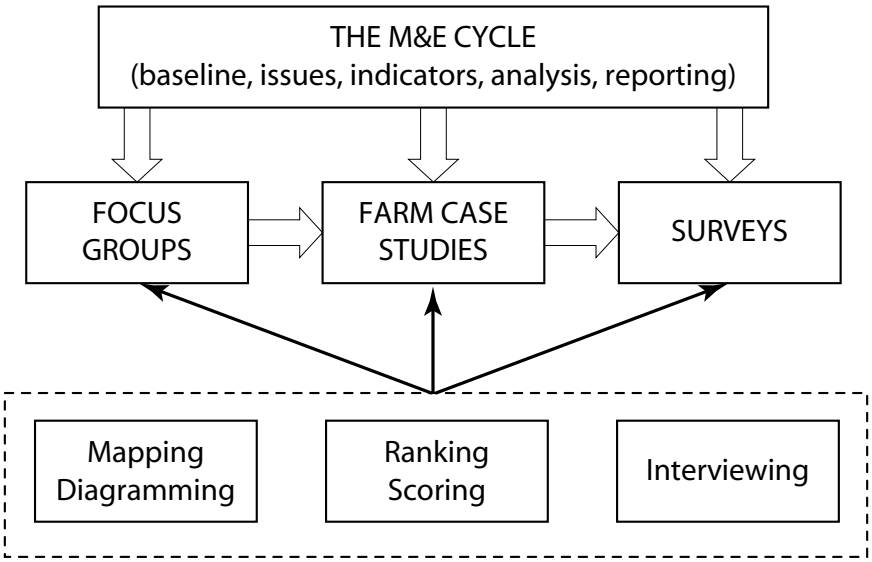


Figure 4. Relationship between methods and techniques for monitoring and evaluation (M&E).

- Mapping can be used in a *focus group* meeting (e.g. a forage farmers' group) to elicit and record information about the location, extent, and species composition of members' forage plots.
- Mapping can also be used in a *case study* to depict the layout of the case study farm and record various attributes of the farm.
- Similarly, asking respondents in a *survey* to draw a simple diagram of their farm layout and to record information about each plot (e.g. area, tenure status, crops grown etc.) can be a more 'user-friendly' and reliable way to obtain this information than simply asking questions and recording answers in a questionnaire table.

Mapping may also be *combined with other tools* in a given setting, say a focus group meeting. For example, having constructed a community map, showing the location of households, farms, and community facilities, a wealth-ranking exercise might be conducted in which participants agree on wealth categories and collectively assign each household to a category, the resultant rank then being recorded on the community map. This could help the group and the project worker to monitor whether certain conservation technologies are only being adopted by better-off farmers or by all farmers uniformly.

2.8 How is monitoring and evaluation information utilised?

The use of each of the methods and tools listed above involves three phases:

- an elicitation phase, in which information and opinions are expressed and recorded; for example, farmers' knowledge about their local landscape is expressed in the form of a community resource map;
- an analysis phase, in which the information is summarised, aggregated, correlated, or otherwise analysed to make it more useful for monitoring and evaluation; for example, the forage plots recorded on the community map may be counted and the number in each sub-village written on the map or in a table or chart, to indicate the extent of forage adoption by location; and
- a utilisation phase, in which the information is communicated to those who need it to make decisions; for example, a local project team may use the information about number of forage plots by location to evaluate the suitability of the forage species being offered to farmers.

Methods vary according to whether these phases

- are conducted at one time (e.g. a single meeting of a farmer group) or at separate times (e.g. analysis and utilisation of the information involves some delay);

- are conducted in one place (e.g. a community meeting place) or several places (e.g. analysis is conducted in the researcher's office and the information communicated to headquarters);
- involve the same people (e.g. farmers and project workers) or several groups (e.g. analysis is conducted by specialist staff and the information is utilised by project managers).

The process of M&E will be more participatory the more the three phases come together. Nevertheless, a given method may serve several purposes at once, e.g. a farmer planning meeting may generate information upon which farmers are able to act but which can also be communicated to project staff at various levels and (if the expertise is on hand) incorporated in a database at the project headquarters. As far as possible, we should be aiming to develop M&E procedures which simultaneously satisfy various stakeholders in this way (see Figure 3).

Regardless of the methods used, or the degree to which they can be considered participatory, the information generated is inevitably woven into a *story* of some sort (e.g. in a written report or when reporting during a project meeting or review). It is the stories we tell which place indicators and other data in context and communicate this information in order to make some point, whether to urge fellow project participants to take corrective action or to persuade donors to continue providing support. *Indicators are the bare bones of M&E; it is the stories which put flesh on these bones and bring them to life*. More explicit and systematic attention in M&E needs to be given to the processes by which stories emerge from participants' experiences and observations (e.g. Davies 1996; Dart 1999).

Hence in the FSP and similar projects it is important not only to report on the various quantitative and qualitative indicators that have been developed and measured. There will be much that occurs which is not captured by these indicators alone. In fact, it is likely that some of the most important outcomes of the FSP will not have been anticipated when setting up the M&E system, or will not be fully reflected in the data that system provides (Cramb 2000). Annual meetings, mid-term reviews, and project workshops should be used to bring out the stories behind the M&E data. To some extent this will happen naturally during the life of a project, but it should be planned for explicitly so that the full richness of various local experiences can be drawn out, shared, and reflected upon. It is in this way that participants can get behind the questions about 'what happened' to an understanding of 'why things happened the way they did'. Our ability to address the larger questions regarding the effectiveness or otherwise of participatory research will depend on this kind of systematic 'story telling'.

3 Mapping and diagramming

Mapping, diagramming, and other visualisation tools can play a valuable role in the whole participatory research process, from problem diagnosis and planning to monitoring and evaluation (Schonhuth and Kievelitz 1994; Pretty et al. 1995; Van Veldhuizen et al. 1997). Some examples of such tools are:

- Maps
- Time lines and historical paths
- Seasonal calendars, daily routines
- Flow and impact diagrams
- Crop and activity histories

Diagramming and visualisation tools allow complex information and processes to be represented in a simple, easily understood format. Their use helps to reverse the conventional roles of development workers and farmers in community meetings and enables both literate and non-literate people to contribute meaningfully to the discussion. These tools not only provide an efficient means of eliciting information but enhance the capacity of farmers to organise and communicate their knowledge, and contribute to the building of a 'collegial' relationship between farmers and researchers.

While these tools are typically used in the context of a focus group, many of them can also be used effectively in farm case studies and household surveys. In deciding which diagramming tool to use, the development worker needs to consider the type of information needed and the specific circumstances of the farmer group.

3.1 Maps

Overview

Maps in this context are hand-drawn representations of key spatial variables in a farming community. They include resource maps (showing land resources, land tenure, land use etc.), social maps (showing residences, community facilities, wealth-rank of households etc.), and farm transects (showing variation in resource characteristics and use along a cross-section of the community landscape).

Resource and social maps are important tools used in identifying, characterising, and classifying farming systems and communities. On a basic level they enable a quick identification of land use patterns and the location of households within the village or community. When combined with tools such as wealth and wellbeing ranking (to be discussed later) they become valuable sources of information for development workers and project staff. When used in such a context, maps enable groups within communities to be identified and stratified (e.g. according to wealth, gender, or ethnicity) and interventions modified to suit particular target groups.

Elicitation

Before starting a mapping exercise in the field it is important for the development worker or team to be fully prepared with materials, to have an agreed understanding of the role each member of the team will play, and to have an appreciation of the context in which the exercise will take place (e.g. regarding what kinds of social or political groupings exist or whether land disputes are an issue).

There are various materials which can be used in mapping exercises, depending on the local situation, availability of materials, and budget. Many practitioners/manuals suggest that local materials (sticks, stones, dirt floor) be used in preference to pens and paper brought in by the development worker. However, an alternative view is that a dirt floor drawing is only temporary, whereas farmers may be quite proud of their achievement and prefer to keep their map in the community for presentation and updating. Whichever method is used will depend on the participants' purpose in constructing the map.

If it is decided to use paper to draw the map then the development worker must bring a large enough sheet (or several sheets stuck together). The size of paper will depend on

- the area of land to be drawn and the level of detail sought,

- the number of farmers expected (so that most can comfortably stand around the sheet of paper and not crowd out others), and
- the area of flat, or reasonably flat, surface on which the drawing will take place.

In practice, most mapping exercises result in farmers reaching the edge of the paper with still more detail to be added. A tip is to start the exercise by detailing the boundaries and moving inwards.

Drawing materials such as pens will depend on local availability and budget. Broad-tip marker pens or whiteboard markers are ideal but usually expensive, while ballpoint pens or pencils leave only faint lines and can easily tear the paper. Whichever option is chosen the development worker or team will need to bring sufficient pens to enable active participation by farmers. In addition, a recurring problem where mapping exercises are being conducted with different groups in the same field site is the gradual reduction in the number of pens over the course of the exercises[1]. Avoid using rulers as these imply a need for precision and exactness and can cause long arguments about whether one farmer's house or field should be 2 centimetres to the left or 3 centimetres to the right.

Before conducting the mapping exercise it is important, first, to arrange a place, time and duration for the meeting with the farmers and, second, to ensure that a broad cross-section of the group or community is represented at the exercise.

At the start of the exercise, explain to the farmers the purpose of the exercise and what they are being asked to do (e.g. to draw a village map showing roads, rivers, residences, and major land uses). However, it is important not to 'over-explain' what is wanted or how the mapping should be done. Rather, allow the farmers to express themselves in their own way. In other words, just get started.

During the exercise the development worker has to balance the requirement of not interfering more than is necessary (it is the farmers' diagram) and ensuring that the symbols of power (pens, stick) are handed around equally. Pay particular attention to those who are reluctant (women, poorer farmers). Be aware of people who dominate and those who are on the margins.

Where households are being indicated on a map it is important to note the potential variability in names and their role as unique identifiers of households. For example, in Vietnam wives do not take on the husband's family name and in Indonesia occasionally only one name is used. Also, sometimes shortened names or nicknames are used and this can lead to confusion in subsequently trying to identify households from the map.

Analysis and utilisation

The analysis of the map depends on the amount of information that has been included by the farmers and the questions of interest to the development worker. Maps can show the location of households, fields, and resources, and the pattern of land-use. This information may require no further analysis — the map may be kept in the community in a prominent place to be used by farmers and development workers for on-going planning and monitoring. Alternatively, if project staff have the necessary skills and resources, the map may be used as input for a geographical information system (GIS) database, permitting the information to be stored, updated and manipulated in a variety of ways.

Combined with other information, notably equity ranking, one use of maps is to stratify households according to their location, resource base, and status (e.g. gender of household head, relative wealth status). This enables farmers and development workers to direct project resources towards specific groups and to monitor the extent to which these target groups are in fact benefiting from the project. Using maps enables such information to be presented in a visual and easily interpreted way.

However, getting farmers to draw their fields or in other ways to identify tenure boundaries may raise ethical questions. For instance, if a farmer claims one plot of land as his or her own, in what context is this claim made? Is the claim recognised as valid by the government or is it an ancestral claim? If one farmer claims the plot viewed by another as theirs, does the map help legitimise the first farmer's claim? Alternatively, mapping can be viewed as the first step towards resolution of such conflicting claims. In sum, the development worker must appreciate the context in which such maps are drawn.

1. At one project site a bag of rubber bands was brought for use in various activities. Over the next few weeks when the team visited individual farmers for case study interviews many farmers were seen wearing rubber bands as bracelets. The rubber bands were also used by children in their games. We never could find out where all the marker pens went!

An example

We arrived at the village at 9 am and went to the house of a local forage adopter who had volunteered to hold the meeting. The actual meeting did not start until 10 am, as the farmers trickled in slowly from their outlying farms. About 20–25 farmers (including husbands and wives) were present, most of whom were involved in growing forages.

After a brief introduction explaining why we were there and the information we wanted from the maps (household location, household name, gender of head of household, what types of livestock they had, and whether they grew forages) the farmers started to draw their village. The exercise started off slowly with much discussion about the boundaries of the village and what should be included on the map and what shouldn't.

After about ten minutes of discussion and when pen had just been put to paper there was a late arrival — the datu (traditional headman) and his wife. He strode into the area under the house where we were all gathered, asked what the task was, and was told that 'we are mapping' or words to that effect. This was enough explanation for him, in contrast to the others who had needed quite a long time to discuss the matter. Taking the marker pen from the hand of the male farmer who had just started drawing the road (and seemingly oblivious to the five spare marker pens on the table waiting to be used) the datu immediately started sketching the village map. From his arrival outside the house to commencement of sketching took less than ten seconds.

The datu had complete control and was the only one actually drawing anything on the map. It took a great deal of effort to get a few other people to contribute, at least verbally, to the map's construction. Towards the end of the mapping exercise, which took about two hours, there were five to seven people at any one time making a contribution to the drawing — naming the households and providing information about them.

After the map was constructed we wanted to identify different groups within the village according to wealth status and wellbeing. The translator was explaining to the farmers that we wanted them to rank the households into three categories, upper (ta'as), middle (centro) and lower (ubos). The datu, who spoke English, wanted a personal explanation on the side, which was duly given. The datu objected to ranking everyone into three groups, saying 'we are all ubos here'. It was suggested that he knew there were some farmers in the community who were more ubos than him and some who were more ta'as than him. What was wanted was a relative ranking of people, not an absolute one, and that even though everyone was poor he could look around the community and see that there were differences between people.

This explanation appeared to satisfy him and the farmers proceeded to classify the households in the village. At the end of the ranking the datu was asked how he had been classified. He said that he had been classified as centro. When asked why, since he was a datu (and obviously regarded highly in the village), he said that he was only centro despite being a datu because he was poor.

One of the difficulties we initially had with the mapping exercises was getting an accurate picture of the wealth ranking, as invariably only 3–4 people decided the ranking for a particular sub-area in the village. Eventually we tried a system where one person read out the names of the households one at a time and everyone to give a ranking by 'open outcry'. This was very successful, and enjoyed by everyone, as people shouted out what they thought each other should be. This helped defuse the occasional tension, as people objected to being classed in certain categories — especially if they were classed as ta'as.

After the ranking of the households, we then elicited their criteria for ranking, asking them the reasons why they classified people as being ta'as, centro, or ubos.

The map shown in Figure 5a was drawn by members of the forage group at Sitio Kaluluwayan in Barangay San Luis, Malitbog, Philippines. The information was then entered into a GIS database enabling it to be reproduced as shown in Figure 5b.

3.2 Time lines

Overview

Time lines and historical pathways are powerful tools to condense and present complex information about important changes in a farming community or environment. They visually present a sequence of key events and trends in key variables which, taken together, help to account for the current farming

conditions. Local knowledge about long-term processes and interactions is pooled and made explicit for immediate analysis and decision-making.

Elicitation

Time lines are usually completed in the context of a focus group discussion or case study interview. In a group discussion the use of a large sheet of paper and marker pens to sketch out the process is a valuable aid to enable all participants to view the time line and make comments. Such a process could also be done on the ground using locally available materials such as sticks and stones to mark important events.

It is important not to insist on consensus regarding the timing and circumstances of major events but to accept divergent views and probe for the reasons behind them. Different people have different perceptions of the same event and each point of view has its own validity. Often interesting insights can be derived from a divergence of views.

In any case, the time line or historical path must have a story attached to it to make it meaningful, hence a member of the team needs to be assigned to make notes of the discussion surrounding the construction of each part of the diagram.

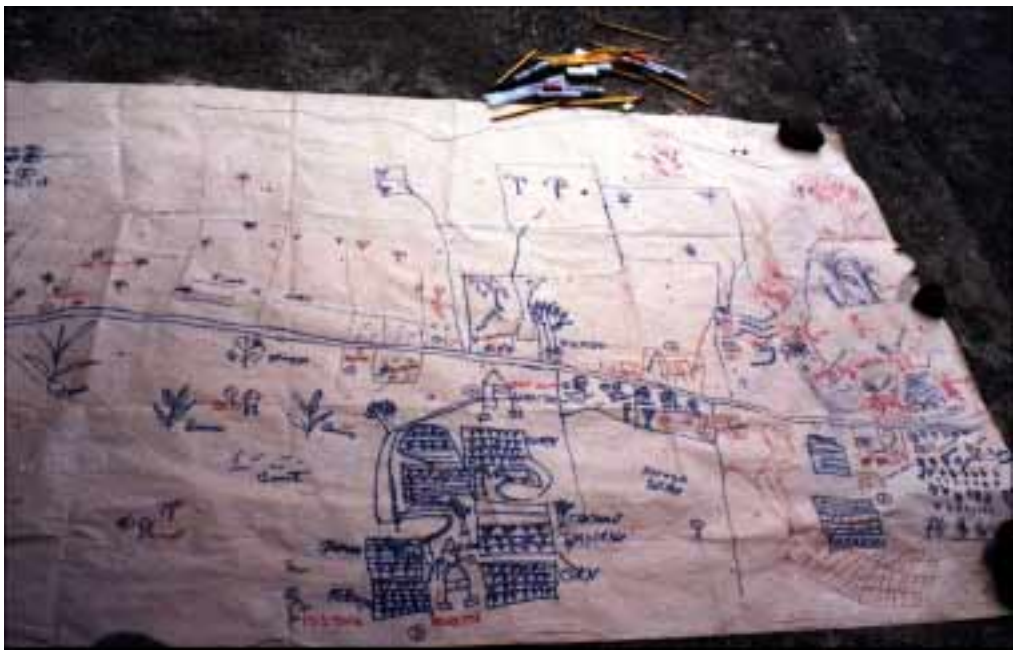
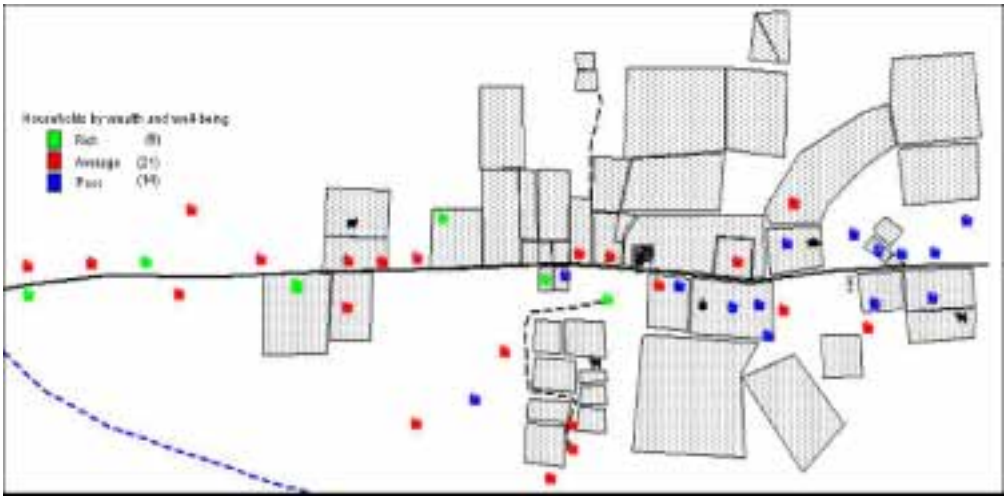


Figure 5a. Output of community resource mapping at Sitio Kaluluwayan, Malitbog.



.**Figure 5b.** Geographical information system version of community map for Sitio Kaluluwayan showing wealth rankings.

Analysis and utilisation

There is no need for further analysis of a time line or historical path. The diagram itself summarises a complex process of change and enables farmers, project staff and others to understand the context in which change has occurred and to appreciate the range of different factors that have given rise to the current situation. However, as indicated above, a narrative version of the time line may be a useful adjunct, particularly for those not present when the time line was constructed.

An example

The time line in Figure 6 depicts the spread and adoption of forages in Malitbog. Unless otherwise stated, forage species planted at new sites came from FSP seed stocks and/or planting material from the Sitio Kaluluwayan multiplication plots.

The initial demonstration/multiplication plot was established in 1995 in Sitio Kaluluwayan, Barangay San Luis. After a year of growing forages in the demonstration plot, farmers within Kaluluwayan began to experiment on their own land and expand their areas of forage plots from 1996 through 1999.

In 1996, an attempt was made by the local extension officer to expand demonstration plots to nearby Barangay Kalingking. The establishment of a forage group and demonstration plot was successful but due to some problems within the group the forage group disbanded and the demonstration plot was no longer maintained. After several years of inactivity the arrival in Kalingking of the M&E team in mid-1999 prompted renewed interest in forage technologies and the establishment of a new forage group.

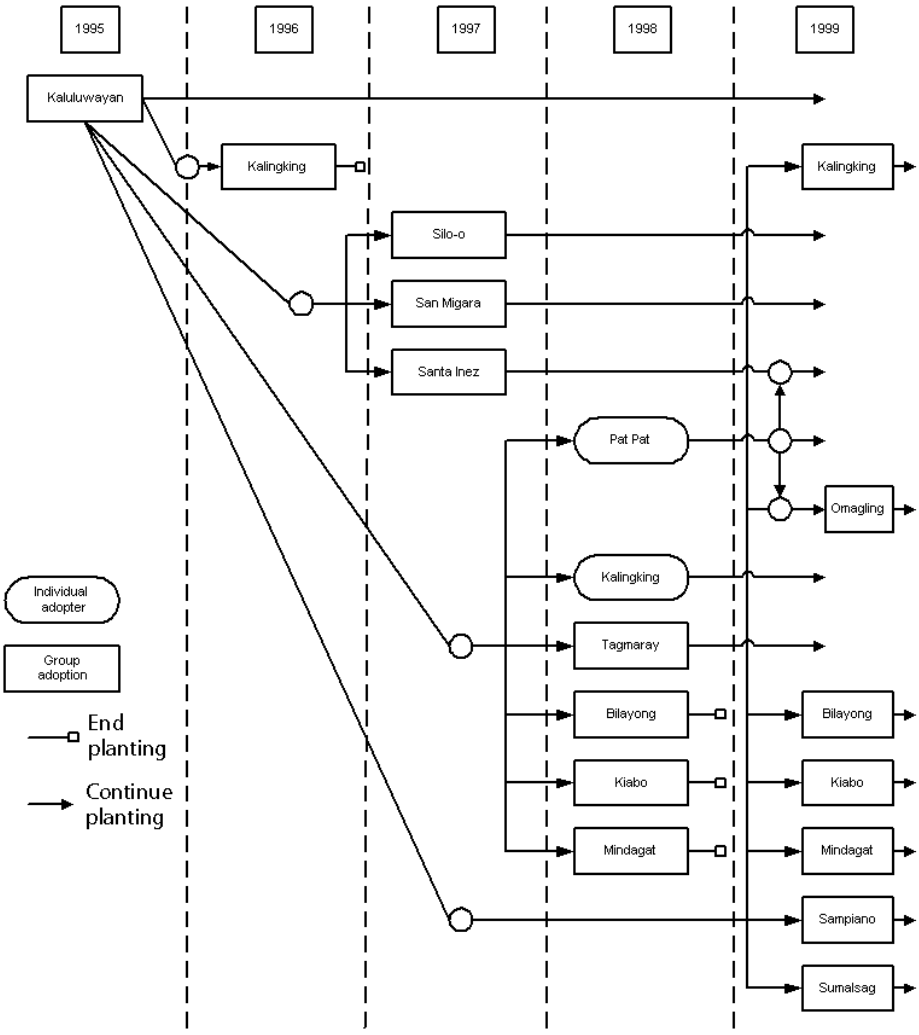


Figure 6. Time line for adoption of forages in Malitbog.

In 1997, demonstration and multiplication plots were established in three new areas: Barangays Silo-o and Santa Inez and Sitio San Migara, Barangay San Luis. All three of these establishments were successful and farmers in these areas moved from demonstration plots to growing and expanding forages in their own farm over subsequent years.

Following the expansion of forages in 1997, in 1998 four new groups were established in Barangays Kiabo and Mindagat and Sitios Tagmary, Barangay San Luis, and Bilayong, Barangay Problacion. In addition, two individual farmers, one in Barangay Pat-Pat and the other, a former forage group member from Kalingking, decided to establish and expand forages on their own farm plots in the absence of any concerted group effort in those locations. Both of these farmers, acting as individuals rather than in a group, continued expanding forage production through 1998 and into 1999. At the Tagmaray site farmers established and expanded forages on their own farm plots but the story was different for the forage groups at Bilayong, Kiabo and Mindagat. A motorbike accident in late 1998 meant that the local development worker was unable to visit and support forage activities at these three sites. The subsequent abandonment of the demonstration and multiplication plots demonstrates the fragility of the adoption process at crucial moments in time. The resumption of extension activities in 1999 led to a resurgence of interest at these sites and the recommencement of forage activities.

With the resumption of extension activities in 1999 another three forage groups were started: Barangays Sampiano and Sumalsag and Sitio Omagling, Barangay Kalingking. Apart from seed stocks provided by the FSP and planting material from Kaluluwayan, the farmer at Pat-Pat provided planting material for the establishment of a demonstration and multiplication plot at Sitio Omagling and for some farmers from Barangay Santa Inez who were expanding their forage plots. It became necessary to obtain planting material from Pat-Pat for the establishment of forages in Omagling after the initial planting of seeds was washed away by heavy rain.

3.3 Seasonal calendars and daily routines

Overview

Seasonal calendars provide an outline of the timing of critical events in the annual cropping cycle as well as other seasonal events and circumstances that impinge on farming activities (e.g. timing of onset of rains, periods when roads are impassable etc.). A seasonal calendar is a good tool to use in describing how farmers use their household labour resources for various activities, giving an immediate appreciation for periods of labour surplus and deficit without resorting to time-consuming and expensive work diaries. Similarly, a description of daily routines can be used to make a quick assessment of how time is spent at different times of the year and between different household members.

Elicitation

Seasonal calendars can be constructed either as a group exercise or on an individual basis. A calendar matrix is drawn up either on the ground or on a large sheet of paper (Table 5). If several farmers are going to be asked to develop a calendar, either as case studies or as part of a survey, then covering the matrix with plastic and using water-based markers is one way of preserving the matrix. The number of columns (time periods or seasons) needs to be decided first. This depends on the development workers' assessment of the degree of detail needed and the ability of the farmers accurately to partition their labour between blocks of time.

Table 5. A seasonal calendar matrix.

Activity	Jan–Feb	Mar–Apr	May–Jun	Jul–Aug	Sep–Oct	Nov–Dec
Activity 1						
...						
…						
Activity X						

Local concepts and definitions of time need to be taken into account. For example, in the Philippines we had arranged the labour-use schedule for household activities into two-monthly blocks — Jan–Feb … Nov–Dec. When we started constructing a similar labour schedule with farmers in Vietnam, the translator wrote down the months as 1–2 …11–12. We asked if 1–2 meant Jan–Feb, to confirm that we were dealing with a calendar year rather than starting from harvest or planting time. However, the translator indicated that 1–2

represented Feb–March — as the Vietnamese follow a lunar calendar, not a solar calendar.

The number and type of activities carried out by the household needs to be elicited by probing questions. Usually the farmer will only mention the most important activities and it may be necessary for the development worker to continue to ask what other activities are undertaken by the household. Care must also be taken to elicit activities undertaken by other members of the household, not just the person being interviewed. This is especially so for activities undertaken by women, children, and older family members.

Stones or seeds can be used for counters. (Maize seeds, which are flat, work quite well, but mung-bean seeds, which are round and roll off, do not.) The farmer allocates a fixed number of counters between the activities and over time. This allocation should be done simultaneously (that is, over both activities and time). The number of counters can vary between farmers and will depend on the number of activities undertaken by the household. The general principle is that the number of counters should be just sufficient for the farmer to distinguish between each cell of the matrix. As a rough guide, between 50 to 100 stones or seeds should be used.

After the farmer has finished weighting, the facilitator reviews the results with the farmer. Using pair-wise comparisons between the cells, the farmer is asked to verify that the relative weightings are correct.

Analysis and utilisation

The analysis of seasonal calendars depends on what is required and the level of expertise of the analyst. The farmer and development worker can use the calendar to identify periods of surplus and constrained labour and to work out a budget of seasonal labour requirements compared with availability. In periods of labour constraint the farmer and development worker can determine to what extent outside labour can be hired to make good the shortfall or what farming activities can be changed to reduce labour requirements, for example, using early or late maturing varieties of crops to spread out labour requirements for harvesting or using herbicides to reduce labour for weeding. In addition, the calendar can identify potential ‘slack’ periods in which the farm household can undertake additional income generating projects. Care must be taken to elicit the reasons for such ‘slack’ periods.

On a more advanced level, project staff can utilise statistical analysis to identify commonalities and differences between different types of farm household. Multivariate analysis of variance (MANOVA), using each household as a repeated measure within blocks of household types, is one such method. Before embarking on such analysis project staff would need to consult a statistician. (For example, the matrix weighting results in a relative weighting with a grand total equal to 100% for each respondent, hence there is no total variation between respondents, only within respondents’ activities. This means that a standard ANOVA/ MANOVA analysis will not be correct.)

An example

This example is from a female smallholder farmer in the Philippines (Figure 7). The farmer grows bananas (saging), maize, taro (gabi), sweet potato (camote), summer squashes and cattle (baka). At first glance you can see that the farmer spends most of her time tending her banana crop. Her periods of high labour demand are between July to October when she also plants and harvests maize and plants sweet potato. During the early part of the year she grows squash which is in rotation with her maize crop. Her one cow places a constant and relatively heavy demand for labour on herself and there is probably a place for labour-reducing, cut-and-carry forages in her feeding system.

3.4 Flow and impact diagrams

Overview

Flow and impact diagrams are a way of visually identifying what are often complex linkages and interactions in a farming system or development process. Such diagrams are a useful tool for discussing with farmers the problems they face, the causes and consequences of those problems, and possible entry points or solutions. They also provide a basis for tracing the actual or expected impacts of a particular change or development program.

Elicitation

The flow and impact diagram is developed by a farmer or group of farmers with facilitation by the development worker. The diagram can either be drawn on the ground or on a large sheet of paper with marker pens, depending on availability of materials.

Figure 7. Seasonal calendar for a farmer in Malitbog.

If analysing the interactions in a farming system, the components of the farming system under examination first need to be identified (e.g. the various cropping and livestock activities). Then the linkages and flows between the different components can be shown on the diagram. If undertaking a problem diagnosis, the first step is simply to elicit the problems seen by farmers, with each problem being written on a separate card. Then the cards can be arranged on the sheet of paper with arrows showing how problems are related in a causal manner. A similar approach can be used in identifying the flow of impacts from a particular intervention, such as the introduction of forage plots to the farming system. Throughout, the development worker must ask probing questions to elicit farmers' perceptions of underlying causes and ultimate consequences. It is important to elicit negative as well as positive effects in order to identify problems and their potential solutions.

Analysis and utilisation

As a first step the diagrams serve as a basis for discussion among farmers, and between farmers, the development worker and project staff in identifying key linkages, underlying problems, points of intervention, and impacts, positive and negative. The diagrams can be combined with ranking and weighting (see below) to prioritise linkages and problems and to identify key variables which should be monitored. The developed diagrams can be kept and used by farmers and development workers to monitor changes in farming and livelihood systems.

Flow and impact diagrams capture a farming system or program impact at a particular time (even though elicited impacts may be seen by stakeholders as potential or future impacts). Perceptions of impact change over time as farmers and others become more experienced with the changes occurring in the farming system. Thus the development worker needs periodically to revisit the diagrams with the farmers in order to update them. Typically this means an elaboration of the linkages and flows initially identified.

An example

The following example is taken from a livestock system problem diagnosis conducted in M'Drak, Vietnam. The diagnosis was conducted with each of the six villages in the commune in community focus groups. The group size ranged from 30–60 farmers depending on the village size[2]. The entire exercise took about 10–15 minutes for each village including the ranking exercise. With the help of the development worker asking probing questions, the farmers developed a flowchart of livestock

2. This was approximately a 90% attendance rate, possibly due to the monetary incentives to attend

problems and showed how the problems were interrelated (Figure 8). For example, a lack of capital meant that adequate shelter for their livestock could not be built and, combined with bad weather during the wet season, this led to animals getting sick, resulting in poor growth in liveweight. In summary, farmers came up with the following problems with their livestock system:

- Lack of capital
- Climate
- Draught power is poor
- Feed availability
  - Dry season
  - Wet season
- Feed quality
  - Dry season
- Genetics and breeding
- Poor grass species
- Lack of grazing land
- Slow liveweight gain
- Animal health
- Animal housing
- Labour availability
- Poor management knowledge
- Low reproduction
- Thin animals
- Lack of supplements
- Ticks
- Lack of veterinary supplies
- Lack of drinking water

After the diagnosis was carried out, the sheet with the flowchart was placed on a table and farmers were handed out a set of cards numbered 1 to 10. They were asked to place the cards in order of importance on each of the problems and the results were then collated and analysed (Figure 9).

The results showed no significant variation between villages. Farmers saw capital constraints as the major problem for livestock production. Feed

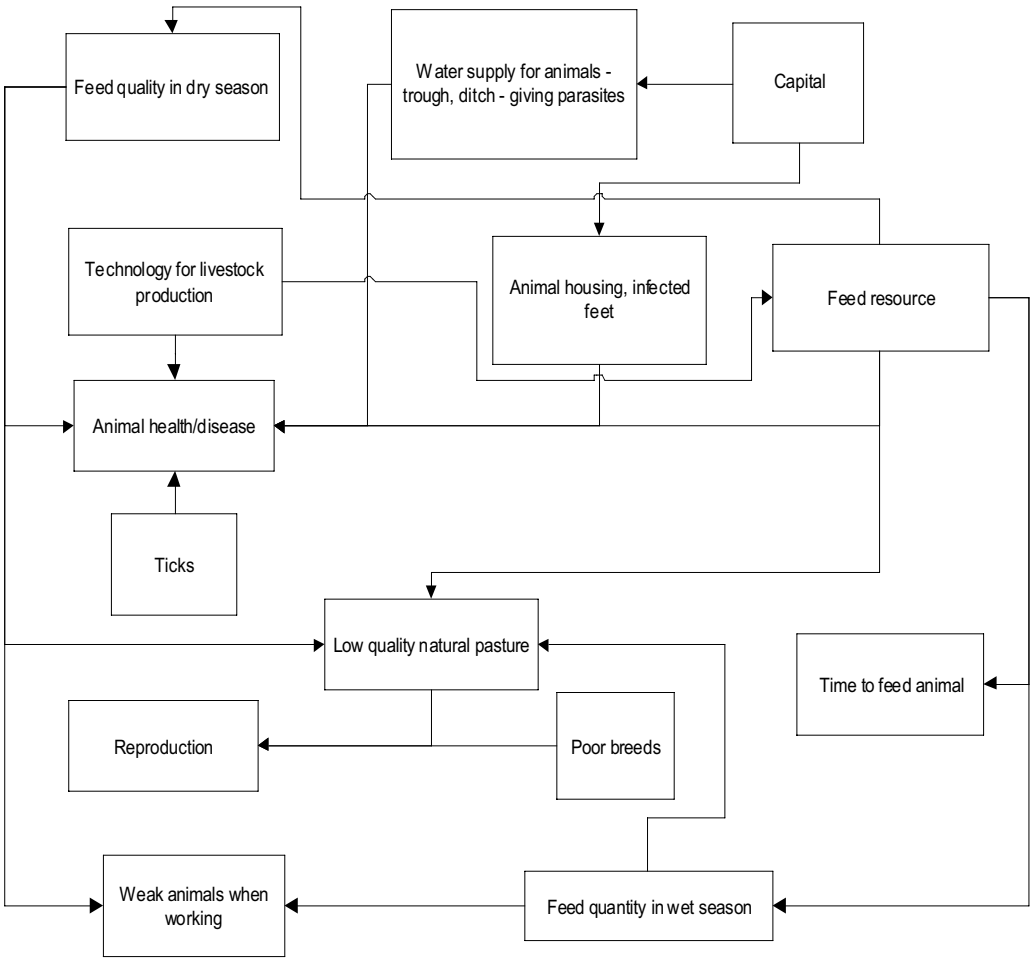


Figure 8. Farmers' flowchart of livestock problems in M'Drak, Vietnam.

constraints and housing were seen as the second most important problems, with feed availability and quality in both the wet and dry seasons seen as major constraints to animal productivity.

3.5 Crop and activity histories

Overview

Crop and activity histories use a diagram to elicit the sequence and timing of operations within a given cropping period as well as the sequence and timing of crops in a long-term rotation. They can be used to establish the actual land-use dynamics on a farm and as a basis for land-use planning.

Elicitation

Crop histories are easier to derive on a plot-by-plot basis. Hence development workers might like to compile them in conjunction with farm maps detailing the location and characteristics individual plots within the farm boundaries. Most farmers can remember plot histories reaching back four or five years but individual circumstances must be taken into account when deciding how far back the plot history should go.

The history is constructed by dividing the crop year into appropriate seasons and then developing the cropping sequence showing the crops grown, their order in rotation, and the period of time each occupies the plot of land. As a first step, major milestones should be sketched out for each plot — i.e. the planting and harvesting of each crop in rotation – before the detail is filled in (fallow, land preparation, weeding, fertilising etc.).

Incorporation of intercropping and mixed crops into the farm plan complicates the crop history. Intercropping with perennial crops such as fruit trees, coconuts, or bananas allows cash or subsistence crops to be grown in the establishment phase of the perennials. However, as the canopy closes, the area available for intercropping reduces as well as the potential yield. Constant modification of land area and crop yields under intercropping needs to be incorporated into the crop history. Mixed crops cannot realistically be treated as two separate crops for planning purposes; rather a new ‘mixed crop’ activity should be defined and operations for this combined activity specified.

Analysis and utilisation

Crop and activity histories, once elicited, require no further analysis as such (other than collation and comparison across project sites). Apart from using the crop and activity histories to gain an appreciation of the farming system and land use patterns in the project area, crop histories can be used by the farmer and development worker to plan sustainable land use. Crop histories can help establish whether the actual or proposed land-use pattern is consistent with the land resources

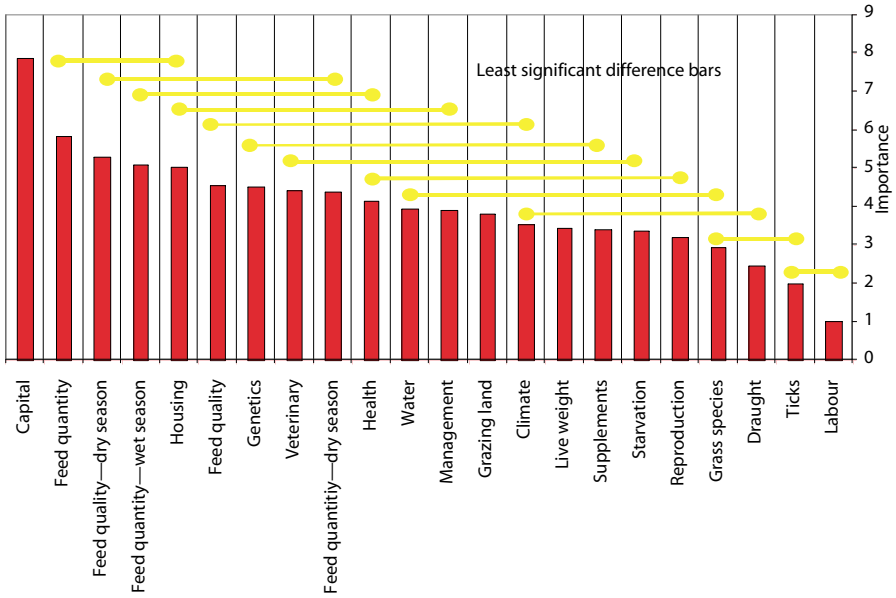


Figure 9. Analysis of farmers’ ranking of livestock problems in M’Drak, Vietnam.

available and the long-term sustainability of the farm plot (fertility, disease, pests, soil structure). Crop rotations and intercropping are important factors in maintaining or depleting soil fertility and so a land-use plan must take into consideration the incorporation of legumes, pasture or fallow. Any land-use plan involves establishing the areas of each crop to be planted each year, the planting dates and durations of these crops, and the sequence in which these crops are to be grown.

An example

The following example comes from a smallholder farmer in Maltibog, Philippines (Figure 10). The farmer has 2 ha of land divided into three plots — 1 ha of lowland rice, 0.5 ha of maize/tomatoes in rotation, and 0.5 ha of sweet potato/vegetables in rotation.

	Jan–Feb	Mar–Apr	May–Jun	Jul–Aug	Sep–Oct	Nov–Dec
1995	Kahoy (trees for firewood, otherwise vacant)					
		Tomatoes		Maize		Tomatoes
		Sweet potato			Vegetables	
1996						
		Maize		Tomatoes		Maize
		Sweet potato			Vegetables	
1997		Rice				
		Tomatoes		Maize		Tomatoes
		Sweet potato			Vegetables	
1998		Vacant				
		Maize		Tomatoes		Maize
		Sweet potato			Vegetables	
1999				Rice		
		Tomatoes		Maize		
		Sweet potato			Vegetables	

Figure 10. Crop history for farmer in Malitbog, Philippines.

4 Ranking and scoring

Preference ranking and matrix scoring are tools that are used primarily to explore people's perceptions, elicit criteria, and understand their choices and decision-making. They enable development workers and project staff to obtain information on farmers' preferences, priorities, and criteria for evaluating changes to their farming system. These tools can be also used to obtain qualitative information about resource use or income which would otherwise have been collected using more conventional, data-intensive means – for example, data on labour use for different activities can be collected either by asking the farmer to record or recall the number of hours or days spent on each activity, or by asking him or her to allocate weights (e.g. seeds) to each activity to reflect labour use. Ranking and scoring tools also provide a means of assessing relative wealth and wellbeing.

Preference ranking and matrix scoring have distinct advantages over more conventional data collection techniques when used in a participatory framework. Compared with verbal responses to interviewer questions, these physical activities, carried out by the farmers themselves, shift attention away from the traditional roles of 'outside' interviewers and 'local' respondents towards the activity itself. Since the activity does not rely on quantitative data which may be sensitive (especially in the case of income derived from farming activities), this defuses the situation and allows people to express their perceptions. In addition, the discussion associated with ranking and matrix scoring results in deeper understanding of the farming system.

Four basic types of ranking and scoring tools are considered here:

- Preference ranking
- Pairwise ranking
- Matrix scoring
- Wealth ranking and wellbeing analysis

4.1 Preference ranking

Overview

Preference ranking is simply a tool by which farmers can indicate the relative importance they attach to an array of items. It can be used to identify, list and prioritise problems and possible solutions to problems. As a tool it helps development workers and project staff understand farmers' criteria and decision-making. Preference ranking has been used to identify desired characteristics of new and existing technologies and to establish criteria for evaluating results of experiments and programs. When carried out with a range of farmers it can be used to compare the priorities of different groups (men and women, young and old, rich and poor).

Elicitation

The process of preference ranking is relatively simple but needs a skilled and experienced development worker to implement it properly. While the actual preference ranking itself takes a short time, there is substantial time involved in preparation of the ranking cards and in the subsequent analysis.

First the question of interest needs to be identified. This should be a single, well-defined topic so that only criteria relevant to that topic are obtained. Second, the identification of options or criteria by the farmer or group under investigation needs to be carried out. How this is done depends on the specific situation — preferences can either be elicited individually within a semi-structured interview or within a focus group. For purposes of illustration the following discussion concentrates on the focus group method.

Within the focus group, the participants are asked a question relating to the topic of interest — for example, '*What are the problems you are having with your livestock?'* As participants detail their problems (or criteria, or impacts etc.) these can be written on cards and the cards stuck to a wall or on a large sheet of paper, perhaps as a flowchart showing the linkages between problems (see section on Flow and Impact Diagrams above). Whichever way is chosen, it is important to ensure that all participants

get an opportunity to express their opinions and that the views of women and other groups are represented.

The number of items elicited will depend on the situation and the topic, but as a general rule-of-thumb the development worker should be aiming to get 10–15 different items. People have difficulty in ranking too many items, so they should be grouped into larger categories if there are too many.

Once the items have been elicited they can be ranked in order of preference. The flowchart or card-and-chart is placed on the ground and the participants place ranking cards on each item in order of importance. Strips of detachable ranking cards need to be prepared by the workshop facilitator before the exercise (Figure 11). These strips are numbered 1–10 and may contain a unique identifying number underneath. This identifying number is used in advanced forms of analysis to keep individual responses together without actually identifying people. This must be emphasised to the participants, particularly for topics of a sensitive nature. One reason why the development worker may wish to keep individual responses together is that demographic and resource data collected at another time can be used to identify groupings of participants who are more likely to have particular preference rankings. For example, the participants in a workshop may be asked to fill in a short questionnaire anonymously at the beginning of the workshop and to write their ranking cards' unique identifying number on that questionnaire.

Figure 11. A strip of detachable ranking cards.

1 42	2 42	3 42	4 42	5 42	6 42	7 42	8 42	9 42	10 42

Workshop facilitators need to ensure that farmers understand what weighting system is being used, that is, whether '1' or '10' signifies the highest preference. When using ranking cards it is important to remember that a '6' and a '9' look identical upside down. This problem can be solved by placing a line under the numbers '6' and '9'.

Once all the ranking cards have been placed on the sheet where the problems (or other items) have been recorded, the ranking cards are collated for each item and analysed.

Analysis and utilisation

The analysis of the preference ranking can be done in various ways. A simple analysis can be done immediately, to get feedback from the participants, or later by the development worker. More complex analysis can be done by project staff with access to computers.

An immediate analysis only takes a few minutes and enables validation and discussion with the workshop participants. The responses for each item can be grouped into High (scores 1–3), Medium (scores 4–6), and Low (scores 7–10) and the frequency of each response counted. It is important to account for the non-responses (when there are more items than ranking cards) by ensuring that the total responses for each item add up to the total number of participants. The non-responses are included in the 'Low' category. For example, in a group of 14 farmers the problem 'pasture farm from house' was ranked as shown in Figure 12, with two non-responses included in the category 'Low'.

Pasture far from house

High	Medium	Low	Total
7	3	2 (+2) = 4	14

Figure 12. Example of grouping of rankings into high, medium and low.

The resultant ranking can be checked with the participants to see if it meets with their expectations, and then discussed. The discussion could focus on why particular problems are considered more important than others and what solutions can be identified.

The development worker can carry out a more detailed analysis later by constructing bar charts of the frequencies and ranking the items in order of high–medium–low importance. Combined with a comparative display of ranking from different groups of participants, this display of results enables the development worker and project staff readily to identify which criteria are important for particular groups of farmers.

Project staff can carry out a more advanced level of analysis with access to computers and basic statistical programs. (As an example, Luis Hernández Romero at CIAT has developed a preference ranking software program for Excel

spreadsheets based on logistic regression. A more general functional form such as the generalised linear model (GLM) Procedure in SAS can also be used.) By combining the ranking responses with demographic and other data, project staff can identify groups with particular preferences.

An example

The following example is taken from a forage adoption impact assessment exercise carried out with smallholder farmers in M'Drak, Vietnam. The workshops were conducted with each of six villages in the commune in community focus groups, which ranged from 30–60 farmers depending on village size. The impact elicitation and ranking exercise took about 10 minutes.

A typical exercise in one of the focus groups started with a discussion about how planting forages led to farmers 'being happy'. As the farmers came up with a list of actual and potential immediate, intermediate and long-term impacts, these were written up on a large sheet of paper with arrows linking impacts that had a cause and effect (Figure 13). Questions such as 'How does this make you happy?' or 'What follows on from this impact?' prompted farmers to think about how each problem was related to the others.

In all, the workshop participants identified 24 different impacts that forages had or were expected to have on their farming system (Table 6). After the impacts had been written down the farmers were each given a set of ranking cards and were asked to rank the impacts according to importance (Figure 14).

Table 6. Forage impacts identified by farmers in M'Drak, Vietnam.

Profit	Poor species	Selling livestock
Livestock numbers	Soil fertility	Labour saving
Control weeds	Crop yield	Safety
Feed	Manure	Men's labour saving
Feed quality	Draught power	Women's labour saving
Feed quantity	Health	Time for other activities
Feed different livestock types	Wind break	Cropping
Erosion control	Fattens animals	Reproduction

After the ranking exercise, the cards were collated and taken away for analysis. A generalised linear model (GLM) was estimated. The results, summarised in Figure 15, showed that the ability of forages to provide good quality feed and to fatten different types of animal was considered to be the most important impact. At the other end of the scale, the potential of forages to increase the sale price of livestock or the reduction in adult male

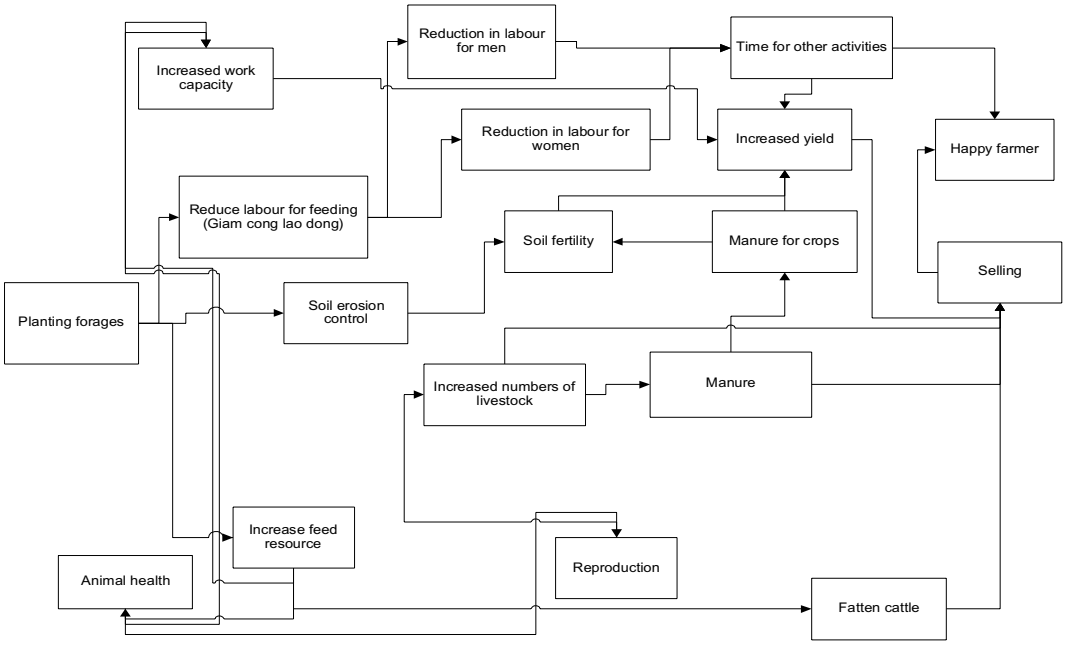


Figure 13. Farmers' analysis of forage impacts, M'Drak, Vietnam.

labour in the household were considered not important (or not achievable).

Figure 14. Farmers ranking forage impacts, M'Drak, Vietnam.

4.2 Pairwise ranking

Overview

Pairwise ranking is similar to preference ranking in that people are asked to choose between items. The difference is that in pairwise ranking the items are presented as paired comparisons, rather than ranking all items simultaneously. The advantage in conducting pairwise ranking compared with complete preference ranking is that people are forced to make a very careful decision between the items. In preference ranking there is a real danger that people may become overwhelmed with the number of items and will not make a carefully considered choice.

Elicitation

As with preference ranking, the topic to be discussed needs to be identified beforehand. The participant or participants are asked to choose a number of items or options to rank. Whereas the preference-ranking tool is ideal for collecting information rapidly from large groups of people, the pair-wise ranking tool is more suited to individual interviews or small groups of people. A matrix is drawn up with the items written along two sides, as shown in Table 7 for a set of six criteria for a good forage species.

The participant is then asked for each pair which alternative they prefer. It is important for the development worker to probe the informant to find out why the choices were made — '*Why is A better than B?'* and '*Why is B worse than A?'*.

Analysis and utilisation

The analysis of pairwise ranking involves counting up the number of times each item is chosen as the preferred option in order to arrive at an overall ranking of all the items considered. The item with

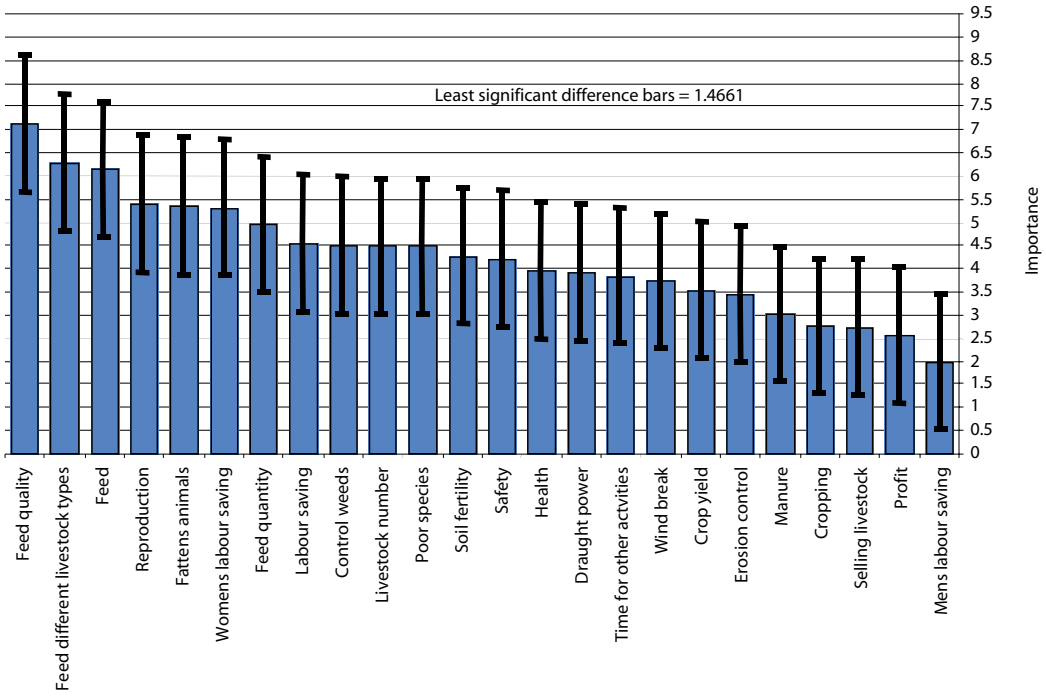


Figure 15. Statistical analysis of farmers' ranking of forage impacts, M'Drak, Vietnam

the highest numerical score is ranked highest, that with the second highest frequency is ranked second, and so on. The data collected from multiple informants can then be pooled and analysed in the same way as for the preference ranking tool.

The reason why an informant made a choice is often just as important as the choice itself. Much can be learned about farmers' perceptions and decision-making behaviour by asking why items are ranked in a particular way. The ensuing discussion can be enlightening for both development workers and the farmers themselves. These reasons or explanations should also be included in the tables reporting the ranking exercise.

An example

This example is taken from a participatory breeding evaluation of tropical forage species conducted with a group of smallholder farmers in Malitbog. Farmers were asked to list the species of forages they were growing, rank them via pairwise comparisons, and detail some positive or negative characteristics about each species. Table 8 shows the results. The forage species grown are listed down and across the matrix, thus each cell shows the preferred species resulting from a particular pairwise comparison. The third bottom row showing the overall rank of each species is derived from a simple count of the number of times a species is listed as 'preferred' in the body of the matrix. For example, *Panicum maximum* 'Si Muang' (TD58; Tanzania), identified in the table as TD58, wins every pairwise comparison and is thus ranked first. The last two rows show the positive and negative characteristics mentioned by the farmers.

4.3 Matrix scoring and weighting

Overview

Matrix scoring and weighting techniques have advantages over preference ranking in that not only the rank or order of preferences is obtained but also a measure of the strength of preference, i.e. 'how much more' one item is preferred over another. Not only can matrix scoring and weighting show the magnitude of differences between a set of preferences but the technique also enables the identification of criteria and of the trade-offs involved in choosing between alternatives.

Elicitation

The basic procedures involved in matrix scoring are the same as for constructing seasonal calendars, described in Section 3.3, except that here, instead of weighting activities over time, the aim of the exercise is to weight activities (or some other dimension) according to one or more criterion or objective, such as household cash income and subsistence income (or income in kind). For example, in the matrix shown in Table 9, the farm

Table 7. Matrix of criteria for a good forage species.

Still green in dry season						
Cattle like to eat leaves						
Good in poor soils						
Stops soil erosion						
Goats like it						
Easy to cut						
	Still green in dry season	Cattle like to eat leaves	Good in poor soils	Stops soil erosion	Goats like it	Easy to cut

household's activities are listed as column headings, and the rows record different criteria (such as type of income). The cells in the matrix can then be used to indicate the relative importance of each activity in terms of the criteria listed.

The number and type of activities and criteria need to be elicited by probing questions. Usually the farmer will only mention the most important activities or criteria and it may be necessary to continue to ask what other activities or criteria the farmer uses. Care must be taken to elicit activities and criteria of other members of the household, not just the person being interviewed. This is especially so for activities undertaken by women, children, and older family members.

The matrix is constructed either as a group exercise or on an individual basis. The matrix can be constructed either on the ground or on a sheet of paper. If several farmers are going to be asked in turn to develop a matrix, either as case studies or as part of a survey, then covering the matrix with plastic and using water-based markers is one way of preserving the underlying matrix.

Table 8. Farmers' pairwise ranking of forage species, Malitbog, Philippines.

Panicum maximum 'Tobiata' (CIAT 6299) – **6299**								
Panicum maximum 'Si Muang' (TD58; Tanzania) – **TD58**	TD58							
Brachiaria brizantha 'Marandu' (CIAT 6780) – **6780**	6299	TD58						
Stylosanthes guianensis 'Stylo 184' (CIAT 184) – **184**	6299	TD58	6780					
Flemingia macrophylla 'Chumphon' (CIAT 17403) – **17403**	6299	TD58	6780	184				
Brachiaria decumbens 'Basilisk' (CIAT 606) – **606**	6299	TD58	6780	606	606			
Paspalum atratum 'Terenos' (BRA 9610) – **9610**	9610	TD58	9610	9610	9610	9610		
Setaria sphacelata var. *Splendida* 'Lampung' – **Setaria**	6299	TD58	6780	184	Setaria	606	9610	
Species identifier	6299	TD58	6780	184	17403	606	9610	Setaria
Rank	3	1	4	6	8	5	2	7
Positive characteristics	Palatable	Not itchy Palatable to all animals	Resistant to trampling	Palatable to goats Controls weeds	Good for hedgerow	Palatable Fast regrowth Resists trampling Not easily uprooted	Palatable Fast regrowth Grows easily	Palatable
Negative characteristics	Itchy Thorny	None	None	None	Less eaten by animals	Difficult to control spread	None	None

Stones or seeds can be used for weighting. The farmer is asked to allocate a fixed number of tokens between the activities and the criteria. This allocation should be done simultaneously, i.e. over both activities and criteria. The number of tokens can vary between farmers and will depend on the number of activities and criteria. The general principle is that the number should be just sufficient for the farmer to distinguish between each cell of the matrix. As a rough guide, 50 to 100 stones or seeds should be used. After the farmer has finished weighting, the results are reviewed, using pairwise comparisons between the cells and asking the farmer to verify that the relative weightings are correct.

Table 9. Matrix for scoring activities according to various criteria.

	Activity 1	Activity 2	Activity 3	Activity 4
Criterion 1				
…				
…				
Criterion X				

Analysis and utilisation

The analysis of the matrix depends on what is required and the level of expertise of the analyst. At the simplest level, the farmer and development worker can use the matrix to identify activities that meet certain criteria, for example, the activity which generates the most cash income for the household. On a more advanced level, project staff can utilise statistical analysis to identify commonalities and differences between different types of farm household. Multivariate analysis of variance (MANOVA) using each household as a repeated measure within blocks of household types is one such method. Before embarking on such analysis project staff should consult with a statistician.

An example

The following example comes from work carried out in Malitbog. As part of our case studies and surveys we wanted to identify the relative importance of farm activities in terms of both subsistence income (or home consumption) and cash income. Income and livelihood matrix analysis was conducted. Table 10 shows how one farmer allocated 100 tokens between a range of livelihood activities and between cash income and home consumption.

How accurately does the income and livelihood matrix reflect actual farmer income and consumption patterns? To address this question we compared the matrix approach with conventional activity budgeting to obtain a quantitative base point for household activities. Activity budgets for the above smallholder's maize and banana crops were obtained and total revenues calculated. On a yearly basis her returns were approximately P70,000 and P69,000, respectively. This was sufficiently close to the matrix weighting of 12% for each of maize and bananas to lend some credence to the matrix weights as an accurate measure of household income and consumption — at least for this farmer.

Table 10. Income and livelihood matrix for a female smallholder farmer in Malitbog, Philippines.

Activity	Income and savings	Consumption	Total
Maize	12	0	12
Banana	2	10	12
Fruit	4	14	18
Vegetables	4	6	10
Livestock	4	6	10
Forage	4	4	8
Kapok	0	4	4
Sweet potato	4	6	10
Weaving	6	6	12
Labouring	0	4	4
Total	40	60	100

4.4 Wealth and wellbeing ranking

Overview

Wealth and wellbeing ranking is an integral part of the monitoring and evaluation of rural development projects in that it enables a characterisation of the distribution of wealth and wellbeing within the community in which the project is operating. The need for such characterisation is directly tied to the primary objective of rural development — alleviation of poverty. If the character and determinants of poverty are known then it is easier to formulate poverty alleviation strategies. In communities where subsistence and semi-subsistence livelihoods are prevalent, monetary income is a poor proxy measure of poverty and wealth. In such communities, alternative, locally-based indicators are needed to describe adequately the dimensions to wealth, wellbeing and equity. Wealth ranking has been widely used to monitor the impact of projects, identify and target specific groups within the community, and understand local criteria of wealth and wellbeing.

Elicitation

Wealth and wellbeing ranking has commonly been conducted using two broad techniques — card sorting by key informants and social mapping by community focus groups. Whichever method is used, the informants should be representative of the community and should have knowledge of everyone in the community.

Card sorting. In card sorting, a list of households is obtained (either from official lists, key informants, or a mapping exercise) and the household names are written on cards (one card for each household). The informant is asked to sort the households into groups according to their wealth or wellbeing status; the number of groups depends on the informant and will usually be from three to five. This exercise is carried out with several informants — the usual recommendation is that there should be at least three informants for every 100 households. Figure 16 gives a hypothetical example in which three informants sort fifteen households into (respectively) four, five, and four wealth categories, arranged in descending order from left to right.

In card sorting, the results for each key informant are tabulated and a score for each household is given depending on its grouping. For instance, if the first key informant divided the community into four wealth groups and placed Household 15 in Group I (the highest group) then Household 15 is given a score of 4/4 = 1.00 (Table 11). Similarly, if household 12 is placed in Group IV (the lowest group) it is given a score of 1/4 = 0.25. This is carried out for each household for each informant and the results totalled. Households are then ranked according to the total scores received and divided into overall wealth groupings (e.g. Groups I to IV in Table 11). The divisions between these groupings are essentially arbitrary but it may be possible to identify discontinuities in the household scores. It is important to realise that although the derived ranking of households appears to be continuous it is in fact derived from discrete groups. Hence the resultant number of wealth categories should not be more than the smallest number of categories used by any of the key informants (four in the above example).

The card sorting technique has a number of drawbacks:

- It depends on a limited number of informants;
- It relies on the tedious and complex derivation of ranks from group scores which are thus prone to error;
- It does not handle biases very well in that equal weight is given to informants' ranking of households. This is a problem if an informant wrongly places a household in a particular group. This can be seen in the example above where Informant 3 has placed Household 15 in the lowest group but the other two informants have placed Household 15 in the highest or second-highest groups (Figure 16).

Table 11. Analysis of wealth ranking of 15 households by 3 informants.

House-hold	Informant			Total score	Group
	1	2	3		
9	0.25	0.2	0.25	0.7	IV
11	0.25	0.2	0.25	0.7	
12	0.25	0.2	0.25	0.7	
2	0.25	0.4	0.25	0.9	
1	0.5	0.4	0.5	1.4	III
7	0.5	0.4	0.5	1.4	
4	0.5	0.6	0.5	1.6	
6	0.5	0.6	0.5	1.6	
3	0.75	0.6	0.5	1.85	II
15	1	0.8	0.25	2.05	
14	0.75	0.6	0.75	2.1	
5	1	0.8	0.75	2.55	
13	0.75	0.8	1	2.55	
8	1	1	1	3	I
10	1	1	1	3	

Social mapping. Wealth and wellbeing ranking can be conducted in association with resource and social mapping exercises. Once the households of a community have been identified on a map, a group consensus can be reached as to what category a particular household falls into. This circumvents a potential problem in the card sorting procedure where one informant may not be as familiar with the circumstances of a given household as another informant. The grouping of households results from a consensus of opinion amongst the participants in the social mapping exercise. This provides a shortcut to the ranking and scoring procedure in the card sorting exercise. However, in social mapping exercises care must be taken to get a group consensus on rankings since, as with any group exercise, power relations within the group may inhibit participation.

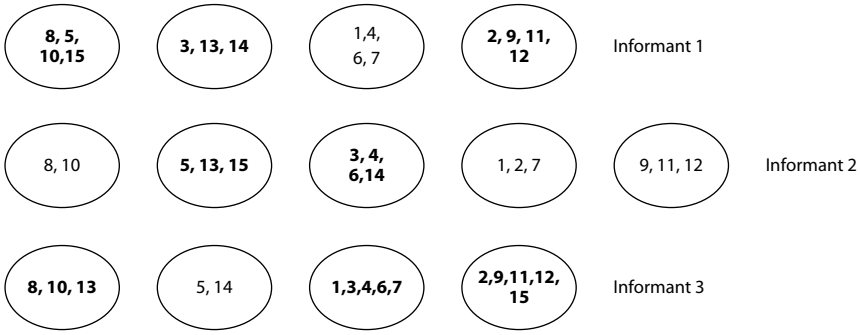


Figure 16. Example of wealth ranking of 15 households by 3 informants.

It is useful to determine the criteria by which informants categorise households. This can be done before or after ranking has taken place. However, local perceptions of household status are usually much more complex than can be explained by a simple list of criteria. As such, the elicitation of criteria before ranking has taken place has the potential to bias the ranking itself. That is, the ranking may be conducted solely in terms of the explicitly stated criteria, rather than being based on a more general and intuitive consideration of wealth and wellbeing. Hence it is better to conduct the ranking first and then simply ask the informants their reasons for ranking households as they did.

Analysis and utilisation

The wealth and wellbeing rankings, once derived, require no further analysis, but they can be utilised in various ways. For example, they can be used to identify groups within the community to be targeted for specific development programs. They can be used for stratification purposes for survey work. If handled carefully, they can be used by the development worker to keep track of changes in the distribution of households among wealth categories over time.

An example

The following example comes from a social mapping exercise conducted in Malitbog. The mapping exercise was conducted with community groups from seven sitios (villages) who were asked to draw their village (roads, fields, households) and then indicate the wealth and status of each household on the map (Figure 17).

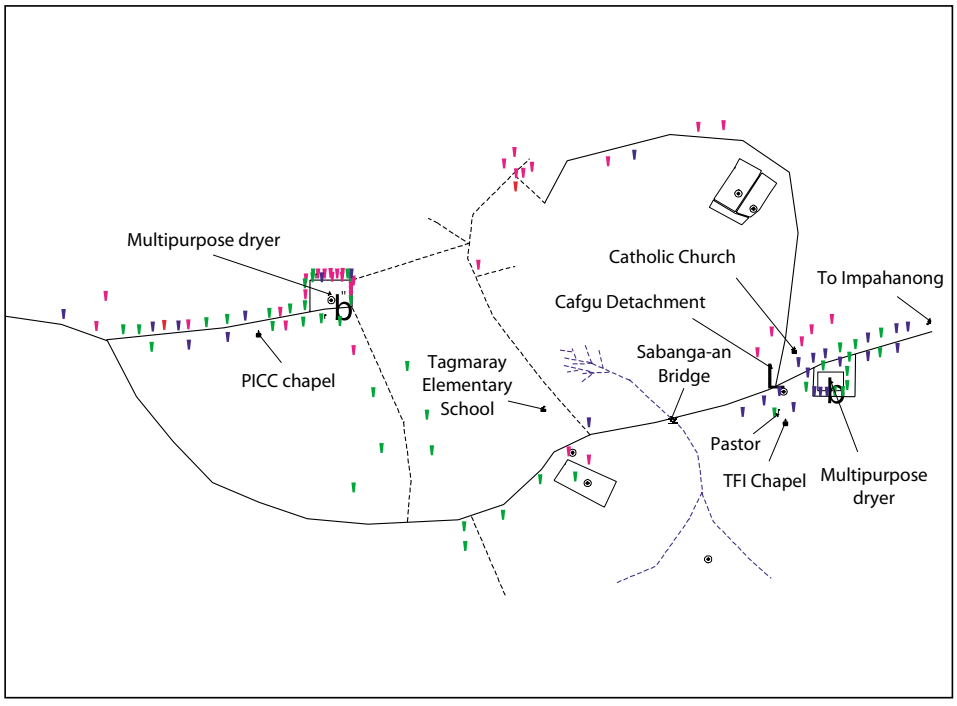


Figure 17. Wealth and status mapping by farmers at Malitbog, Philippines, to classify farm households.

The participants were first asked to nominate how many different wealth-status classes of households there were in their community. There was a consensus that the villages comprised three classes, ta'as (upper), centro (middle), and ubos (lower). Second, the participants indicated on the map to what class each of the households belonged. An 'open outcry' system was used to reach a consensus for each household — one participant read out each household name in turn and the group called out what they thought the ranking should be. After all the households had been classified. the participants were asked what criteria they had used to differentiate the households. Across all seven villages a total of 50 different criteria were nominated, of which the most commonly mentioned ones were those listed in Table 12.

Table 12. Criteria used by farmers at Malitbog, Philippines, to classify farm households.

Rich farmers	Average farmers	Poor farmers
• Large area of land • Large number of livestock • Off-farm/ professional/ salaried work • Owns transport	• 1–3 ha of land • 1–2 head of livestock • Average income	• Farm labourer • No livestock • Tenant farmer • < 1 ha of land • Caretaker of livestock • Lack of food • No land • Not industrious

A statistical analysis was carried out on the data collected from the social mapping exercise, including data on wealth ranking, gender, adoption of forage technology, and household resources (number of children, livestock possession). The results indicated that adoption of forage technology differed between villages and that female-headed households were less likely to adopt forage technology. In addition, while those households with livestock (cattle, buffalo, goats, and horses) were more likely to adopt forage technologies, due to the obvious livestock benefits, there was no indication that adoption differed between households of different socioeconomic status (rich, average, poor).

5 Interviews

Interviewing is one of the main techniques used in M&E (Schonhuth and Kievelitz 1994; Pretty et al. 1995; Van Veldhuizen et al. 1997). It complements other approaches (mapping, ranking, etc.) by providing in-depth information, both qualitative and quantitative (Krueger 1994; Bernard 1995). There are several types of interview ranging from the very informal to the very formal. Participatory approaches have helped make interviewing less formal, more conversational, and more responsive to a given situation, while still focused and structured (Mikkelsen 1995).

Patton (1990) describes four different types of interview:

- Informal conversational interviews, in which questions emerge from the immediate context and are asked in the natural course of conversation; there is no predetermination of question topics or wording.
- The interview-guide approach, in which topics and issues to be covered are specified in advance in outline form; the interviewer decides the sequence and wording of questions in the course of the interview.
- Standardised, open-ended interviews, in which the exact wording and sequence of questions are determined in advance. All interviewees are asked the same basic questions in the same order. However, questions are worded in a completely open-ended format.
- Closed, quantitative interviews, in which questions and response categories are determined in advance, responses are fixed, and the interviewee chooses from among these fixed responses or responds in terms of a number.

These types of interview fall broadly into two categories, semi-structured interviews (types one and two) and structured interviews (types three and four). Each has its own advantages and disadvantages, as discussed below.

5.1 Semi-structured interviews

Overview

While semi-structured interviewing appears to be informal and conversational, in fact it is a well-defined and systematic activity that has clearly defined goals and guidelines. The advantage of this technique is its flexibility and responsiveness — the interview can be matched to individuals and circumstances. At the same time, the use of an outline or guide can make data collection reasonably systematic. The disadvantages are that it requires some skill and is therefore difficult to delegate to an assistant; different information may be gathered from different people, depending on which topics arise; and data organisation and analysis can be quite difficult (Mikkelsen 1995).

Semi-structured interviews can be carried out with individuals or with groups. Individuals can be selected respondents who give information about themselves (case studies), or key informants whose special knowledge can give insights on a particular topic. Group interviews can be conducted with a community group comprising diverse members with access to a broad range of information, or with a small, select group of like-minded individuals (a focus group) who are able to discuss a particular topic in detail.

Elicitation

While there are different ways to conduct semi-structured interviews, the most important aspect is the manner and context in which the interviews are conducted. Who carries out the interview (and with whom), how it is conducted and where and when it is conducted are integral factors to a successful interview. Interviewing is a skill which is acquired through practice. Most pitfalls can be overcome by having empathy and rapport with the people being interviewed and a good technical knowledge of the farming system in question. Some common mistakes include asking leading questions, or asking questions which are ambiguous. Mikkelsen (1995, 110–111) lists some general guidelines for semi-structured interviews:

- Begin with a greeting and state that the interview team is here to learn.

- Begin the questioning by referring to someone or something visible.
- Conduct the interview informally and mix questions with discussion.
- Be open-minded and objective but judge everything you hear — there are many reasons why people give the information that they do, not necessarily because it is accurate or truthful.
- Carefully lead up to sensitive questions — put these near the end of the interview so that if the respondent decides not to answer these you do not lose their willingness to answer earlier questions.
- Be aware of non-verbal signals.
- Avoid leading questions and value judgements — such questions can cause bias in the answer.
- Avoid making assumptions – for example, asking people how many grades of school they completed assumes that they went to school in the first place.
- Avoid questions that can be answered with 'yes' or 'no'.
- Be aware of both direct and indirect questioning — for example, asking a male farmer about farming activities carried out by his wife may lead to different answers than if you asked the wife directly.
- Individual interviews should be no longer than 45 minutes and group ones no longer than two hours.
- The interviewer should have a list of topics and key questions written down in a notebook.
- The interviewer or a member of the interviewing team should make detailed and systematic notes, as these are the primary output of the interview.

When the collection of information is delegated to someone who has a lack of ownership of the process or who will not benefit from the outputs, the quality and reliability of the information declines. In such a situation, what is intended to be a semi-structured interview with open-ended and probing questions becomes more like a structured, closed-question survey without any desire on the part of the interviewer to find out the reasons why people give the answers they do. Hence it is important for semi-structured interviews to be conducted by experienced workers with a genuine interest in the outcomes.

Analysis and utilisation

There is no strict framework for analysis of semi-structured interviews as there is for structured interviews. The primary purpose of the interviews is not to collect quantitative data from which to draw inferences — a purpose best left to structured interviews in a survey framework — but to tell a story. The qualitative information gathered from semi-structured interviews enables researchers to describe patterns among the data and to build explanations of processes, such as farmers' adoption decisions.

In fact, there is no clear demarcation between the elicitation and analysis phases in semi-structured interviewing. The technique is essentially iterative, hence analysis is occurring concurrently with data collection. The interviewer follows a process of 'observe, think, test, and revise' as the interview proceeds, in order to develop robust conclusions in a participatory manner. Triangulation — the comparison of multiple, independent sources of evidence — is also used to strengthen the validity of the findings. GAO (1990) suggests developing alternative interpretations of findings and testing these through a search for confirming and disconfirming evidence, until one hypothesis is confirmed and others are ruled out. The reproducibility of findings is established through analysis of multiple sites and data over time. These can be analysed by developing a matrix of categories, using graphic data displays, tabulating the frequency of different events, developing complex tabulations to check for relationships, and ordering information chronologically for time series analysis. Data analysis ends when a plausible description or explanation has been developed, having considered all the evidence (GAO 1990, 59).

An example

An example of how semi-structured interviews are carried out is given by a series of case-study interviews of smallholder farmers in Maltibog and M'Drak. First, a list of households was obtained from a series of social mapping exercises carried out with each of the six villages within each project site. The households had been stratified according to wealth and wellbeing ('rich', 'average' and 'poor'), gender (female-headed households, male-headed households), and whether they were adopters or non-adopters of forage technologies. It

was decided that the primary basis for stratification was wealth, hence three smallholders from each village were randomly selected according to wealth, resulting in 21 case studies from each project site. At a second level of stratification, constraints were placed on the selection so that at least one female-headed household per village and at least one non-adopter was selected in the sample. An example of stratification from M'Drak is shown in Table 13.

Table 13. Stratification of case study farmers in M'Drak, Vietnam.

Farmer ID	Village	Gender	Forages	Wealth
56	1	Male	Yes	Rich
65		Female	Yes	Average
108		Male	No	Poor
286	2	Male	Yes	Rich
294		Male	Yes	Average
322		Female	No	Poor
117	3	Male	Yes	Rich
127		Male	No	Average
135		Female	No	Poor
7	4	Male	Yes	Rich
51		Male	No	Average
28		Female	Yes	Poor
225	5	Male	Yes	Rich
281		Female	No	Average
240		Male	Yes	Poor
153	6	Male	Yes	Rich
200		Male	No	Average
172		Female	No	Poor

The interviews were carried out over a period of several weeks, with each interview lasting about one to two hours. The total interview time per farmer was strongly correlated with the experience of the interviewer/translator. In one memorable interview with an inexperienced translator it took 20 minutes to ask a single question — much useful information was obtained about numbers of livestock and different types of crops grown, but nothing relevant to the actual question! It was found to be difficult for outsiders without knowledge of the local language to carry out interviews, as they had to rely on translators to interpret questions and answers. Meanings and distinctions between similar words in one language may not have been translated correctly into another. For example, the word 'livestock' is translated (correctly) into Cebuano (the language spoken in Malitbog in the Philippines) as 'hayop'. However, 'hayop' is invariably interpreted by farmers as referring only to cattle or buffalo. Translators who understood the process and knew what questions were being asked and (more importantly) why, were able to elicit the information quite quickly. As an example, interviews that took 8 hours with the first farmer were soon being completed in one hour. Devolving responsibility for interviewing to well-trained and motivated development workers under a mentoring scheme resulted in better quality information. The development worker felt 'ownership' of the process, hence was more motivated to achieve an accurate result.

A selection of notes taken during a case-study interview is given below. The selection concentrates on livestock.

Interview with Farmer X, female farmer from Village Y in Cu'Kroa Commune, M'Drak. No forages. Socioeconomic status: Poor.

Labour: Three people in the household (herself, her son and his wife). She has four sons and two daughters of her own and they also live in the commune. The daughter-in-law works full-time on the farm whereas the son only works part-time because of ill-health. Farmer herself only works part-time as well because she is old and also in ill-health. She does not have any hired labour but her two daughters and one of her sons-in-law come and help when she needs them. She also has a few neighbours who come during busy periods (e.g. harvest and planting) to help on an exchange labour basis.

Farm: Her farm consists of 1500 m^2 of wetland for paddy rice and 2500 m^2 of upland. This is situated around the house so she does not have to travel far to work on her farm. The crops she is growing are rice, maize, peanuts ("yield very low, bad soil, cattle come and eat, has to fertilise'), vegetables including cabbage, sweet potato (variety in which just the leaves are used), green beans, and black beans (planted at the same time).

Animals: She has one bull she just got from her son two days ago on a share basis. She is raising the animal to collect the manure and for draught purposes. In 1997 she did have one other animal (cow) but it died of foot-and-mouth disease (did die and was not slaughtered). She sold the meat for VND500,000 but she bought the animal in 1995 for VND2 million.

She had one sow which she bought in April 1999 for VND150,000 and sold it in July 99 for VND300,000 (Table 14). She sold it because of disease problems in the pig. She usually raises

between one and three pigs a year during the harvest time because the price for feed is low. How many and when she buys and sells depends on the price of feed and the availability of ready cash to buy the pigs. The time to sell depends on when she needs the money. Last year and this year the price per kg was VND18,000/kg to buy a suckling piglet and VND12,000/kg to sell an adult pig (Table 14).

Table 14. Details of pig enterprise of case study farmer in M'Drak, Vietnam.

Year	Number of pigs	Buy (VND '000 each)	Sell (VND '000 each)
1995	3	100–150	167
1996	2	125	200
1997	0	–	–
1998	1	150	270
1999	1	150	300

Feeding system for cattle (based on previous cow): She mainly tethers on native grass and sometimes cuts and carries. If the animal is not working then she will tether from 7–8 am to 5–6 pm and some cut and carry, usually 5–10 kg at night if she is ill and maybe up to 20–30 kg at night if she is healthy. If the animal is working then it is mainly fed cut and carry at night (20–30 kg) and when the animal stops working it is also tethered. She also supplements with rice bran when working (don't know how much). It takes her 1 hour to cut 20–30 kg of feed but might take 2–3 hours depending on the availability of feed and if she has to search for good grass. There is good grass early in the wet season and also late in the wet season. There is no problem with the feed since she has only one cow.

She usually grazes the cow around the house, but if the weather is good she goes elsewhere because the grass around the house is poor. She does not have any grazing land of her own but since she only has a crop for 6 months she grazes the animal in the fallow area for the other 6 months. At the end of the wet season and in the dry season the animal grazes the upland area. When there is a crop in the ground she has to go elsewhere for grazing. In these times she grazes the animal around the garden and along the road and when the grass along the road becomes low she grazes the animal 0.5 to 1 km away.

She takes the animal grazing herself and has to stay with the animal. She grazes it from 8 am to 4 pm. In the dry season, when the animal is in the upland area, she spends around 3 hours/day tending the animal and moving the tethering peg around.

She collects 1 tonne of manure/year (she also collects the manure when the animal is grazing away from the house). The manure is used on her rice and maize crops.

Feeding system for pigs: The farmer feeds the pig maize and rice bran and sweet potato leaves. She usually feeds the pig for 6 months and can feed around 4 months of bran from her own crop and 2 months worth purchased feed. The mixture is around 50:50 maize:rice bran and she needs to buy around 60 kg of bran — that is, the pig eats 180 kg of bran over the six month period. The bran costs VND800–1000/kg for the rice and VND1800/kg for the maize bran. She feeds 5 kg of sweet potato leaves/pig/day when the animal is big, usually for the last 2 months. The market price for the leaves is around VND500/kg but she uses her own leaves.

5.2 Structured interviews

Overview

Structured interviews are mainly used for comparative purposes and to obtain quantitative data (GAO 1991). Typically, structured interviews are combined with a sampling scheme and are used to generate data for statistical inference. For example, sample surveys (using a structured interview technique) can generate information which can be generalised to the population from which the sample was drawn, whereas case studies (using a semi-structured interview technique) are specific to the person being interviewed and the information cannot be generalised to the population. However, inferential analysis is not restricted to the use of structured interviews in a sample survey format.

Structured interviews allow a consistency between interviews so that every respondent is asked the same question. This is what allows the comparison between respondents. It also makes it possible to delegate the interviewing task to enumerators, provided they are thoroughly trained and well supervised. However, unlike semi-structured interviews, structured interviews limit the ability of the interviewer to ask questions outside the format of the questionnaire and thus are prone to omission of information that may be of interest. Structured interviews can be of an open-ended or closed-question type and can be conducted face-to-face or by a written questionnaire filled in by the respondent. However, in situations such as Malitbog and M'Drak, face-to-face interviewing is the only feasible technique.

Elicitation

There are many good references on structured interviews and survey design (e.g. Casley and Kumar 1988; GAO 1991, 1992; Fowler 1993; Poate and Daplyn 1993; Bernard 1995; Pannell and Pannell 1999). It is not the purpose of this report to reproduce that material. However, it is worth emphasising that structured interviews need to be carefully planned in order to be successful. The planning of a structured interview needs to take into consideration not only the design of the appropriate questions but also the selection of the sample to be interviewed. There are many problems with structured interviews, in particular sample surveys, which can be avoided by careful planning and pre-testing. However, one particular pitfall that appears prevalent in most surveys is the lack of forethought for data analysis. This falls into two categories — the collection of data without consideration of the statistical and sampling context, and the inclusion of questions in a structured interview which are not going to be analysed. In the second instance the collection and coding of that information is a waste of valuable time and resources. In general, it is far easier to expand a questionnaire and increase the number of respondents than it is to manage and utilise the data which results from this activity. As far as possible the aim should be to minimise the number of questions asked and the size of the survey sample, while maximising the reliability and utilisation of the data generated.

Analysis and utilisation

The analysis and utilisation of data collected from structured interviews depend on whether the data are derived from open-ended or closed questions and whether the responses can be quantified or not. Closed questions usually mean (a) that the responses are exhaustive and mutually exclusive (all possible responses are covered and they do not overlap) and (b) that the questions are asked of all respondents. For open-ended questions, however, responses may range from no response, through a few words, to several sentences. Respondents usually only detail factors which come to mind immediately, not necessarily the most important factors. Quantifiable responses enable higher order analysis to be carried out whereas non-quantifiable data restrict the analysis to description of the situation.

Analysis of structured interview data can be carried out at several levels. At the first level of analysis a description of the data collected needs to be given. This can be done in the form of frequency tables that can show the number of respondents in each particular category. At the second level of analysis a description and analysis of the data is carried out. Each question can be analysed and associations between responses examined. This can be done in the form of correlation and chi-squared analysis to check the statistical significance of differences between groups. The third level of analysis takes into account the interaction of many different variables on the responses for particular interview questions, and addresses more complex analytical questions. Such analysis can be carried out using analysis of variance, multiple regression analysis, and discriminant function analysis.

An example

An example of a structured interview survey instrument is the Adoption Tree Survey conducted by the Forages for Smallholders Project (FSP) at its project sites in Southeast Asia. The FSP philosophy is to encourage farmers to evaluate forage varieties and to develop innovative ways of integrating and using these forages in their farming system. The information collected in the 'adoption tree' was needed for the project to understand the process of participatory forage technology development and to measure milestones for the project and donor. The key objective of the survey was to find out how forage technologies were being developed by farmers and to document the process of adoption within and between farms. Additionally, the FSP wanted to document farmers' experiences with forages, for example, their criteria for selection of forage species and varieties. The Adoption Tree Survey was designed as a semi-structured interview with participatory components but in practice was conducted in the field as a structured interview in a survey format. Table 15 shows some of the quantitative results for two FSP sites in Indonesia.

While the Adoption Tree Survey provided useful data for M&E, a subsequent assessment revealed the following problems. First, there were several design issues with the survey:

- Too much information was collected from all farmers involved in the FSP whereas surveying a sample of farmers would have been more efficient.
- Information was collected primarily to satisfy project and donor needs, not the needs of the farmers or development workers in the field.

- Some of the forms were too complex and tried to collect too much information.

The survey focused the time and attention of the development workers on farmers who were included in the survey, diverting attention from other farmers who were starting to innovate.

Table 15. Selected data from Adoption Tree Survey in Indonesia.

Survey summary	Kapuas	Marenu
Households	247	75
Farm size (ha)	2.7	2.5
Lowland rice (%)	27	20
Farmers with large animals (%)	98 (cattle)	84 (sheep)
Mean animal number	3.1	24
Market orientation (%)	65	50
Area of forages (ha)		
1996	12.6	4.3
1997	25.2	13.4
1998	46.1	9.4
Forage system (% of farmers)		
Evaluation plots	40	0
Cut & carry plots	45	91
Hedgerows	16	0
Living fences	0	68

In addition, there were problems with the interviewing process:

- Semi-structured interviews tended to become structured and open questions became closed.
- Information was recorded without cross-checking; more probing questions were needed, asking for clarification.
- Interviewers sometimes failed to consider whether answers conformed to what they saw or heard around them; they had difficulty with the concept of the degree of accuracy needed, e.g. in relation to the initial area of forages and the area of subsequent expansion.
- Visiting individual farmers in their homes took a long time.

There were also major problems with encoding, data entry and analysis:

- The information was entered too slowly to provide immediate feedback to help with planning.
- It was difficult to enter data because not every interviewer encoded the data as required.
- Qualitative data had to be encoded subsequent to the survey to be used in the analysis; it would have been better if encoding of information, ready for data input, was done in the field by the interviewer.
- Using local languages was essential but slowed the analysis because it required subsequent translation of responses.

Several potential solutions to these problems were identified. The Adoption Tree Survey needs to use open-ended, informal questions with data encoded by the interviewer in the field. How can this be achieved? First, the interviewer needs to feel ownership of the survey and to see value in the information generated; the survey must not be a chore but bring practical benefits to the development worker. Second, there needs to be more training for all people involved in the survey. Third, the survey instrument has to be flexible enough to be adapted to changing needs.

The survey needs to collect a small set of ‘good-quality’ information rather than a large set of ‘poor-quality’ data. A better approach would be to collect a small amount of basic information from all farmers and more detailed information from a representative sub-sample.

6 Conclusion

Participatory technology development projects, such as the Forages for Smallholders Project and related projects in Southeast Asia, are giving increasing attention to monitoring and evaluation (M&E). In particular, the adaptive nature of technology development requires effective procedures for *impact monitoring* or *on-going evaluation* to assess intermediate impacts and make appropriate adjustments in project activities. This M&E is not just for external stakeholders such as donor organisations and project managers — it can and should be of benefit to all stakeholders, including farmers and field-level development workers. A more inclusive or participatory approach to M&E is both *more effective* in providing reliable information about project impacts and, if conducted well, can *enhance the understanding and capabilities* of all participants. A major benefit is that farmers and field workers gain a greater voice in determining the direction of technology development processes of which they are the prime beneficiaries. In participatory M&E the emphasis is on participation, learning, negotiation, and flexibility, rather than the standardised and summative approach of more conventional M&E.

A participatory technology development project is a complex activity with effects at many levels. These include the *process* of technology development itself and a range of *impacts* arising from that process — immediate, intermediate, and long-term. Measures of intermediate impact frequently have to be used as indicators of long-term development outcomes (such as poverty alleviation). To ascertain the extent to which these effects are actually impacts of the project it is necessary to have a *basis for comparison*, including a comparison of the situation before and after the project and of the situation with and without the project (given that changes also occur in the absence of project interventions). Participatory M&E looks first to the *perceptions and experience of project participants themselves* to establish this comparative perspective, rather than formal statistical comparisons using baseline surveys and non-project control groups.

M&E needs to be seen as an *integral part of the entire project cycle*. Planning for M&E should be part of the initial problem diagnosis and project planning phase, though as with other aspects of the project, the M&E plan should be flexible and capable of modification as experience accumulates. Planning M&E should involve all stakeholders (though not necessarily all together in the same workshop). Planning M&E requires specific answers to the following questions:

- What are the project objectives?
- What are the M&E questions that follow from these objectives?
- Who needs answers to these questions?
- What are the best indicators to help us answer these questions?
- What are the units in which these indicators are measured?
- What are the best methods/tools to obtain this information?
- What/who is the source of this information?
- When does this information need to be collected and at what scale?
- How will the information be analysed?
- How will the information be utilised?
- Who is responsible for collecting, analysing, and utilising the information?

A M&E matrix (such as Table 2 in Chapter 2) can be a useful guide to keep track of the answers to these questions, but there may be many separate steps and elicitation techniques involved in completing the matrix.

At the centre of the M&E plan is a series of indicators which are selected to reflect key intermediate impacts. A *minimal set of indicators* is needed based on their usefulness (especially in terms of their relevance to management choices), their ease and cost of implementation, and the number of different stakeholders benefiting from the information they provide. This implies a need for careful and logical selection of cost-effective indicators, not merely brainstorming to come up with an unedited wish-list. Attention needs also to

be given to the way in which various quantitative and qualitative M&E data are woven together into *coherent narratives or stories* which describe and explain project impacts.

Participatory M&E draws eclectically on *a range of methods and techniques*, both to develop and to implement the M&E plan. In this respect the distinction between 'conventional' and 'participatory' methods and techniques has been overdrawn. For example, questionnaire surveys have been strongly criticised by advocates of participatory methods, but they can be designed and implemented in a 'participatory' (inclusive and responsive) way and have an important place in the repertoire of techniques available for M&E. Having said that, we have found that *working with focus groups and using a range of less conventional techniques (mapping, diagramming, ranking, and scoring)* can yield accurate and useful information quickly and easily, with considerable benefits to all concerned. The success of these techniques, however, depends crucially on *skilful facilitation*. This requires not just skill in the particular techniques, but a clear understanding of the background to and purpose of the activity and a sense of 'ownership' of the outcomes. The participatory nature of M&E is enhanced when the techniques used are such that the *elicitation, analysis, and utilisation* of information can be carried out locally and within a relatively short time-frame.

7 Acknowledgments

The research for this report was funded by the Australian Centre for International Agricultural Research through a Systemwide Grant (IAP/1998/053) to CIAT (Centro Internacional de Agricultura Tropical) and the University of Queensland. The research involved a collaborative effort between many people. We would particularly like to thank the following individuals (in alphabetical order) for their various contributions:

Philippines:

Francisco Gabunada (Visayas State College of Agriculture)

Ed Magboo (Livestock Research Division, PCCARD)

Willie Nacalaban (Department of Agriculture – LGU, Malitbog)

Pinky Ojales (Department of Agriculture – LGU, Malitbog)

Judith Saguinhon (Department of Agriculture – LGU, Malitbog)

Gaspar Velasco (Department of Agriculture – LGU, Malitbog)

Vietnam:

Bui Xuan An (University of Agriculture and Forestry, Ho Chi Minh City)

Le Van An (University of Agriculture and Forestry, Hue)

Le Hoa Binh (National Institute of Animal Husbandry, Hanoi)

Nguyen Manh Dzung (National Institute of Animal Husbandry, Hanoi)

Professor Le Viet Ly (National Institute of Animal Husbandry, Hanoi)

Trong Tan Khanh (Tay Nguyen University, Daklak)

FSP, CIAT, and Others:

Dindo Campilan (CIP, Philippines)

Sam Fujisaka (CIAT, Cali, Columbia)

Barun Gurung (CIMMYT, Nepal)

Peter Horne (FSP/CSIRO, Vientiane, Laos PDR)

Peter Kerridge (FSP/CIAT, Vientiane, Laos PDR)

Karen McAllister (IRRI, Los Baños, Philippines)

Louie Orencia (FSP/CIAT, Los Baños, Philippines)

Ralph Roothaert (FSP/CIAT, Los Baños, Philippines)

Werner Stür (FSP/CIAT, Los Baños, Philippines)

8. References

Anderson, J.R., ed. 1994. Agricultural Technology: Policy Issues for the International Community. Wallingford, UK, CAB International.

Bennett, C. and Rockwell, K. 1995. Targeting Outcomes of Programs: An Integrated Approach to Planning and Evaluation. Draft manual.

Bentley, J.W. 1994. Facts, fantasies and failures of farmer participatory research. Agriculture and Human Values, 11, 140–150.

Bernard, H.R. 1995. Research Methods in Anthropology: Qualitative and Quantitative Approaches, 2nd ed. Walnut Creek, AltaMira Press.

Casley, D.J. and Kumar, K., 1987. Project Monitoring and Evaluation in Agriculture. Baltimore and London, Johns Hopkins University Press for The World Bank, IFAD, and FAO.

— 1988. The Collection, Analysis and Use of Monitoring and Evaluation Data. Baltimore and London, Johns Hopkins University Press for The World Bank, IFAD, and FAO.

Cramb, R.A. 1993. Shifting cultivation and sustainable agriculture in East Malaysia: a longitudinal case study. Agricultural Systems, 42, 209–226.

— 2000. Processes affecting the successful adoption of new technologies by smallholders. In: Hacker, B., ed., Working with Farmers: the Key to the Adoption of Forage Technologies. ACIAR Proceedings No. 95. Canberra, Australian Centre for International Agricultural Research.

Dart, J. 1999. A story approach for monitoring change in an agricultural extension project. Paper presented at the Conference of the Association for Qualitative Research, Melbourne <http://www.latrobe.edu.au/www/aqr/offer/papers/JDart.htm>.

Davies, R. 1996. An evolutionary approach to facilitating organisational learning: an experiment by the Christian Commission for Development in Bangladesh. Swansea, Centre for Development Studies <http://www.swan.ac.uk/cds/rd/ccdb.htm>.

Dillon, J.L. and Hardaker, J.B. 1993. Farm Management Research for Small Farmer Development. Rome, FAO.

Dixon, J.M., Hall, M., Hardaker, J.B. and Vyas, V.S. 1994. Farm and Community Information Use for Agricultural Programmes and Policies. Rome, FAO.

Estrella, M. and Gaventa, J. 1998. Who Counts Reality? Participatory Monitoring and Evaluation: A Literature Review. IDS Working Paper 70. Sussex, Institute for Development Studies.

Fowler, F.J. 1993. Survey Research Methods, 2nd ed. Newbury Park, Sage.

GAO (General Accounting Office) 1990. Case Study Evaluations. Transfer Paper 10.1.9. Program Evaluation and Methodology Division, United States GAO, Washington, DC.

— 1991. Using Structured Interviewing Techniques. Transfer Paper 10.1.5. Program Evaluation and Methodology Division, United States GAO, Washington, DC.

— 1992. Using Statistical Sampling. Transfer Paper 10.1.6. Program Evaluation and Methodology Division, United States GAO, Washington, DC.

Haverkort, B., 1991. Farmers' experiments and participatory technology development. In: Haverkort, B., Van der Kamp, J. and Waters-Bayer, A., ed., Joining Farmers' Experiments: Experiences in Participatory Technology Development. London, Intermediate Technology Publications, 3–16.

Haverkort, B., Van der Kamp, J. and Waters-Bayer, A., ed. 1991. Joining Farmers' Experiments: Experiences in Participatory Technology Development. London, Intermediate Technology Publications.

Jackson, E.T. 1995. Participatory impact assessment for poverty alleviation: opportunities for communities and development agencies. Paper presented at International Evaluation Conference, Vancouver, November 1–5, 1995; cited in Estrella and Gaventa (1998).

Jiggins, J. 1994. Quality control, method transfer and training. In: Scoones, I. and Thompson, J., ed., Beyond Farmer First: Rural People's Knowledge, Agricultural Research and Extension Practice. London, Intermediate Technology Publications, 139–143.

Johnston, B.F. and Clark, W.C. 1982. Redesigning Rural Development: A Strategic Perspective. Baltimore, Johns Hopkins University Press.

Kerridge, P.C. and Fujisaka, S. 1998. Assessing the impact of forages at the farm level. Unpublished paper, CIAT.

Krueger, R.A. 1994. Focus Groups: A Practical Guide for Applied Research, 2nd ed. Thousand Oaks, Sage Publications.

McAllister, K. 1999. Understanding Participation: Monitoring and Evaluating Process, Outputs and Outcomes. Ottawa, International Development Research Centre.

McAllister, K. and Vernooy, R. 1999. Action and Reflection: A Guide for Monitoring and Evaluating Participatory Research. Ottawa, International Development Research Centre.

Mikkelsen, B. 1995. Methods for Development Work and Research: A Guide for Practitioners. New Delhi, Sage.

Norman, D.W., Worman, F.D., Siebert, J.D. and Modiakgotla, E. 1995. The Farming Systems Approach to Development and Appropriate Technology Adoption. Rome, FAO.

Okali, C., Sumberg, J. and Farrington, J. 1994. Farmer Participatory Research: Rhetoric and Reality. London, Intermediate Technology Publications.

Pachico, D., Ashby, J., Farrow, A., Fujisaka, S., Johnson, N. and Winograd, M. 1998. Case study and empirical evidence for assessing natural resource management research: the experience of CIAT. Paper presented at Workshop on Assessing Impacts in Natural Resource Management Research, April 27–29, ICRAF House, Nairobi, Kenya.

Pannell, D.J. and Glenn, N.A. 2000. A framework for economic evaluation and selection of sustainability indicators in agriculture. Ecological Economics, 33, 135–149.

Pannell, P.B.W. and Pannell, D.J. 1999. Introduction to Social Surveying: Pitfalls, Potential Problems and Preferred Practices. SEA Working Paper 99/04 <http://www.general.uwa.edu.au/u/dpannell/seameth3.htm>.

Patton, M.Q. 1990. Qualitative Evaluation Methods. Newbury Park, Sage Publications, 288–289. Cited in Mikkelsen, B. 1995. Methods for Development Work and Research: A Guide for Practitioners. New Delhi, Sage Publications, 102–103.

Poate, C.D. and Daplyn, P.F. 1993. Data for Agrarian Development. Cambridge, Cambridge University Press.

Pretty, J.N., Guijt, I, Scoones, I. and Thompson, J. 1995. A Trainer's Guide for Participatory Learning and Action. London, International Institute for Environment and Development.

Schonhuth, M. and Kievelitz, U. 1994. Participatory Learning Approaches: Rapid Rural Appraisal, Participatory Appraisal; An Introductory Guide. Schrifthenreihe der GTZ No. 248. Rossdorf, GTZ.

Sumberg, J. and Okali, C. 1997. Farmers' Experiments: Creating Local Knowledge. Boulder and London, Lynne Rienner.

Van Veldhuizen, L., Waters-Bayer, A. and de Zeeuw, H. 1997. Developing Technology with Farmers: A Trainer's Guide for Participatory Learning. London, Zed Books

Yin, R.K. 1994. Case Study Research: Design and Methods, 2nd ed. Thousand Oaks, Sage Publications.