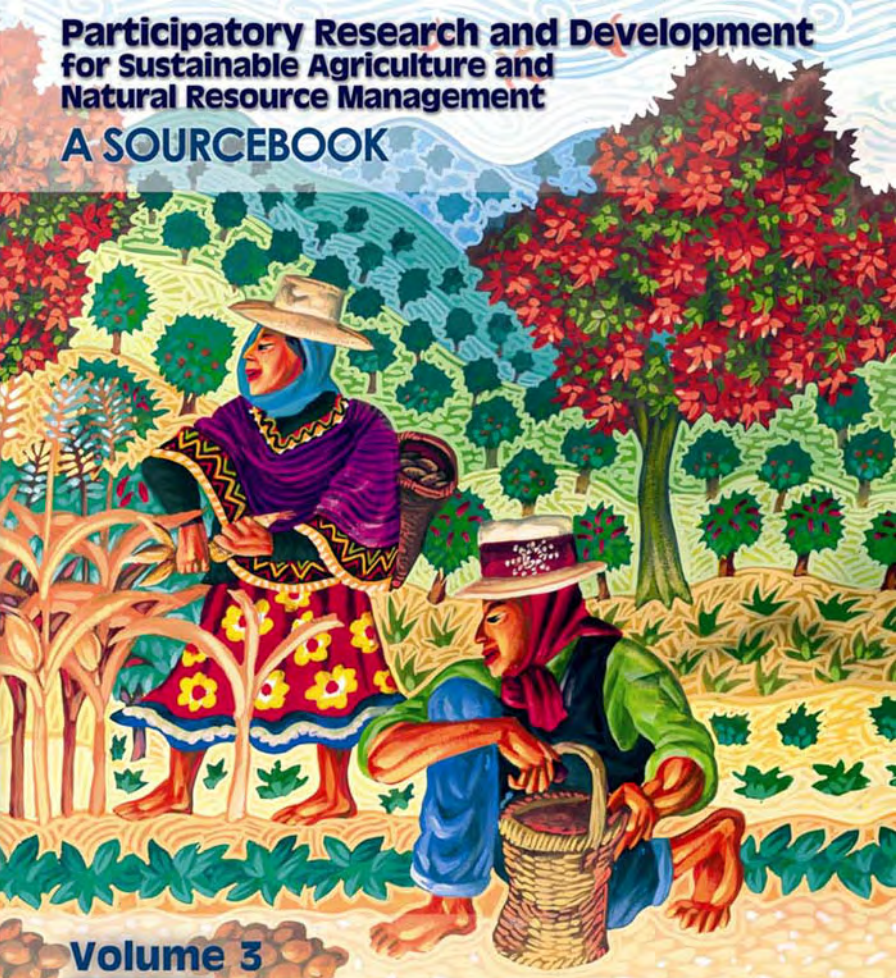
Participatory Research and Development for Sustainable Agriculture and Natural Resource Management

A SOURCEBOOK



Volume 3

DOING

Participatory Research and Development

Participatory Research and Development

for Sustainable Agriculture and Natural Resource Management

A SOURCEBOOK

VOLUME 3: Doing Participatory Research and Development

Edited by

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INTERNATIONAL DEVELOPMENT RESEARCH CENTRE (IDRC)

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Participatory Research and Development: A Sourcebook Overview

The Changing Agenda of Agricultural Research and Development

Agricultural research and development has traditionally focused on meeting the challenge of feeding the world's hungry population. Central to this agenda is the need to increase agricultural production through the introduction of technologies and support services for improving farm yield.

Following the successes of the Green Revolution in the 1960s and 1970s, newer challenges to agricultural research and development have emerged, such as:

- Promoting more equitable distribution of benefits resulting from dramatic improvements in agricultural production.
- Sustaining productivity gains through better management of natural resources supporting agriculture.
- Shifting the focus of research and development interventions to less favorable environments and low-input agricultural systems.
- Strengthening the capacity of local farming communities to continuously learn and experiment ways of improving their agricultural livelihoods.
- Building synergy between technological change and the socio-economic, cultural and political dimensions of agricultural innovation.

Key Themes in Post-Green Revolution Agricultural Research and Development

- Pro-poor targeting
- Conservation and sustainable use of natural resources
- Development of uplands and other less-favored areas
- Local governance, decentralization and citizens' rights
- Equity for women and other marginalized socio-economic groups
- Trade globalization and supply chains
- Migration and rural-urban dynamics
- Property rights and collective action
- Agriculture and human health
- Multi-stakeholder partnerships
- Local capacity development
- Organizational learning and change

In seeking to address these emerging challenges, the dominant transfer-of-technology paradigm has proven inadequate for managing more complex second-generation issues such as: diverse biophysical environments, multiple livelihood goals, rapid changes in local and global economies, expanded range of stakeholders over agriculture and natural resources, and drastic decline in resource investment for the formal research and development sector.

The Changing View of Research and Development

Global experiences now show that the changing agenda requires new ways of thinking about and doing research and development. Fundamental to this emerging paradigm shift is reassessing the traditional notion of research and development as a process primarily concerned with generating and transferring modern technology to passive end-users. Instead, research and development is now widely seen as a learning process that:

- Encompasses a diverse set of activities for generating, sharing, exchanging, utilizing knowledge.
- Results in a wide range of knowledge products, from technological to socio-institutional.
- Builds synergy between local capacities, resources and innovations.
- Draws upon diverse sources of knowledge, from local systems to global science.
- Provides decision-support tools and information that enable various types of users to make strategic choices and actions.
- Requires a holistic perspective of both the biophysical and social spheres in agriculture and natural resource management.

These new perspectives suggest that research and development can no longer be the exclusive domain of scientists, but rather a joint process requiring the participation of a wider range of actors, users or stakeholders. More importantly, it redefines the role of local people from being merely recipients and beneficiaries to actors who influence and provide key inputs to the process.

Participatory Research and Development (PR&D)

In reconceptualizing the research and development process, there has been a growing interest in the use of participatory approaches in the natural resource management, agriculture and rural livelihoods sectors. These have included: participatory rural appraisal, farmer participatory research, participatory technology development, participatory action research, participatory learning and action, gender and stakeholder analysis, community-based natural resource management, and sustainable livelihoods approach.

These diverse yet interrelated approaches collectively represent participatory research and development (PR&D) – as a pool of concepts, practices, norms and attitudes that enable people to enhance their knowledge for sustainable agriculture and natural resource management. Its underlying goal is to seek wider and meaningful participation of user groups in the process of investigating and seeking improvements in local situations, needs and opportunities.

PR&D has partly evolved from efforts to improve technology development and dissemination. However, field experiences show that innovations for improving agriculture and natural resource management need to address not only the technological but also the socio-cultural, political, economic dimensions such as: community structures, gender, collective action, property rights, land tenure, power relations, policy and governance.

Participatory approaches are envisioned to help agricultural R&D: 1) respond to problems, needs and opportunities identified by users; 2) identify and evaluate technology options that build on local knowledge and resources; 3) ensure that technical innovations are appropriate for local socio-economic, cultural and political contexts; and 4) promote wider sharing and use of agricultural innovations. In contrast to the linear process of technology generation-transfer-utilization in conventional approaches, PR&D encompasses a broader set of phases and activities including:

- ***Assessment and diagnosis*:** situation analysis, needs and opportunities assessment, problem diagnosis, documentation and characterization.
- ***Experimenting with technology options:*** joint agenda setting for experimentation, technology development and evaluation, integration of technology components and piloting.
- ***Sustaining local innovation:*** institutionalizing social and political mechanisms, facilitating multi-perspective negotiation and conflict management, community mobilization and action, local capacity development, strengthening local partnerships.
- ***Dissemination and scaling up:*** development of learning and extension mechanisms, information support to macro-policy development, promoting networking and horizontal linkages.
- ***Managing PR&D:*** project development, resource mobilization, data management, monitoring and evaluation, PR&D capacity development.

In practice, PR&D is generally distinguished by key elements such as: sensitivity to users' perspectives, linkage between scientific and local knowledge, interdisciplinary mode, multi-agency collaboration, problem- and impact-driven research and development objectives, and livelihood systems framework.

Promoting and Developing Capacity for PR&D

While there is growing interest in PR&D, it remains widely perceived as incompatible with accepted norms and practices in the mainstream research community. In the field, PR&D demands a set of knowledge, attitude and skills that go beyond the typical human and organizational capacities under top-down research and development paradigms.

In addition, the value adding potential of participatory approaches have yet to be fully explored by research and development practitioners. There remains a major

need to document empirical cases and to systematically assess impact of PR&D. Similarly, there is still limited understanding on PR&D's complementary role to more conventional research approaches, and on maintaining effective linkage with mainstream science to facilitate local innovation processes.

Nonetheless, participatory approaches are gradually gaining ground across the institutional landscape – from research and academic organizations to non-government organizations (NGOs), development agencies, and local government units. To further promote and develop capacities for PR&D, it is necessary to create more opportunities for information exchange, training and networking among the growing number of practitioners and organizations seeking to explore the value-adding potential of PR&D. Among its key challenges are:

- ***Synthesis:*** Reviewing diverse PR&D experiences to identify field-tested concepts and practices for wider sharing and adaptation.
- ***Capacity development:*** Developing PR&D capacities of field practitioners and their organizations such as through training, information services, networking and development of protocols.
- ***Establishing support mechanisms for capacity development:*** Sustaining capacity development through institutionalized, locally-driven support mechanisms.
- ***Integration:*** Creating opportunities and a supportive environment for introducing PR&D in mainstream agriculture and natural resource management programs.

The PR&D Sourcebook

The development of this sourcebook supports wider initiatives in promoting easy access to systematized information on field-tested PR&D concepts and practices among field practitioners and their organizations. It addresses the need to facilitate sharing and use of the expanding knowledge on PR&D by:

1) Identifying and consolidating field-tested PR&D concepts and practices relevant to managing natural resources for agriculture and rural livelihood, drawn from experiences of practitioners and organizations around the world.

2) Repackaging, simplifying and adapting information through the production of a sourcebook on PR&D.

3) Distributing and promoting the use of the sourcebook, including its derived products, particularly in developing countries where access to PR&D information resources is limited.

The primary target users of the sourcebook are field-based research practitioners in developing countries seeking to learn and apply PR&D in their respective programs and organizations. They may have technical or social science backgrounds but share a common interest in using PR&D's general knowledge base. They are involved in research activities dealing with interrelated issues in natural resource management, agriculture and rural livelihoods.

As a whole, the sourcebook is envisioned to provide general reference and comprehensive overview on PR&D. In showcasing the rich, diverse perspectives on PR&D, the sourcebook is characterized by the following salient elements:

- Emphasis on information applicable to ***research- and development-oriented activities,*** complementing existing publications/materials that primarily focus on the use of participatory methods for extension, learning and community mobilization.

- Broad topical coverage of the ***research and development process.*** As an introductory guide on PR&D, it provides general orientation to various phases or types of activities that are specifically covered by existing method- and/or tool-specific publications.

- Focus on the application of PR&D within the framework of ***conservation and sustainable use of natural resources.*** It consists of papers that share field experiences associated with natural resources being used in agriculture and rural livelihoods and/or agriculture and rural livelihoods that consciously maintain long-term productivity of the resource base.

- An integrated ***socio-technical perspective*** that takes into account both the social/human and technological dimensions of innovation required for natural resource management, sustainable agriculture and rural livelihoods.

- ***Cross-cutting perspective*** of PR&D applications, encompassing various types of natural resources, agricultural activities and rural livelihoods; this comparative mode of presenting information complements existing publications that are specific to sub-categories of PR&D applications.

- Conscious effort to seek out papers dealing with ***lesser known projects/ organizations*** in developing countries, especially PR&D experiences that have not been (widely) published.

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User's Guide

The main purpose of this sourcebook is to inspire and guide aspiring and new practitioners of Participatory Research and Development (PR&D) to learn, reflect and constantly refine the way they work. The primary target users are field-based researchers in developing countries involved in activities dealing with the interrelated issues of natural resource management, agriculture and rural livelihoods. They may have technical or social science backgrounds but share a common interest in drawing on the PR&D knowledge base.

The sourcebook is intended to enhance access to systematized information on field-tested PR&D concepts and practices among field practitioners and their organizations. It responds to demands for wider sharing and dissemination of the expanding knowledge on PR&D by:

1) identifying and consolidating field-tested PR&D concepts and practices relevant to managing natural resources for agriculture and rural livelihood, drawn from experiences of practitioners and organizations around the world;

2) synthesizing, condensing and simplifying available information; and

3) promoting and improving availability of information particularly in developing countries where access to PR&D information resources is limited.

As a whole, the sourcebook is envisioned as a general reference and comprehensive overview, showcasing the rich diversity of perspectives on PR&D. The sourcebook is characterized by the following salient elements:

- Emphasis on information applicable to research and development-oriented activities, complementing existing publications that primarily focus on the use of participatory methods for extension, learning and community mobilization.

- Broad topical coverage of the research and development process. As an introductory guide to PR&D, it provides general orientation to the phases or types of activities that are specifically covered by existing method- and/or tool-specific publications.

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- A conscious effort to seek out papers dealing with lesser known projects and organizations in developing countries, especially PR&D experiences that have not been (widely) published.

Sourcebook Structure

The printed version of the sourcebook consists of three volumes and each volume has several sections. The first volume on **Understanding PR&D** is devoted to overview papers; key concepts; and emerging approaches and frameworks. The second volume on **Enabling PR&D** includes papers on capacity development; strengthening institutions and organizations; networking and partnerships; policy, governance and scaling up. The final volume on **Doing PR&D** focuses on technology development, facilitation of local institutions; and organization of communities and stakeholder groups

The following more detailed framework was used by the advisory committee for assigning papers to one of the three volumes.

Understanding PR&D	Enabling PR&D	Doing PR&D
❑ history/evolution of approaches ❑ description of approaches ❑ definition of concepts ❑ explanation of concepts ❑ interpretation of concepts (cases illustrating concepts) ❑ reasons for doing PR&D	❑ institutionalization ❑ institutions and organizations ❑ policy support ❑ capacity development ❑ resource mobilization ❑ curriculum development ❑ partnerships and networking ❑ organizational change ❑ interdisciplinarity	❑ monitoring and evaluation ❑ organizational frameworks ❑ implementing organizations ❑ case examples of PR&D processes (assessment, experimentation, innovation) ❑ experiences with PR&D methods and tools ❑ PR&D research management ❑ learning from other sectors ❑ data analysis and management

Sourcebook Development Process

The development of the sourcebook can be divided into three phases: 1) planning, 2) drafting and 3) refinement, production and distribution.

An international advisory committee and an UPWARD-led working group were formed to oversee the development of the sourcebook. The identification of candidate papers for inclusion in the sourcebook and the commissioning of new papers from invited contributors received special attention during this first phase. To gather a diverse range of materials from a variety of institutions and individuals, announcements were sent to different journals, newsletters, websites and e-groups. Once an adequate range of draft materials was identified, a first outline for the sourcebook was developed by the UPWARD working group and reviewed by the advisory committee. The working group and advisory committee also developed guidelines for the development of the sourcebook.

The second phase focused on the development of a first draft of the paper contributions. The UPWARD working group carried out a preliminary screening and many of these materials consisted of existing papers written for different purposes and audiences. Specific suggestions on how to repackage papers were developed by the working group. This was followed by a "writeshop" where papers were repackaged to shorten and refocus them on key messages relevant to participatory research and development. Some papers were merged, and others were split into several shorter pieces. When topic gaps were identified a special effort was made to search for papers or to solicit new contributions. The writeshop involved the UPWARD working group, editors, artists and layout specialists. After the writeshop, repackaged papers were sent back to the original authors for their feedback and comments. These comments guided the production staff in the development of second drafts. At the end of this process, each member of the advisory committee was provided with a copy of the full manuscript for review.

The final phase covered the refinement, production and distribution of the sourcebook. The advisory committee met with the UPWARD working group, editors, and with representatives of collaborating and donor institutions. The structure of the sourcebook was refined, each paper was reviewed and new gaps in the compilation were identified. Each member of the advisory committee took responsibility for identifying and inviting authors to develop specific papers to fill the gaps. These new submissions were forwarded to the UPWARD working group for repackaging and finalization. Out of the 155 paper contributions screened, 79 papers are included in this final compilation. A camera-ready copy of the sourcebook was prepared for final printing.

It is important to note that each article in the sourcebook is designed to stand on its own and can be read and used independently. The publishers and authors of individual papers encourage readers to quote, reproduce, disseminate and translate materials from this sourcebook for their own use. Due acknowledgement, with full reference to the article's authors and the sourcebook publishers, is requested. The publishers would appreciate receiving a copy of these materials.

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Volume 3

DOING
Participatory Research and Development

Volume Overview

Participatory research and development (PR&D) is done within a knowledge system with components, processes and actors that are interlinked. Innovations emerge as a result of participation and interaction among stakeholders. Hence, it is not only associated with perspectives and approaches that are multiple and diverse, but also with processes that are non-linear, iterative and cumulative. Doing PR&D entails keen consideration of a delicate balance between rigor and relevance, expertise and teamwork, specificity and generalization, learning and action. It requires familiarity with approaches and methods that can effectively and efficiently address the diverse and dynamic nature of rural households, communities and institutions.

As the papers in this volume indicate, there is no one-way of doing PR&D. Some researchers conduct on-farm experiments and ask farmers to participate in their research. Others encourage farmer experimentation and seek the help of researchers and other development workers for ensuring relevance and effective use of the results. Some people see PR&D as an opportunity for farmers to experience the benefits or advantages of improved practices. Others see it as a way of generating innovations and practices that are more relevant to and practical for farmers. For some, it is a vehicle for learning and empowerment. For still others, it is an arena for development action and systematic reflection.

Stakeholders' participation in the research and development process usually leads to more interrelated issues with many ramifications that require much attention. These actors may have a more holistic and integrated view of agriculture and natural resource management than researchers do, with many implications for the way research agendas are formulated, implemented and managed. Doing PR&D requires integrated, interdisciplinary, inter-agency and cross-sectoral teams of R&D professionals.

Another dimension of doing PR&D is the cyclical nature of its processes. PR&D involves description of existing systems, diagnosis of constraints and opportunities, design and testing of ideas and their wider dissemination and reinforcement. It also includes facilitating group formation, institutional innovation and developing platforms for collective learning and action, in addition to the usual elements of planning, implementing, monitoring and evaluating project activities.

The way of doing PR&D continues to evolve as practitioners relentlessly explore, innovate and generate new ideas and techniques. The papers in this volume document the experiences of different institutions as they design, adapt and learn from the various approaches, methods, tools and techniques in the course of doing PR&D. The papers are varied and reflect different degrees of stakeholders' participation and research sophistication. The volume is organized into the following sections:

- Technology Development
- Strengthening Local Organizations
- Multi-Stakeholder Based Natural Resource Management

We hope that these papers provide you with a range of ideas and insights to help you start with or strengthen your own initiatives in participatory research and development.

Technology Development

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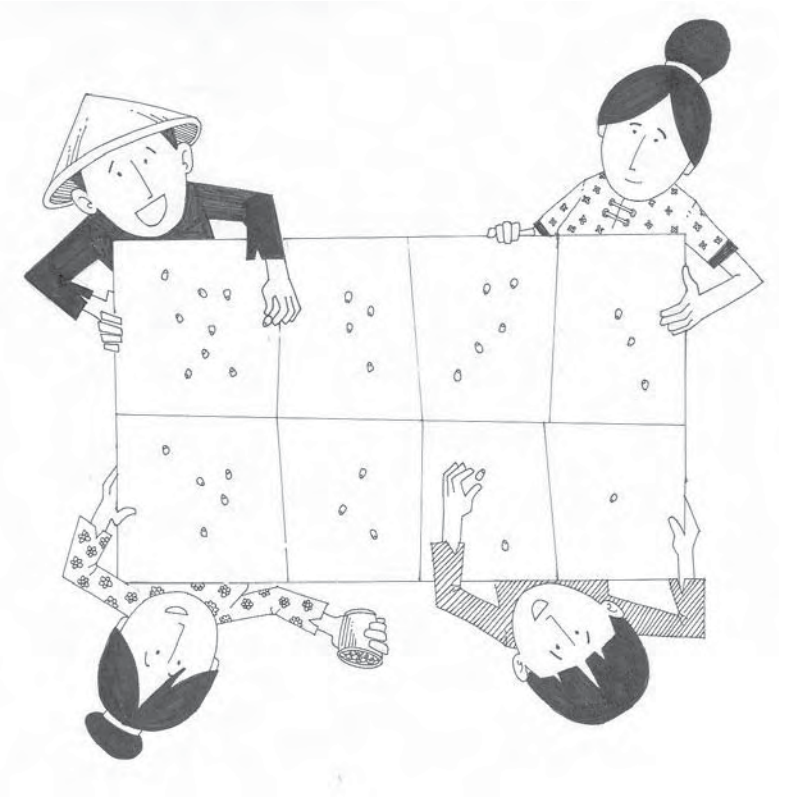
Identifying Local Stakeholders' Research Priorities: Methodological Challenges

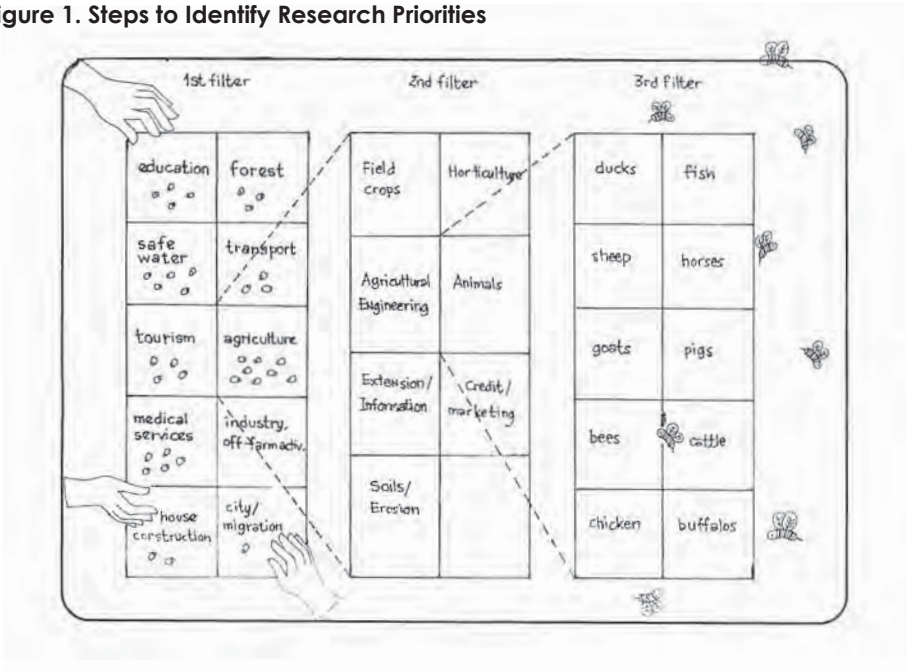


Local stakeholders' priorities for research in agriculture and natural resource management were a primary consideration in a long-term collaborative research program on "Sustainable land use and rural development in mountainous regions of Southeast Asia". The project implemented by the University of Hohenheim, Germany, in cooperation with four Thai and four Vietnamese research and teaching institutions used the concept of ranking to enable male and female farmers in selected villages to set their own priorities for the following five-year period.

Identifying Research Priorities

Various pictures representing a whole range of agricultural and non-agricultural subjects were shown to these farmers. They were then asked to distribute maize seeds on the pictures. The more seeds they placed on a picture, the higher they prioritized the topic. The procedure started with general topics, such as health, education, agriculture and forestry (Figure 1).

Figure 1. Steps to Identify Research Priorities

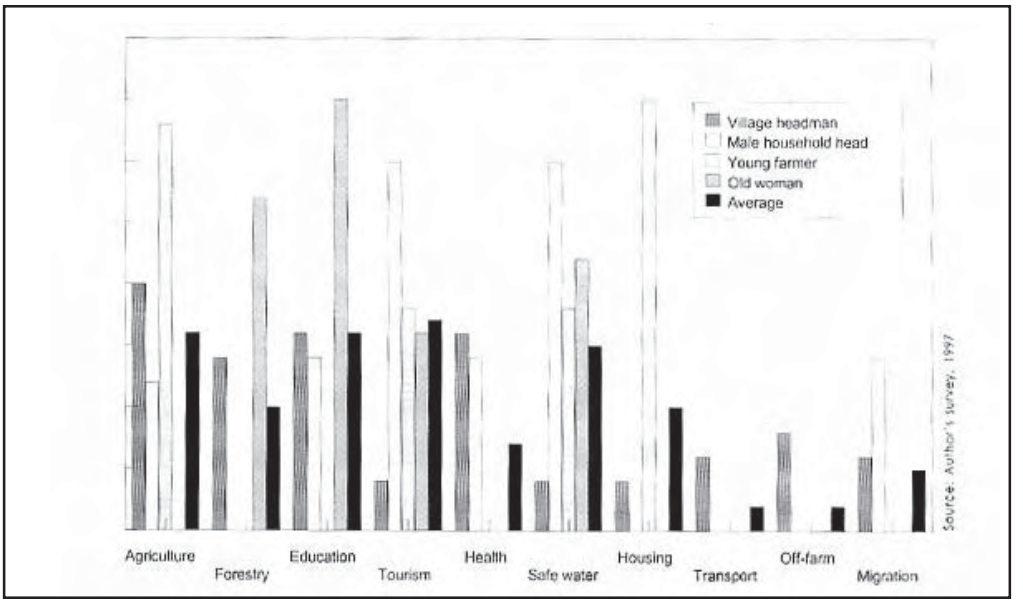


The first filter gave insights into how villagers perceive the future importance of agricultural issues as compared to other topics. Since the research program had a clear focus on agriculture, farmers were asked in the second filter to indicate priorities in the field of agriculture, covering issues such as field crops, horticulture, credit/marketing and animals. A third filter brought information about the relative importance of certain animals and crops, for instance.

Farmers were asked to add other issues (by visualizing them on additional cards) if they felt that the pictures presented did not cover the range of crops grown or types of animals raised in the village. In some cases, the pictures were misunderstood and needed to be adapted to the local context.

After three rounds of priority setting supported by visual tools, further details could be gathered by open questions on specific topics such as crop diseases, animal nutrition problems, or market access. Not surprisingly, the results suggested high variability of priorities depending on the socioeconomic status, ethnic origin, age and gender of the respondents (Figure 2).

Figure 2. Individual Priorities of Four Respondents in an Ethnic Minority Village of Northern Thailand (Relative Importance)

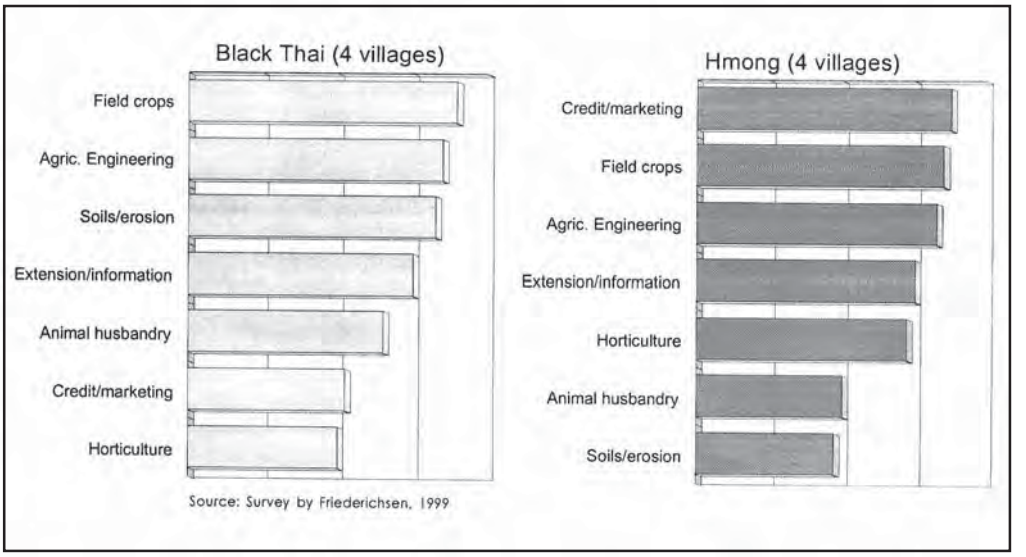


To reduce this heterogeneity, different approaches were tested to obtain an "up-scaled" picture of the main areas of interest and the priority setting of farmers. Working only with village leaders was considered as one possibility to reduce variation, but was later abandoned to avoid social bias towards village elites. Instead of doing the exercise with individuals, groups of farmers were chosen. Usually, groups were determined by gender, as women could express themselves more openly when their male counterparts were not present.

Working with farmers' groups resulted in a more general idea of male and female priorities, which did, however, neglect the considerable differences within the groups (Figure 3). These could only be captured by taking note of the decision-making processes among the participants. Unfortunately, this was sometimes limited by language barriers. The respondents in both Thailand and Vietnam belonged to different ethnic minority groups and an interpreter speaking their language was not always available which would have allowed further discussions.

From the start of the preparation for the research program, it was clear that not all priorities could be considered, given the limitations set by the donor agency. Some priorities could be discarded directly, for example, those that were driven by acute but only temporary concerns, such as the shortage of water in some areas during the El Niño phenomenon. Other priorities were beyond the mandate of scientists, for instance, the lack of citizenship rights raised by ethnic minority farmers in protected areas of Northern Thailand. Health or educational problems also did not match the disciplinary background of the researchers. Some farmer priorities, such as input-intensive vegetable production in highly erosive sloping land, would not be compatible with Thailand's agricultural and environmental policies, which only allowed fruit trees or other perennial crops in certain watershed conservation areas.

Figure 3. Priorities of Black Thai and Hmong Farmers' Groups in Son La Province, Northwest Vietnam



Limitations of the Methodology

In expressing priorities, rural people often face difficulties in distinguishing between research programs and development projects. Some of the problems mentioned by farmers could be solved by extension workers or development projects, if these would introduce technologies and practices that were already tested successfully under similar conditions elsewhere.

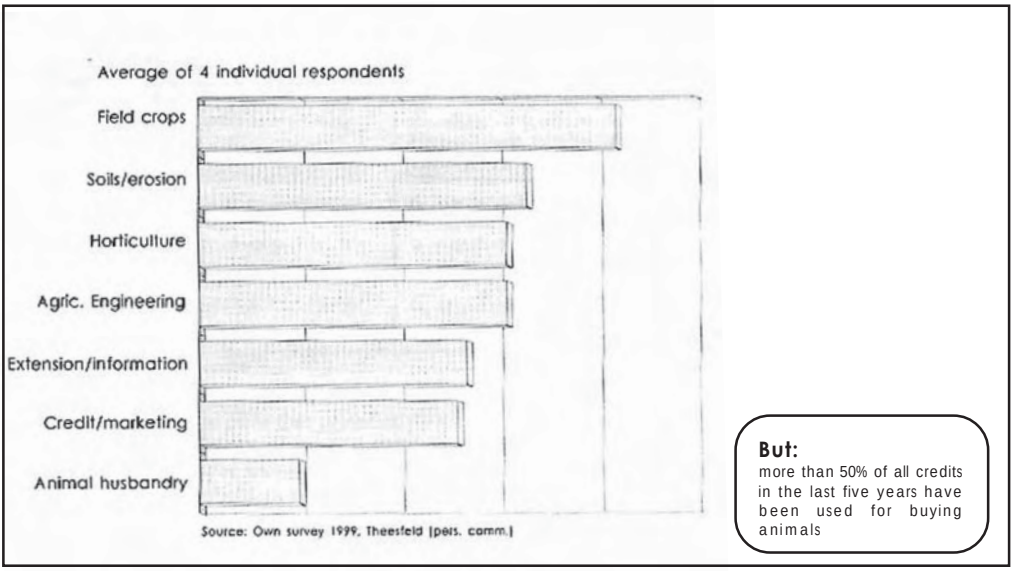
On the other hand, the researchers have their own problems in sorting out research questions from the priorities mentioned by farmers. If Hmong farmers in Northwest Vietnam give access to credit and markets the highest priority because they are disfavored by the formal financial markets and poor infrastructure, is that a problem that deserves more research or is that a pure development problem and a question of political will?

Farmers sometimes also present problems they think the outsider wants to hear (cf. Neubert, 2000). By presenting a whole range of visualized topics simultaneously to the farmers, this bias might be reduced, although not totally excluded. Some farmers' priorities and relevant research questions could not be identified during a short village survey or with the use of participatory appraisal tools. Therefore, the combination of qualitative and participatory methods with longer-term field studies is a necessary prerequisite to gain a more realistic picture of the situation.

In a Dao village of Northern Vietnam, Participatory Rural Appraisal (PRA) exercises with both male and female farmers suggested that livestock does not play an important role in the village. An intensive study on rural credit, however, found that more than 50% of the credits were invested in animals. It turned out that the village headman had recently announced that farmers should not increase

their livestock numbers due to limited feed resources. This indicated that the response of farmers given during the PRA exercise was the "politically correct" view, but did not reflect their real priorities (Figure 4).

Figure 4. Priorities in a Dao Village in Ba Be District, Bac Kan Province, North Vietnam



A major limitation of the ranking of topics by using pictures lies simply in the fact that not all potential priority themes can be visualized. Land tenure conflicts and local power relations, for example, have significant impact on access to resources and technologies and are thus relevant for research, but appeared too abstract to be visualized. Another limitation is that pictures might be interpreted differently, depending on the sociocultural and educational background of the respondents.

Finally, in heterogeneous highland regions, the selection of villages for investigation already predetermines some of the results. The fact that the presence of the researcher, and the expectations that farmers have of him/her, can also influence farmers' stated preferences, cannot be excluded.

Ethical Considerations and Interests of Other Stakeholders

As with many methods from the PRA toolbox, priority ranking can raise high expectations among the participants of the exercise. While priority ranking for development-related problems (e.g., construction of a school or a rice mill) can directly result in material benefits for the villagers, beneficial results of agricultural research cannot be guaranteed. In the particular case of this research program, funding was not assured. It is therefore imperative that farmers participating in the ranking of priorities are informed about the uncertainty of the implications of their participation.

The example below (Table 1) shows that priorities seen by upstream farmers are not necessarily compatible with the views of other stakeholders in the region. While the population in the upper watershed would primarily emphasize their production functions, other stakeholders are usually more concerned about the service functions of the watershed. In following only the interests and priorities of upstream communities, research could miss out on issues that are relevant for a broader range of stakeholders.

Table 1. Conflicting Priorities in Watersheds of Mountainous Regions in Southeast Asia - Production Versus Service Functions

Production functions prioritized by the resident population in mountain watersheds	Service functions prioritized by other stakeholders (lowland populations, national governments and the global community)
sustain agricultural production on a long-term basis	conserve biodiversity and protect natural ecosystems
improve water availability for irrigation	regulate downstream water flows and prevent sedimentation of rivers and dams
retain forest resources for local uses: timber, fuel, grazing, non-timber products	sequester carbon to alleviate the threat of global warming

Adapted from Garrity, 1998

Conclusion

Picture-based ranking of research topics can be an interesting tool in identifying local stakeholders' priorities for agricultural research programs. It is important, however, to avoid typical biases of short-term diagnostic methods, to be aware of ethical concerns and to try to balance farmers' perspectives with the interest of other local stakeholders.

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Participatory Research and Development for Sustainable Agriculture and Natural Resource Management: A Sourcebook

Using Participatory Tools in Setting Gender-Sensitive Criteria for Acceptable Rice Varieties in Eastern India

Sustaining household food (rice security) is the main goal of poor farming households in rainfed lowland rice environments in Eastern India. To these people, this goal is difficult to achieve due to the biophysical and socio-economic factors constraining rice yields. Despite the long-term efforts through rice breeding research, some farmers in Eastern India have resisted their adoption and still continue to grow traditional rice varieties. This may be due to the farmers' lack of accessibility to new seeds or the lack of suitable rice varieties that are better than what are being currently grown. There has been a lack of understanding of the farmers' selection criteria, their environments and gender roles in rice production and processing.

Even with women's active involvement in rice production, postharvest and seed management, scientists who are mostly male often talk with the male farmers only. Ignoring women's knowledge and preference for rice varieties may be an obstacle to adoption of improved varieties, particularly in areas with gender-specific tasks, and in farm activities where women have considerable influence.

A released variety in India such as Pant-4 is high yielding but it is rejected by women farmers because it is difficult to thresh by hand. In contrast, traditional varieties that have low yields are still grown because of their desirable taste and their eating and cooking qualities that make them well-suited for rice products that women prepare.

This paper discusses the methods used in integrating a gender dimension in participatory varietal selection and lessons learned.

The Project

In 1997, the International Rice Research Institute (IRRI) in collaboration with the National Agricultural Research System (NARS) in Eastern India launched the "Farmer Participatory Plant Breeding Program." The program wanted to know two basic things:

- that farmer participation in rainfed rice breeding can help develop suitable varieties more efficiently
- that stages along a breeding program could be identified where farmer interfacing is optimal

The program had two components: a plant breeding component and a social science component that included gender studies. Since 1998, the program has incorporated gender concerns in on-going participatory plant breeding projects conducted by IRRI scientists and NARS. To incorporate both male and female farmers' perspectives, the following strategies were used:

- developing methodologies for assessing male and female criteria of useful traits of rice varieties of male and female farmers
- developing participatory approaches that include male and female farmers in selecting new rice lines
- further enhancing women's knowledge and skills in germplasm conservation
- enhancing NARS' capacities in conducting male and female farmer participatory approaches in rice germplasm enhancement and conservation in rainfed rice environments

The gender study was conducted in two villages of Uttar Pradesh. Basalatpur in Siddathnagar district represents a submergence-prone rainfed area while Mungeshpur in Faizabad district is a drought-prone area. Table 1 summarizes the villages' characteristics.

Table 1. Characteristics of the Project Sites

Characteristics	Research Sites	
	Basalatpur, Siddharthnagar	Mungeshpur, Faizabad
Agroecology	Submergence-prone	Drought-prone
Farming households (total no.)	140	133
Upland (%)	30	20
Between upland and lowland (%)	0	20
Lowland (%)	70	60
Adoption of modern varieties (%)	<20	82
Irrigation (private pump) (no.)	1	10
Average farm size (ha)	1	0.49
Caste composition of households (%)		
Upper caste	6	9
Backward caste	18	49
Scheduled caste	21	42
Minority	55	0
Distance to market (km)	5	28
Degree of market orientation	High	Low

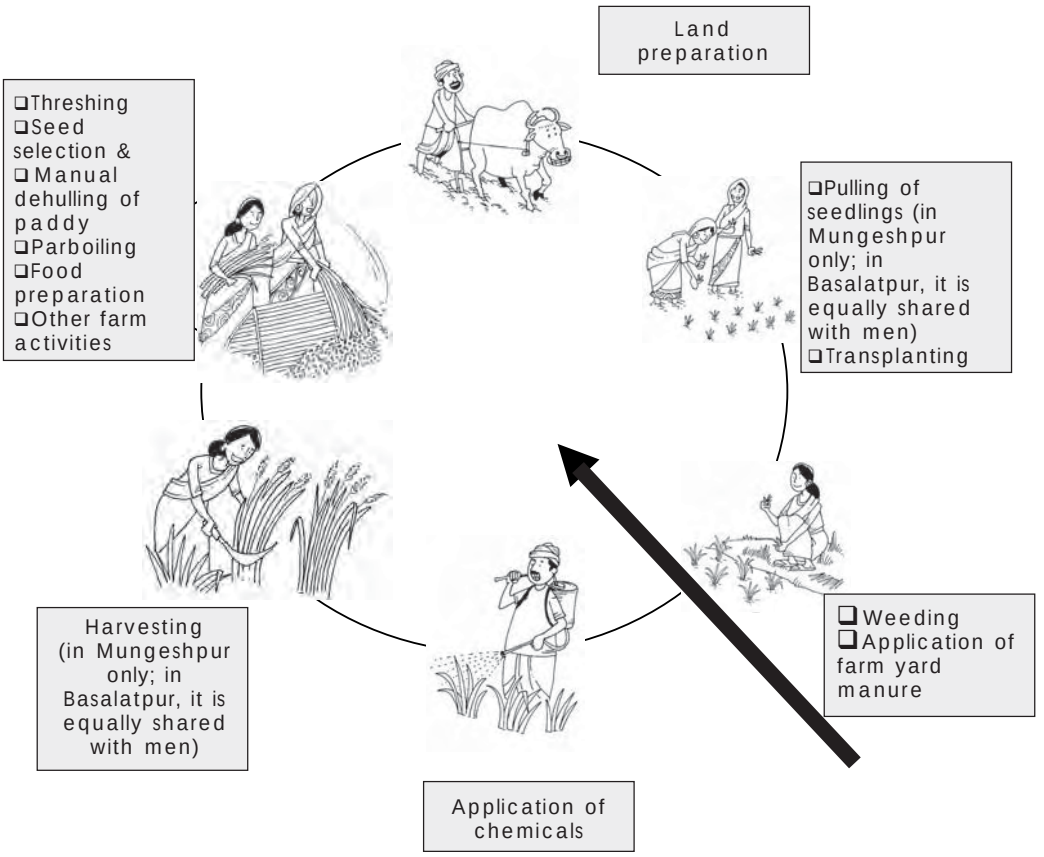
Women respondents were in their 40s and relatively younger than the males. Most of the women had farming experience of 20 years or more. The men, on the other hand, were more literate than the women.

Getting Male and Female Farmers' Criteria of Acceptability

To promote acceptance of modern rice varieties, the program set out to understand better the farmers' selection criteria, paying particular attention to women's opinions. Various participatory approaches were used.

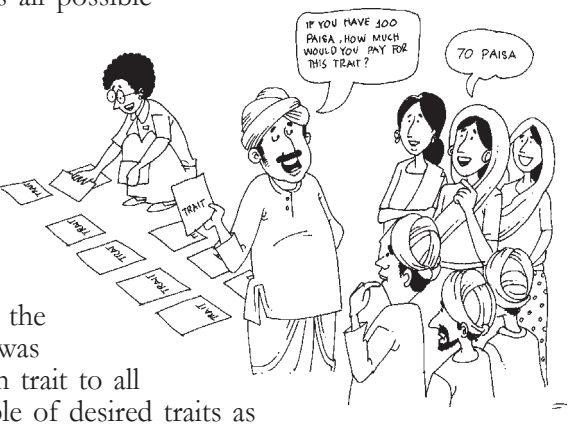
Female participation in rice production in both villages was high. Some tasks were dominated by men while others were generally done by women (Figure 1).

Figure 1. Activities Dominated by Either Male or Female Farmers in Two Villages of Uttar Pradesh, India.



Participatory Ranking Through Graphic Illustration of Traits

Illustrations of land types as well as all possible traits of rice were prepared. Paired combinations of land type and possible trait were then shown to farmers. They were then asked to select only the important traits they would consider in selecting rice varieties for the lowland and upland fields.



After all respondents had answered, the weights per trait for each land type was summed and the proportion of each trait to all traits mentioned was taken. A sample of desired traits as specified by men, women or both are presented in Table 2.

Table 2. Rice Traits Preferred by Male and Female Farmers in Two Villages of Uttar Pradesh, India

Research Sites		
By both male and female farmers	**By male farmers only**	**By female farmers only**
❑ Grain yield ❑ Duration (days from planting to harvest)	❑ Resistance to abiotic stress e.g., drought ❑ Adaptation to specific soil type	❑ Taste ❑ Post-harvest quality ❑ Cooking characteristics ❑ Quality and quantity of straw for animal folder ❑ Competitiveness to weeds

Note: These are just a few of the 15 traits ranked for lowland and upland farming by both villages.

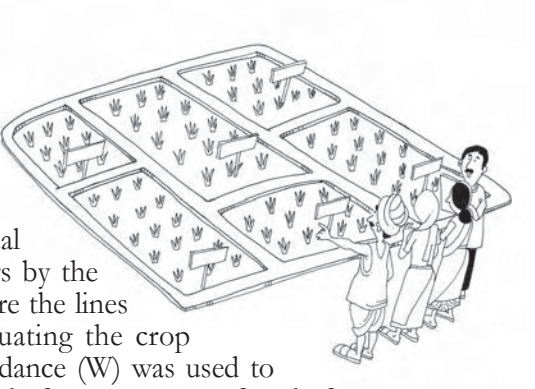
- In Basalatpur, both men and women preferred short duration, medium height varieties. Short duration crops were chosen because of the importance of growing early winter crops like oilseed, linseed, peas and potatoes.

- Women cited adaptation to several food preparations and other rice products as important criteria for selection, especially if traditional methods like hand pounding are still being used.

- High grain price is an important consideration for lowland farmers who sell traditional varieties that command a high price like *Kalamanak*. In contrast, grain price is not that important to the villagers of Mungeshpur because their harvest is mostly used for home consumption.

- Both male and female farmers of Mungeshpur place high priority to grain yield, and eating and cooking qualities. More women prefer traits like short to medium-maturity, grain price, competitiveness against weeds and ease in threshing.

Farmers' Preference Ranking



Five female and five male farmers observed 13 rice genotypes grown on individual plots in farmers' fields. They were then asked to rank the 13 rice lines from 1 (excellent) to 13 (worst) on the basis of visual assessment. The rankings of the new cultivars by the farmers generated a matrix (n x k), where n are the lines being evaluated and k are the farmers evaluating the crop performance. Kendall's coefficient of concordance (W) was used to measure the agreement in rankings among male farmers, among female farmers, and the correlation between male and female farmers' ranking. High and significant correlation values indicate close agreement on the ranking of the 13 rice genotypes by men and women in the sample.

In both villages, both male and female evaluators agreed closely in their ranking of the 13 rice lines. Early maturity and high-yielding lines were very acceptable.

Farmer Participation in Rice Varietal Selection

During the monsoon season, two farmers from each of the villages of Mungeshpur and Sariyawan (rainfed neighboring village) of Faizabad district, and Basalatpur of Siddathnagar district were selected to check the performance of 13 rice genotypes on their fields. The genotypes were 10 advanced lines from a shuttle breeding program from Uttar Pradesh and three released varieties for lowlands.

Of the 13 genotypes in Basalatpur, two are scented varieties (*Kamini*, which flowered in 136 days, and *Sugandha* flowering in 124 days). Scientists distributed the seed through the farmer Participatory Plant Breeding (PPB) project. In this approach, breeders select the most promising lines with farmers. Including female farmers as cooperators gave the women an equal chance to participate in selecting rice genotypes.

The average rice yields obtained by the two female farmers were higher (2 tons per hectare in Mungeshpur and 3.3 t/ha in Sariyawan) than those obtained from the male-managed farms. Average yields were below 2 t/ha because of the infestation of pests and diseases at the time of maturity. This indicates that if women are given equal access to improved seeds and farm management skills, they can be better farmers. Since 1998, participatory varietal selection had been going on farmers' fields by male and female farmers.

Sensory Evaluation of Introduced Rice Cultivars

An evaluation of sensory characteristics was conducted with farmers in a village of Bihar. Twenty-four farmers (12 women and 12 men) evaluated 15 upland rice

varieties as raw rice and parboiled rice for milled and cooked rice appearance, color, odor, texture, stickiness, taste and overall acceptability. The rice samples were milled and cooked by the women farmers following their ordinary practices.

Opinions of women and men farmers were similar, with significant to highly significant correlation between their rankings for milled rice appearance, cooked rice appearance, texture, color and taste. However, they did not agree strongly on stickiness and, to lower extent, odor. In terms of overall acceptability, there was no difference in women and men farmers' opinions on the tested varieties nor in the final choices of the varieties they liked most and least (Singh *et al.,* 2001).

Lessons and Insights from the Case Study

Several lessons were learned in developing and testing the methodologies for farmer participation that included a gender dimension. These lessons are related to the following concerns:

- **Number of cooperators per site.** Due to limited seeds, only two to three trials/farmer were included in each village. Thus, the risks of losing information due to severe drought, poor management of trials, etc. were higher with small number of farmer cooperators per site. Thus, in 2002, the number of cooperators (including women farmers) was increased per site. The "Mother-Baby" trial model may provide an alternative in testing a large number of cultivars under farmer management (Atlin *et al.,* 2002).

- **Number of varieties on demonstration trials to rank.** Farmers had difficulty in visually ranking too many (13-25) rice lines using the scale from 1 (best liked) to n (least liked). Farmers were willing to test a maximum of five varieties only on their field. A simple rating system, for example, 1-3 (bad, average, good) or 1-5 numerical scale, may be more preferable.

- **Constraints in postharvest operations.** Harvesting and threshing small quantities of new rice cultivars impose more hard work on female cooperators. Dehusking paddy manually and hand threshing the small quantities of new rice cultivars for identification and evaluation were too laborious and time consuming. Thus, it is important for field workers to help the women during the harvesting and threshing phase and to ensure that varieties/lines do not get mixed.

- **Selection of women farmer cooperators.** Farmer cooperators may be chosen based on these characteristics: *de jure* and *de facto* female heads of households who have long-term experience in farming; actively involved in rice operations and in decision-making; and no caste preference (whether from the upper caste or low caste).

Proper selection of cooperators will help ensure that the new rice lines are better managed and seeds are properly cleaned and stored.

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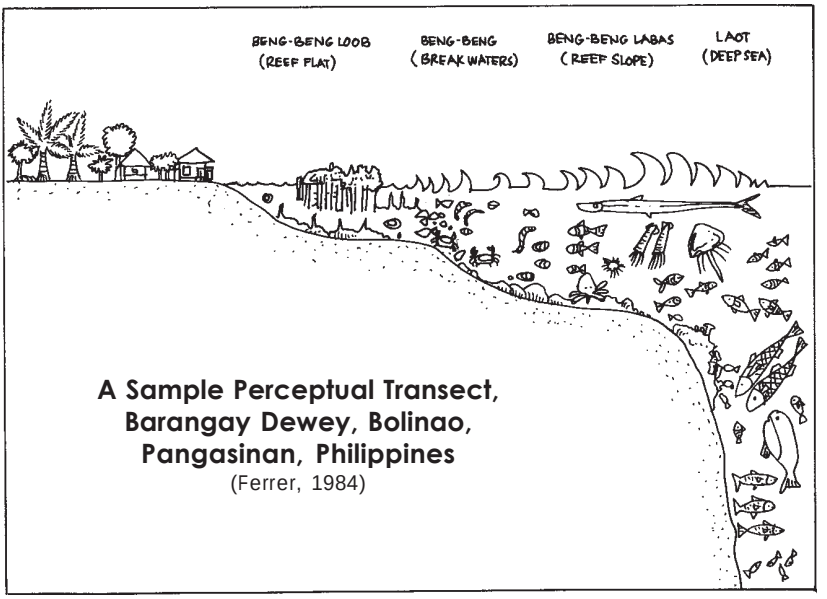
Use of Perceptual Transects in Coastal Aquaculture and Fishery



A Sample Perceptual Transect, Barangay Dewey, Bolinao, Pangasinan, Philippines
(Ferrer, 1984)

Over the last two decades, considerable attention has been focused on the development and refinement of participatory research and development (PR&D) methodologies. In the Philippines, the bulk of this work has taken place within the context of rural development initiatives focused on small agricultural communities.

There has been a general evolution of tools and techniques beginning with Farming Systems Research (FSR) and moving on to more contemporary tools, including Farmer Participatory Research (FPR), Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA) and Participatory Learning Approach (PLA). The primary focus was on strategies to generate better dialogue and understanding between researchers and farmers.

Traditional approaches to aquaculture and fishery management have been criticized because they tended to focus almost exclusively on the behavior of fish, while ignoring for the most part, the behavior of fisherfolks. It has also been noted that ignoring the

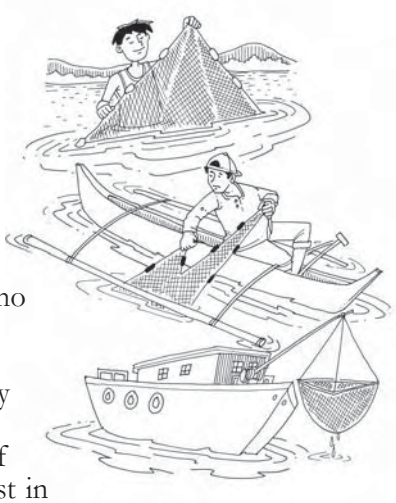
Building upon RRA and PRA, participatory approaches to aquaculture have often been used to increase the researcher's or practitioner's understanding of the role that aquaculture and fisheries management play in rural livelihood as opposed to the more technical activities. Participatory tools have been used primarily to assist in needs assessment and identification of research questions and opportunities for more effective management of the fishery resource base.

interrelationships between fish, fisherfolks and regulators invariably leads to management strategies that fail to meet long-term objectives.

A key element in the application of RRA to fisheries management has been the use of participatory tools to create more collaborative relationships between planners and those affected by the plans. One of the major lessons learned has been that the major constraints to improved management tend to be related more to conflict resolution than limitations in technology.

Participatory Research and Development Applied to Coastal and Reef Fisheries

The focus in adapting participatory processes to coastal zone aquaculture and fishery resource management is not only on participatory tools but also on conditions and environments in which they were originally developed. One of the basic conditions that provided a base for the applications of participatory approaches in agriculture is the farmer's general control over land and labor. Such farmers are free to decide on how they allocate and use these resources to meet their immediate needs for food and income.



Unlike the majority of small farmers who own or have direct use rights over the land they farm, coastal fishers and operators of certain kinds of aquaculture systems generally compete in a kind of common property environment. Compared to small farming communities where residents tend to share similar resource management strategies and goals, coastal residents often find themselves co-existing with multiple stakeholders who can have a different and often conflicting agenda.

An individual fisherfolk or a particular fishing community does not own a coastal reef. It is basically a common property resource (CPR). Even if a village considers itself to have traditional use rights over the reef, most reefs exist in national waters that are in essence an open access resource available to all citizens. This means that it is very difficult to keep outsiders from coming and exploiting the same fishing grounds for their own interest and profit.

Traditional residents often have little real control over the key resource base on which they depend for livelihood, with increased population density in most coastal areas. This can have a profound impact on the efficacy of participatory approaches designed to increase the ownership and control the villagers have over their own development.

Another difference between inland and upland agricultural environments and coastal zones is the degree to which they are impacted by forces beyond the control of local residents. There are general steps that upland farmers can take to reduce soil erosion in their fields. In fact, empowering farmers to assume greater roles in soil conservation and natural resource management, either individually or collectively, has been a focus of much participatory work.

Coastal residents are often severely impacted by upstream erosion, water pollution and flooding, over which they have no control. For most coastal areas in Southeast Asia, seasonal river flooding, pollution and siltation of mangroves and reefs caused by upstream erosion and run-off is a major constraint to artesinal fishery and aquaculture.

This comparison applies not only to environmental conditions but extends to the economic sector as well. Farmers and coastal fisherfolks both rely on external markets and have little influence over price. Farmers, however, have greater options to withhold food crops from the market hoping to get a better price later in the season.

Fisherfolks, unless willing to dry their catch, have little choice but to sell their fish on the same day they are caught, and hence are at the total mercy of buyers. Practitioners of PR&D in coastal areas need to recognize these conditions and develop appropriate tools and techniques that will help residents to deal more effectively with a complex, multi-stakeholder reality.

Early work in the Philippines includes the development of a manual of rapid appraisal techniques for Philippine coastal fisheries (Fox, 1986) and a set of coastal resource profiles (Ferrer, 1984). In the mid 1990s, researchers at the International Center for Living Aquatic Resources Management (ICLARM) developed a set of methodologies for assessing the contribution of aquaculture in small farming systems (RESTORE) and the management of coastal and reef fisheries (RACE, RAFMS and RAMP).

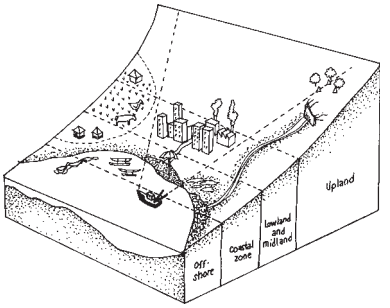
The Research Tool for Natural Resource Management Monitoring & Evaluation (RESTORE) is a long-term transformational process that is closely aligned with PLA and participatory action research. Rapid Appraisal of Coastal Environments (RACE) and Rapid Appraisal of Fisheries Management Systems (RAFMS) are largely research-led adaptations of RRA and PRA methods. RAMP is an ethnographic-based process that involves the collection of secondary and primary, as well as quantitative and qualitative data.

Use of Perceptual Transects in Developing Fishery and Coastal Zone Management

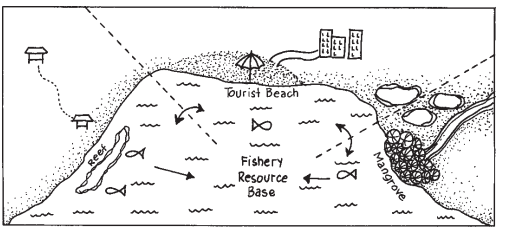
Practitioners need to focus not only on local households and community groups but also on identifying external factors that have impacts on how villagers perceive and manage their coastal resources. The transect analysis is a tool that can help practitioners and villagers recognize the factors and actors affecting a development activity.

A transect is a visual cross-section of a particular environment that highlights the different microenvironments or subsystems within the area under investigation. Transect analysis focuses on the flows or energy and resources from one area to another.

The Geographical Information System (GIS), satellite imagery and RRA complement the transects in generating and displaying a range of information and data. The PRA-type tools capture a higher degree of complexity surrounding fishery and aquaculture activities in coastal areas.



A Sample Vertical Transect



A Sample Horizontal Transect

It is possible to construct generalized transects that reflect a complex array of resource and material flows within and between terrestrial and marine environments. The coastal transect generally covers many miles of considerable physical and ecological differentiation, unlike the small-scale transects of a given upland farm or village that can be trekked by a group of researchers and farmers.

Researchers and practitioners should recognize perceptions of different stakeholders as important predictors of human behavior, especially in environments with a high degree of human and biophysical diversity. Transects and focus group interviews can be used to develop imagery of both the real and perceived environment. Inconsistencies between the perceptions of the environment and the behavior of different stakeholder groups are often indicators of unseen barriers to collective action and effective co-management of the resource base.

Perceptual transects that approximate the world view of different stakeholders can assist in identifying:

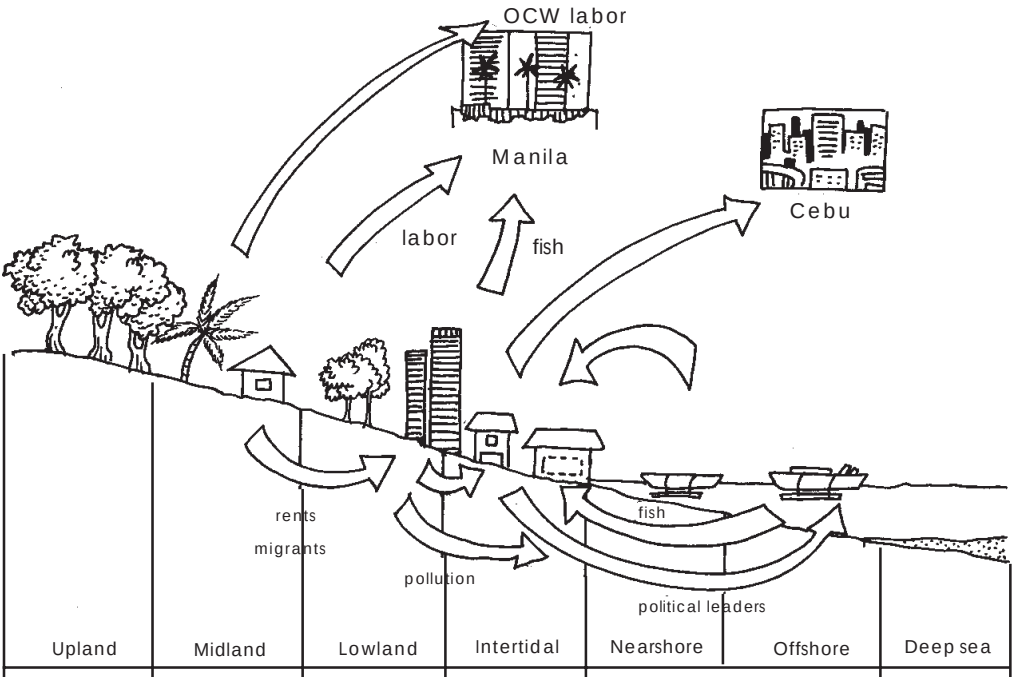
- different views of the resource, and its various uses
- society- and value-based norms that influence distribution and allocation patterns

Steps in Developing Perceptual Transects

A range of tools and techniques associated with RRA, PRA and PALM (informal interviews, resource maps and geographical and historical transects) can be used to help community residents generate their own perceptual transects. Having individual informants and villagers or fisherfolks draw their own transects and resource maps can often result in the identification of many important elements in the environment that may not have emerged in the informal interview.

Each stakeholder or stakeholder group, including both men and women, must be presented with the same opportunity to "paint" as broad, or as narrow, an environmental picture as they wish. It is critical that the image clearly reflects, as much as possible, all aspects of the environment that are important to each stakeholder, or in someway impact upon their quality of life. Such maps and transects can depict perceptions in both space and time.

Figure 1. Sample Coastal Transect
Biophysical, Socioeconomic, Administrative and Political Characteristics
Maqueda Bay, Philippines.



Upland	Midland	Lowland	Intertidal	Nearshore	Offshore	Deep sea
Secondary forest	Coconuts/corn grown by tenant farmers on land owned by municipalities	cassava/corn grown by tenants on land owned by municipal elite	municipal elite control market and dominate fish distribution to regional and national urban center	heavy competition between artisanal and commercial fishers		
	loocal traders supply fish to Inland villages on market days	denuded hillsides	difficult for Local Government Unit (LGU) to enforce fishing regulations	common use of illegal trawling and dynamite		
	out migration of village youth for schooling and domestic labor	high cost of electricity and poor infrastructure make local processing of fish and agricultural products difficult		completely unregulated open access marine resource base		
				over-exploited fishery but with same control of illegal methods fishers feel there would be enough for everyone		

Adapted from: McArthur, 1995

Perceptions are an Enduring and Resilient Force

Perceptions commonly reflect an ideal or desired state that may not necessarily be consistent with actual conditions. In a discussion with a group of fisherfolks in Central Philippines, there was general agreement among respondents that if only illegal trawling and the use of dynamite could be controlled, there would be enough fish for everyone. This view was not borne by an objective assessment of the local fishery by marine biologists and fishery specialists (Pullin *et al*., 1994). Nonetheless, this perception and others like it, are likely to be the driving force behind management behavior and fishing strategies.

People base decisions and behavior on how they perceive a situation and not so much because the perceptions accurately mirror local conditions, but because they reflect what people want to believe. People the world over tend to reject or deny what is unpleasant, or uncontrollable. The more useful a perception is to a particular group, the longer it is likely to be maintained, even in the presence of evidence to the contrary (McArthur, 1995).

Strategies designed to elicit perceptual transects or mental resource maps may provide important information which practitioners and stakeholders can use to deal openly with differing interests in managing a common resource base. A comparison of perceptual transects may help identify groups of people who place a similar value on a specific set of attributes or behavior. Such judgment groups (Hammond *et al.*, 1975) may play key roles in conflict resolution as they make explicit the differences between competing groups.

Perceptual transects, as a tool, can help to identify what different stakeholders feel they have to gain or lose in the resolution of a dispute. Such transects may also be useful in distinguishing between conflicts that arise out of competing interests and those that emerge from different value orientations.

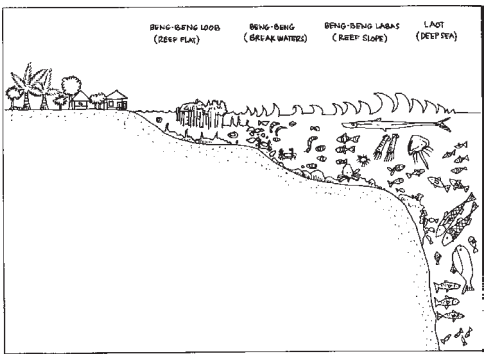
The inclusion of perceptual transects in the management database should produce a closer balance of focus on both prey (fish) and predator (human fisherfolks). The objective is looking both at what fisherfolks are doing and what they think the fish are doing. This multi-objective approach should build upon measured assessments of the fishery base, as well as perceptions and perceived expectations of the fisherfolks and the regulators.

Comparisons between present and past situation historical transects can provide a striking summary of the changing conditions to which coastal residents and fisherfolks have to adjust. Observing the transect making process (be it on paper or drawn on the ground) can often provide valuable information on local environmental knowledge and the degree to which this is shared across a village or between different stakeholders.

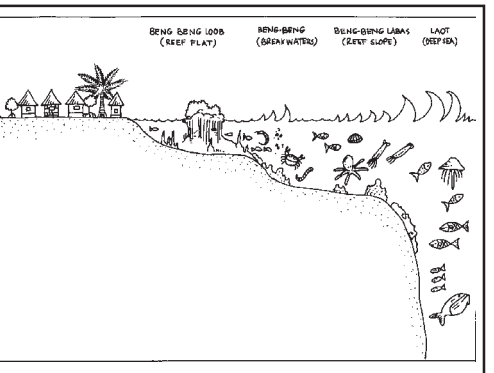
It is assumed that an individual perceptual transect will focus the greatest detail on aspects of the resource base that are most useful or meaningful to the stakeholder. The rest of the surrounding environment will likely be compressed and exhibit less differentiation.

It is possible to construct a composite perceptual transect based on the detailed portions of several individual stakeholder resource maps that represent different stakeholder groups such as men, women, artesinal and commercial fisherfolks. Such images help identify areas of potential complementarity in resource management, as well as nodes of competing or conflicting interests.

Figure 2. Sample Perceptual Transects of PAST and PRESENT Conditions



Sample Perceptual Transect of PAST Conditions (Barangay Dewey, Bolinao, Pangasinan, Philippines)



Sample Perceptual Transect of PRESENT Conditions (Barangay Dewey, Bolinao, Pangasinan, Philippines)

Building upon the physical transect, color-coding or some other technique may be used to indicate different stakeholder ownership or access patterns to a particular resource. Colored arrows may also be used to indicate which group of stakeholders has primary control over particular extraction technologies, market structures, and channels of distribution.

In comparing different perceptual transects, it may be possible to identify distinct judgment or interest groups among the various stakeholders. An important objective in analyzing perceptual transects is determining the nature of the key groupings of stakeholders in the resource base, and the important value orientations, economic interests and political positions they hold. The transect also facilitates identification of monetary and non-monetary resources and their impact on market transactions and property rights.

Future Challenges and Opportunities

It is clear from the various approaches and methods described that applying PR&D processes in aquaculture and fisheries owes a lot to the evolution of participatory methodologies focused on agricultural and community development. Adapting the methods and tools to fit aquaculture and fisheries was necessary. Working in densely-populated coastal areas requires addressing not only the needs of individual families and fisher groups. Increasingly, one also needs to work within the context of a larger arena of competing municipalities, as well as national and foreign stakeholders who all claim varying rights to, or are attempting to exploit legally or otherwise, the open access to coastal fishery.

The challenges are more social and political, rather than technical in nature. Where conflict is an overriding issue, participatory methods may have to embrace aspects of stakeholder analysis and dispute mediation processes. This creates an opportunity in which communities and fisher groups can assume greater roles in designing and implementing management strategies. The issues in an open access

resource environment are very similar to those encountered by development workers who are trying to apply participatory processes to integrated watershed management.

Practitioners need resources to work with multiple villages and groups. They should also motivate communities and stakeholders to participate in processes that will hopefully help them identify common interests. Ultimately, this increases their awareness on how actions and management strategies affect surrounding communities along the coastline or up and down a watershed.

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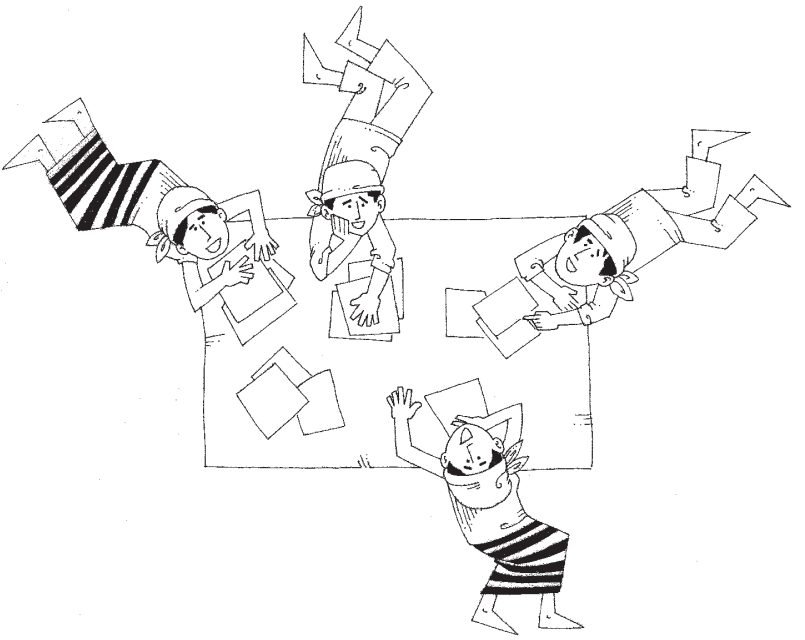
Development of a Farmer Recording System in Burkina Faso



Collection of quantitative and qualitative data requires regular monitoring of labor and other inputs. Conventional surveys do not produce sufficiently detailed information, and close monitoring by scientists would have been too time-consuming.

In Burkina Faso, the Integrated Soil and Water Conservation in Africa (ISWC) program was facilitating joint research on the sustainability of improved traditional planting pits called zaï. It also looked at the socioeconomic constraints related to zaï, such as the use of materials and the time investment for digging and managing the planting pits at the household level. It was responsible for monitoring the joint experimentation but could not visit the participating farmers on a daily basis to interview them about their activities. The scientists felt that reasonably reliable quantitative information could be generated only if the farmers would record the data themselves. They believe that developing a Participatory Rural Appraisal (PRA) tool would also serve to reduce the role of external actors in participatory research (PR) and to increase the credibility of PR in the eyes of conventional researchers because scientifically-valid data would be generated.

Instead of text that the farmers could not read, drawings were used to visualize the different agricultural activities. Because keeping records was a completely new activity for the farmers, the scientists thought it best not to overload them with data collection and therefore reduced the number of parameters to be recorded to a minimum.

Most farmers involved in the ISWC-Burkina program are illiterate. Setting up and carrying out joint experiments and fully involving the farmers in these experiments required the creation of a system that would allow them to record data about their farming activities.

During a working session in May 1999, the scientists, a PRA specialist from the PRA Network of Burkina Faso, and farmers involved in the program selected the following parameters: labor inputs, the amount of organic matter used (which largely determines the success of zaï) and the yields of cereals (millet and sorghum), and crop residues.

Description of the Recording Tool

The new tool consists of a series of recording sheets that allow farmers to record the selected parameters on a daily and weekly basis. They need not write down numbers; they can simply mark one of the boxes. Three types of sheets were developed to collect the information. In each case, a different sheet is used for each major farming activity, and all sheets for one activity are bound into a booklet.

- The first type sheet is for recording the labor invested in a farming activity on a daily basis over a week (Figure 1). Each activity is represented by a symbol. And under each activity, every actor or source of labor input (man, woman, child...) are also represented by appropriate symbols.

Figure 1. Sheet for Recording the Labor Inputs Into Agricultural Activities

			Farming Activity			
Days in the week	Duration of work	Labor input **Man**	Labor input **Woman**	Labor input **Child**	External labor input	Cash expenses on hired labor
Day 1 (1 symbol)	●					
	◒					
Day 2 (2 symbols)	●					
	◒					
Day 3 (3 symbols)	●					
	◒					
Day 4 (4 symbols)	●					
	◒					
Day 5 (5 symbols)	●					
	◒					
Day 6 (6 symbols)	●					
	◒					
Day 7 (7 symbols)	●					
	◒					

Legend: ● Full workday ◒ Half workday **X** Day of the week **W** Local currency

- The second type of sheet summarizes the use of labor over the entire season for each farming activity (Figure 2). It thus gives the farmer an overview of the total amount of labor invested in each activity being monitored.

Figure 2. Sheet Summarizing Total Labor Input Into a Defined Agricultural Activity Throughout One Season

	Activity Monitored 			
	Man 	Woman 	Child 	Paid Labor 
	9	28	13	W O
	38	76	33	W O

- The third type of sheet is for recording the amount of materials carried to and from the fields (e.g., the amount of compost taken to the fields, the amount of harvested grain and crop residues taken from the field to the compound) (Figure 3).

Figure 3. Sheet for Recording the Amount of Manure Transported to the Fields

	No. of donkey carts 	No. of baskets transported by bicycle 	No. of baskets carried on the head 
Number			

Developing and Using the Tool

The development of this tool required the participation of all the partners in the joint experimentation. The process went through the following steps.

Defining the Content and Approach

During a working session, the scientists, non-government organization (NGO) staff, and the PRA specialist from the PRA Network discussed the general contents of the tool needed, the general approach to be taken to develop it, and a time frame for its development. The contents reflected the data needed by the scientists to analyze the zaï technique.

Designing the Tool

The scientists and the PRA specialist then exchanged ideas on the form in which the different activities to be monitored will be presented. The basic principle was that it should be easy for the farmers to master the tool. For each major farming

activity associated with the zaï, representative symbols were identified. The PRA specialist made drawings and tested these with some of the farmer experimenters to find out whether they understood the symbols. The symbols that passed the tests were integrated into recording sheets.

The scientists participated regularly in the discussions, as they wanted to be sure that their interests were being taken into account. The PRA specialist prepared draft booklets for the eight following activities: compost production (labor for compost pits digging, filling, watering and emptying), compost transportation to field, digging and fertilizing of zaï pits, sowing, weeding, maintenance, harvesting, harvest transportation and storage, crops residue transportation. The major focus was on the labor requirements for each activity, but two booklets were concerned on quantities (the amount of compost and manure used and the total harvest).

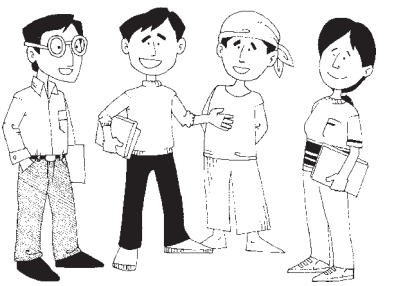
Presenting and Discussing the First Draft of the Tool

The scientists, NGO staff, and PRA specialists met with nine farmer experimenters and explained to them how to use the tool. The nine men quickly understood and had no difficulties in completing some exercises proposed by the scientists and in filling in the different sheets. The farmers proposed small changes in the drawings so that they would be easily recognized.

Finalizing the Tool

Based on the farmers' comments, the PRA specialist finalized the design. The PRA Network then produced 50 sets of each of the 12 booklets.

Training Farmer Innovators to Use the Tool



The 20 farmers who were involved in the experiments and who would start working with the tool, along with 12 other interested farmers, met for a demonstration of the tool and did several practical exercises with it. This session allowed the farmers to familiarize themselves with the tool. Because of the time and costs involved in producing the tool and monitoring its use, the ISWC program initially gave it only to the 20 farmer experimenters. The farmers started using it immediately after the training. It took only one month to move from Step 1 to Step 5. The process started in May 1999, and because of the wet season (it is usually expected in June), the scientists urged all partners to move ahead quickly.

Monitoring and Supporting the Farmers in Using the Tool

Field agents from Organisation Recherche Formation Appui Accompagnement aux Communautes de Base (ORFA), an NGO involved in the program, visited each of the 20 farmers once a week to provide support, and if necessary, to help correct certain mistakes in filling in the sheets. The support visits to the farmers became less frequent after one month because the field agents could see that the

farmers had fully mastered the tool by then. However, during monitoring by ORFA, it became evident that six of the 20 farmers (30%) were recording exaggerated data. The field agents could easily discern this, because they knew the composition of the labor force in each household. They did not discuss this matter openly with the farmers, leaving them to find out for themselves whether it was advantageous to exaggerate. The ORFA staff suspected that these farmers wanted to emphasize to the others how much work they were investing in the different activities.

Analyzing the Results

The scientists analyzed the data and discussed them with the 20 farmer experimenters at a meeting held in April 2000. However, before this, the farmers had started using the data themselves. In 1998, a Farmer Innovator Network had been formed in Yatenga Region with the support of ISWC program and, during a meeting in November 1999, the 20 farmer experimenters described the tool to all 41 members of the Network. During this session, one of the farmer experimenters presented some of his calculations. He had used the total labor inputs that he had recorded for each activity and valued each working day at 750 CFA (about US$ 1.25 per day). He was thus able to present a clear picture of investments into the different farming activities.

Lessons from the Program

During a meeting of all partners in April 2000, a general evaluation was made of the use of the recording tool. The following lessons were drawn:

- The tool was generally applied well. Seventy percent of the farmer experimenters filled in the data correctly and calculated the total number of days for each activity, while making a distinction between the source of labor (men, women and children).

- Two farmers asked support from literate persons (generally their children) to keep the records. This may have led to errors, because these other family members were not trained in the use of the tool.

- The innovators proposed certain changes, such as the need to include the costs of food and drink for traditional group labor; this confirms that they fully understood and mastered the tool.

- During a brainstorming session on what to do with the tool in the future, the farmer experimenters suggested that the tool should be made available to their neighbors. They have concluded recording information in this way would be useful for all farmers, and therefore wanted to see the use of the tool widely spread.

- The interest in the tool is broad and the farmers who have experienced it are thinking about how they could continue to use it even after the ISWC program has ended. They have already copied the contents of each recording sheet into their own notebooks.

- All farmer innovators appeared to use the tool for decision-making. One illiterate farmer, Ali Ouédraogo from Gourcy village, exclaimed enthusiastically that, from this moment on 'even our meals will no longer be unplanned.' The use of this tool has stimulated the farmers to ask additional questions, such as 'Should we reduce the area we cultivate?' and 'Why have certain fields not produced well despite all the labor or manure used?'

- All scientists and field agents who were involved in this experience have agreed to continue to use and refine the tool.

The same 20 farmers continued to use the tool in the year 2000. The first impressions of the ORFA field agents are that the exaggerations observed in 1999 are no longer being made. The farmers felt that they have developed a new skill that helps them to make better decisions. Further monitoring and analysis by all research partners should show the impact of the use of this tool on the farmers' management decisions.

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Farmer Demonstration Trials:
Promoting Tree Planting and Farmer Innovation in Indonesia

In many areas across Southeast Asia, deforestation has created a scarcity of productive forest resources. This shrinking forest base, combined with a growing human population and an expanding middle class with discretionary income, results in an increased demand for forest and tree products – timber, fruit, spices, medicines, etc. This demand creates incentives for smallholder tree farming. In some communities, smallholder farmers have spontaneously planted or protected trees to provide products for home and market. Farmers see tree farming as a way to diversify production and income; reduce risk; make more efficient use of their limited inputs (labor, time, land, capital); and build assets for the future. Smallholder tree farming is often successful because of the farmers' self-interest to profit from their efforts. However, these systems are not universal.

In many communities, farmers are adjusting from a situation of 'open-access forests' to one where trees are scarce. These farmers lack the tree planting skills necessary to develop viable tree farming systems. Well-intended top-down development efforts to help farmers expand tree resources often achieved little, because species selection, plantation design, and location are often imposed without considering farmers' objectives or market opportunities. Active farmer participation is essential to develop successful tree farming systems that address the biophysical and socioeconomic conditions faced by farmers.

This paper describes farmer demonstration trials (FDT) and summarizes the experiences in developing FDT with smallholder farmers and non-government organizations (NGOs) in Indonesia.

Farmer Demonstration Trials

Farmer demonstration trials are evaluation trials designed by researchers/ extension staff with farmers for establishment and management under farmers' biophysical, socioeconomic, and management conditions intended to:

- test and demonstrate the advantages of good germplasm (species, provenances, varieties, clones, or seed sources)
- expand on-farm tree resources
- inspire farmer/NGO innovation
- serve as a future source of on-farm seed production

Implementation Team

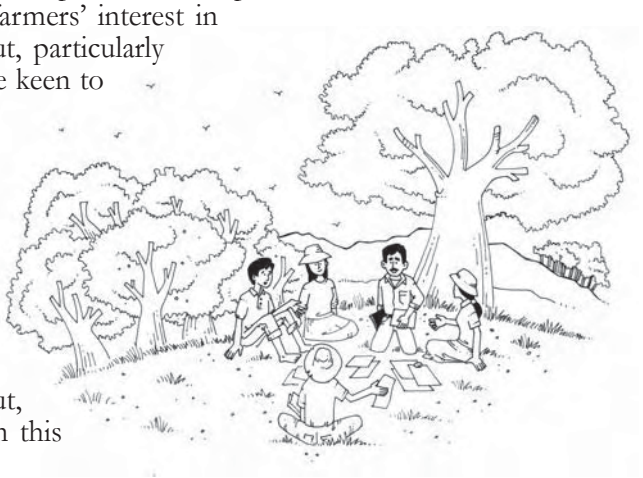
Developing a program on FDT requires an implementation team (IT) of at least two people: a community organizing specialist and a tree specialist. The IT can be larger, or can seek assistance when necessary from social or technical specialists of government agencies, NGOs, or other stakeholders.

Getting Started

Farmer interest should be gauged under informal conditions. Most often, FDTs are conducted where the IT is active. Pre-existing linkages provide easy access to communities. Contact key farmer leaders and ask if they could discuss tree farming with you. Adjust time to fit farmers' schedules. Be ready to discuss the issue during the preliminary contact, but realize farmers are busy and it may be best to return a few days later.

Initial Discussion

Tell farmers you are interested in learning about their tree farming systems. Avoid mentioning trials or tree-planting support until after you have gauged their interest. Start by asking farmers about their current tree resources, tree management methods, and the tree products collected from forests. The discussion should lead to farmers' tree problems and priorities. If not, steer the conversation to those topics and farmers' interest in tree planting. Record farmers' input, particularly their priority species. If farmers are keen to plant trees, mention FDTs and schedule a follow-up meeting (farmer workshop). Even a little interest is enough to get started. However, if farmers are not interested, do not push the issue. Forcing a community to plant trees is a sure formula for failure. Choose another community. In order to obtain representative input, 10-20 farmers should participate in this initial discussion.



Germplasm and Markets

Germplasm and markets are crucial elements to any successful tree-planting activity. Before the workshop, conduct a rapid reconnaissance of the local area to determine tree germplasm (seed or seedlings) availability and tree product marketability. Farmer priority species for which germplasm is available and strong markets exist for their products, can be considered 'best bet' species on which FDTs should focus. Germplasm availability is evaluated by visiting tree nurseries, tree seed dealers, and seed sources. Whether seedlings should be produced or purchased depends on the existence of village tree nurseries and the time remaining before the planting season.

'Best bet' species are species for which sufficient evidence indicates strong value to both household and market economies, making those species a priority for smallholder tree-domestication activities and FDTs.

In the first year of a FDT program, it may be easier to purchase, rather then produce seedlings. Marketable tree products are identified by visiting local markets and market agents. Farmer leaders can assist in this process. Betser (2000) provides a framework for rapid market surveys. Although the framework is more detailed than what is needed here, it provides insight on ways to identify marketable tree products. More thorough market analysis and germplasm evaluation can be conducted as the FDT program progresses.

Farmer Workshop

The farmer workshop is held in the village. Its purpose is to confirm farmer interest, build partnership, and develop a work plan. Start the workshop by reviewing farmers' and IT's interest in tree farming and the FDT concept. A short review may be sufficient, but be prepared to discuss FDTs in detail. To facilitate this process, invite other specialists (a forester or horticulturist) to complement the skills of the IT during the workshop.

To provide visual examples of possible FDTs, the workshop should include a field visit to timber, fruit tree, or mixed plantations – whichever is appropriate. Contact the landowner or manager prior to the visit and ask them to present a site summary. The IT should point out key aspects of the tree system that are relevant to farmers. Farmers will benefit greatly from the field visit.

Designing Farmer Demonstration Trials

Following the field visit, the farmers are ready to design FDTs, with the assistance of the IT. The key aspects of a FDT design are objectives, species, tree spacing and management. Draft designs should be completed during the workshop.

CAUTION: Field trips: Do not visit sites that are not relevant to farmers or that are beyond the IT's capacity to adapt to farmers' conditions.

Objectives

The objectives should be simple and clear. For example, to introduce x new species and test their survival and growth rates (during the first two years) under local

biophysical conditions or to compare the survival and growth rates (during the first 2 years) of x species under local biophysical conditions. The species included in the FDT should be specified by common and botanical name. Farmer and IT objectives could differ, but should be complementary. The IT should avoid imposing their objectives to farmers!

Best Bet Species

A list of best bet species will result from the rapid reconnaissance. It may include local species (as a control), new provenances or varieties of local species, and new species. With concurrence of farmers, the IT may add species to the best bet list that may fit farmers' priorities. Species may be timber, fruits or multiple-purpose trees. Each of these species groups has a different function. If more then one species group is included in a FDT, the objective is not to directly compare their performance, but to evaluate their compatibility. It is wise to start with species that serve both a household use and meet a market demand.

Tree Seed

Most farmers and NGOs involved with tree planting activities face annual shortages of tree seeds. To meet their needs, they use whatever seed is available regardless of quality. Studies indicate that over 75% of the seed used is collected locally. Establishing quality on-farm seed sources is a viable way to improve the quality of the tree seed used by farmers and NGOs. See Mulawarman *et al.*, 2003 for information on seed source establishment and management.

Trial Design of FDTs

In the beginning, particularly with farmers who have limited tree-planting experience, the design and objectives of FDTs should be made simple. One standard design and set of objectives will suffice for all participating farmers.

Tree Spacing and Management

Tree spacing and management greatly effect FDT success. Farmers with limited tree-planting experience will require strong guidance. FDTs are intended to address farmers' needs. Listen to farmers' concerns and use their input to develop the design. Sometimes farmer input is not technically sound. For example, many farmers want to plant at dense spacing without thinning trees. They initially ignore that trees need additional space as they grow larger. Politely explain the limits of their design and suggest alternatives. Most farmers will appreciate the comments and quickly grasp the reason.

Examples of Trial Design

A simple design could have the objective to compare growth and survival of five timber species, each planted in two blocks of 25 trees at spacing of 2 x 4 m (total area approximately 0.2 ha). Such a design will provide farmers the information they seek and targets success. As farmers gain experience, more complicated, farmer-specific designs will develop.

Examples of more complicated designs are alternate rows of short- and long-rotation timber trees, or testing various intensities of branch pruning. More complicated designs require more management and monitoring from the IT and tree specialists. The IT must be ready to provide this input.

The idea is not to dictate a management regime, but rather provide a range of options, which farmers can adapt to their conditions. Intercropping with annual crops during the first 1-3 years should be

encouraged. Farmers will benefit from crop yields, and trees will benefit from management (fertilization, weed control, etc.) of the annual crops. Mulawarman *et al.,* 2003 provides good guidelines of successful tree establishment and management.

Roles and Support

At the onset, it is important to be clear about roles and levels of support. Generally, farmers and the IT design and establish FDTs together. Farmers are responsible for managing the trials, with advice from the IT. However, if farmers wish to alter the management plan – even remove the trees – they are free to do so. Both farmers and the IT conduct monitoring and evaluation (M&E), as each may have different objectives and criteria. Franzel (2000) describes the *bao* game, an evaluation technique the IT can help farmers implement. The IT should clearly state that the trees are farmers' property. The IT has no claim to the trees and nor is the IT responsible for buying the tree products. Discuss the respective roles and responsibilities of farmers and the IT with all participants and document the outcome.

Appropriate support from the IT include the cost of workshops, field visits and trainings; technical information (manuals, leaflets, etc); germplasm; nursery materials; and agricultural inputs (fertilizer, pesticides in case of infestations, etc). Hats and t-shirts are a good promotional tool that build enthusiasm – but they are not necessary. Avoid giving money. Experience indicates money attracts the wrong type of participants; raises unrealistic expectation; hampers self-motivation; and dilutes the focus of the activity. Asking farmers to provide some type of in-kind matching support strengthens partnership and demonstrates farmers' commitment.

It is wise to start a FDT program with a small number of farmers. At one site, only seven farmers in two villages were involved in first year activities. Following the success of those trials, 20 additional local farmers and a few neighboring villages wanted to establish FTDs. Success breeds demand, the IT must gauge its capacity to meet demand before expanding.

Other Stakeholders

Government technical agencies and NGOs have roles to play in developing FDT. Most technical agencies are mandated to serve the needs of the smallholder farming communities, but are ill-equipped to do so. Through involvement in the FDT process, technical agencies will gain participation skills. Experience shows that the staff of technical agencies quickly perceive the advantage of participatory approaches in their own work. While meeting their agency's mission and goal remains a priority, benefiting smallholder communities becomes an important objective. Most NGOs have close linkages with local communities and understand local conditions. Not all NGOs are proficient with tree-planting activities; but their staff is usually motivated and eager to learn. Operating through NGOs can

greatly expand the impact of a FDT program. The planning workshop is modified for an NGO audience; the level of technical intensity can be increased. Each NGO could develop one or a series of FDTs. Roles, responsibilities and levels of support should be specified in a contract.

Timeframe and Planning

Implementing a FDT program should take 3-12 months. To facilitate planning, initial contact with farmers should be three months before the planting season – at least 4 -5 months if a nursery is to be established and seedlings are to be produced. Ample nursery management guidelines exist and need not be discussed here. Any forestry office and many NGOs can provide advice regarding nurseries. The farmer or NGO workshop may take 1-3 days.

A three-day workshop would have the following agenda:

- Day 1 – Discuss local tree farming systems, farmer tree needs, and FDT concept
- Day 2 – Field Visit
- Day 3 – Design of FDTs

As with any tree planting activity, FDT establishment must be preceded by thorough land preparation and planned to coincide with the beginning of the rainy season. Most FDTs are established on fallow or marginal agricultural land. Control of grass and other herbaceous vegetation is a priority during the first year.

Follow-up meetings every 3-6 months should be held to visit FDTs and identify tree-related problems and opportunities. If the implementing organization is active in the community, FDTs should be one component of a wider development program.

Research or Development?

FDTs are primarily a development tool, working examples intended to develop on-farm tree resources; help farmers gain tree-farming experience; and generate information that is immediately applicable to farmers' conditions. Research applications are of secondary importance. FDTs are generally good to evaluate farmer acceptability and profitability of the species and designs tested, and to identify farmer innovation. Because replication, randomization and treatments are not strictly applied, FDTs have limited potential to evaluate biophysical parameters. If biophysical evaluation is desired, parallel researcher-controlled trials can be established nearby on farms or research stations. Franzel (1999) provides a comparison of researcher and farmer trials, which is illustrative to people interested in developing FDTs.

Limitations and Related Issues

There are a number of technical, policy and socioeconomic issues that may limit the potential of FDTs. Key technical issues include germplasm collection and management, tree propagation and nursery management, tree management, fire management and intercrop management. Farmer training in these areas will enhance FDT success and sustainability. Policy concerns include land tenure, market access, and tree utilization. Inadequate rights in these areas restrict farmers' ability to benefit from tree farming. Parallel activities by interdisciplinary teams to address policy issues can enhance farmers' tree-farming rights and thus the relevance of FDTs.

Jealousy, competition and favoritism within the community can limit the success and impact of any development activity. Participation in a FDT program should be transparent and equitable, including as many community sub-groups as possible. The potential public benefits and impacts of the FDT process should be articulated to the entire community. Jealousy within the community can be reduced by producing (or purchasing) extra seedlings for distribution to interested farmers. At distribution, the IT records the name of the farmer, species/number of seedlings distributed and objective/plan for planting the seedling. Farmers are reassured that the seedlings are their private property and the IT has no claim on the trees or their products.

Tree product marketing, postharvest processing, and enterprise development are often identified as holding great promise for smallholders, as these issues have received little attention to date. Certainly the development of smallholder marketing linkages should be prioritized. Postharvest processing and enterprise development are much more complicated. Undertaking these activities requires a lot of new information, planning, skills, capital and cooperation among farmers; timely delivery of products; and entails significant financial risk. It is not likely that most farmers or farmer groups are prepared to assume such new challenges. Thorough assessment of the individual and institutional capacities within a community is required before promoting these activities.

Postharvest processing and enterprise development can not be considered an easy first step towards expanding local economic capacity. Farmers would be better served to first focus on establishing permanent market linkages, thoroughly understanding market demand, and developing their capacity to produce reliable quantities of high-quality tree products that meet market specifications.

Application Domain

FDTs are relevant to all rural populations, particularly those with a paucity of forest resources and close proximity to market centers. They are flexible and easily integrated into existing farming systems, particularly where landholdings are small (2 ha or less); marginal soils do not support continuous annual crop production; household labor and capital are limited; and need dictates the production of multiple crops (annual and perennial) for multiple purposes (timber, fuel, fruit, shade, soil conservation, etc). Experience shows that FDTs are an effective means of involving farmers in species evaluation and technology innovation. FDTs are very suitable to conditions where off-farm or seasonal employment in urban areas restrict the availability of household labor. FDTs help farmers develop the tree-farming systems and skills that are better suited to such socioeconomic conditions than annual cropping alone.

The technical and leadership capacity built through the FDT process empowers communities and creates conditions where sustainable smallholder tree farming cultures can evolve. Beyond enhancing local livelihood, the creation of tree-farming cultures directly advance the international public environmental goals of land rehabilitation/reforestation, carbon sequestration, watershed protection and biodiversity conservation.

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