EPTD WORKSHOP SUMMARY PAPER NO. 2

DESIGNING POLICY RESEARCH ON LOCAL ORGANIZATIONS IN NATURAL RESOURCE MANAGEMENT

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EPTD Workshop Summary Papers provide an overview of the discussions and findings of workshops and conferences that the Division has helped organize or sponsor. It is generally expected that a proceedings volume of papers will be published at a later date.

ABSTRACT

As policy research on natural resource management (NRM) evolves, new priorities are emerging related to the strategy, design and implementation of policies to support local organizations (LOs) as managers of natural resources. However, research on policies affecting LOs is at a very early stage, with no accepted body of indicators, methodologies and conceptual approaches, and little documentation or critique of the research methods that have been used. To address this gap, and to lay the basis for a future program of comparative research, IFPRI, CIFOR and ODI co-sponsored an international workshop in October 1994, with experts from different disciplines and different resource domains. This synthesis paper highlights and further explores the discussions and recommendations of that workshop.

The main policy factors which affect LOs are economic, legal and institutional, and political. Key policy research questions are to estimate or predict the level or type of impact of particular policies on LOs and their management of natural resources; to identify the "leverage" points through which policy does or might influence LOs and policy design features which influence effectiveness; and to understand or influence the process of policy formulation. LOs have an interest in the results of policy research, both to influence policy and to improve their own support programs. Indeed, one of the principal challenges for the design of policy research in this area is to link research and action agendas. Having LOs as partners in research brings both advantages and challenges for research design.

As researchers struggle to design of policy research on local organizations in NRM, they must choose carefully their specific policy questions, resaerch tools, indicators and research methodologies. It can be difficult to define actual policies and policy objectives related to LOs and NRM, as well as the degree and nature of policy implementation. Different disciplines offer a wide and complementary range of instruments for collection of data on policy action, effects on LOs, change in natural resource management, and final effects on social, economic and natural resource conditions. Comparative analysis between case studies requires that researchers regularly collect and report information about contextual factors which are proven or hypothesized to influence local organizations. Participants identified key variables of group structure and function and of resource management outcomes and identified key issues to be addressed in selecting indicators for these variables. Further work is needed to prioritize variables and indicators and to develop standard measurement techniques including the use of indicators based on local people's criteria of evaluation.

The choice of appropriate analytical tools to explore or test hypotheses linking policies and LO behavior remains controversial. Game theory and simulation models seem useful, at this time, mainly for theoretical work. More empirically-driven econometric models permit some testing of hypotheses about policy impact, but were critiqued as

tending to be overly deterministic, in an arena which some argued was highly context-specific and/or path-dependent. In-depth case studies used for process or action research were seen by some as more reliable guides to understanding the actual relationships between policies, LOs and NRM, but important questions of sampling and extrapolation were raised. Some tentative approaches to reconcile comparative and location-specific research and different disciplinary perspectives were suggested.

Clearly, this field needs further methodology development, which draws upon and integrates different disciplines and perspectives. The new CGIAR Inter-Center Initiative on Property Rights and Collective Action in Natural Resource Management offers a promising forum to discuss and test alternative approaches with a range of research partners, and to develop standard data protocols which will facilitate comparison of results across studies.

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ACRONYMS

CGIAR	Consultative Group for International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIFOR	Center for International Forestry Research
ICI	Inter-Center Initiative
ICRAF	International Center for Research on Agroforestry
IFPRI	International Food Policy Research Institute
IIED	International Institute for Environment and Development
IIMI	International Irrigation Management Institute
ILCA	International Livestock Center for Africa
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
LO	Local Organization
NGO	Non-Governmental Organization
NRM	Natural Resource Management
ODI	Overseas Development Institute
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal

PREFACE

As policy research on natural resource management evolves, new priorities related to the strategy, design and implementation of policies to support local organizations as managers of natural resources are emerging. This new focus on the role of local organizations originates from multiple sources: increasing devolution of resource management responsibilities away from national public agency control, a search for increased efficiencies through local community-public agency partnerships, democratization leading to recognition of longstanding traditional local rights over resources, and new economic opportunities for development of natural resources.

The Consultative Group for International Agricultural Research (CGIAR) has undertaken a number of activities related to local organizations in natural resource management over the past decade. IIMI has worked with irrigation user groups in Asia, ICLARM with fishing groups in Asia and Latin America, ILCA with communal range management in Africa, CIAT with watershed associations, and IFPRI with water user associations in India and Africa.

With the recent re-orientation of the CGIAR towards natural resource management, new research has begun at ISNAR on the role of local groups in technology research, at ICRAF for agroforestry planning in watershed management, and at IRRI in integrated pest management. The new forestry center established in 1992, CIFOR, has placed issues of devolution and local community management of forest resources at the heart of its own policy research program. In 1994, IFPRI established a new program of comparative research on Property Rights and Collective Action for Natural Resource Management, with projects on forest, rangeland, irrigation, and watershed policy issues, in Latin America, Africa and Asia. In 1995, IFPRI was designated as the "convening center" for the CGIAR Inter-Center Initiative on property rights and collective action. Planning efforts are now underway for this initiative, involving both CGIAR and other international and national research centers.

This new focus within the CGIAR reflects an expansion of interest within the international research community. In the past the ODI's networks on community forestry, irrigation, agriculture, and range management have examined the role and options for local organizations in natural resource management, but in recent years they have focused increasing attention on the policy environment within which those organizations operate. A number of non-governmental organizations which support local organizations in natural resource management have also turned their attention to policy issues, in the hopes of replicating widely the successful results of their work in diverse community projects. Many are interested in policy research to improve the design of their own programs, and to provide information for advocacy work with policymakers.

Nonetheless, research on policies affecting local organization is at a very early stage.

There is no accepted body of indicators, methodologies and conceptual approaches, and little documentation or critique of research methods that have been used. An IFPRI literature review (Rasmussen and Meinzen-Dick 1995) concluded that research design problems were significantly hindering effective use of the proliferating body of case studies for comparative analysis and policy formulation.

Informal interactions among researchers at IFPRI, CIFOR and ODI around these issues led, in 1994, to a joint initiative to organize a workshop to bring together some of the most experienced people working on local organizations in natural resource management in developing countries. The objective was to assess the "state-of-the-art" of policy research on this topic, and the major challenges, "lessons learned," and "gaps" in research design. A very successful workshop was held in October 1994, co-sponsored by IFPRI, CIFOR and ODI, with Ford Foundation funding for the participation of experts from developing countries. The discussions and conclusions of that workshop produced this Synthesis, as well as a commitment to expand collaborative policy research in the future, through the Inter-Center Initiative.

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1. BACKGROUND, OBJECTIVES AND ORGANIZATION

POLICY RESEARCH ON LOCAL ORGANIZATIONS IN NRM

In the past two decades, interest in relationships between international and national policy and the role of local organizations (LOs) in natural resource management (NRM) in the tropics has grown. Increased attention to these relationships reflects several factors. First, structural adjustment has led to strong pressures to reduce direct national government spending in all areas, including NRM. Thus, national governments and those concerned for the protection of natural resources are increasingly seeking alternative institutional

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mechanisms for their management. At the same time, scrutiny of the quality of direct government resource management has led to the conclusion that local management is, or is likely to be, a superior strategy for promoting resource husbandry at least under some conditions. This conclusion has been drawn not only for management of forests, irrigation systems, range and in-shore fisheries, but also for soil and water conservation, watershed management, and development and testing of agricultural technologies, particularly in heterogeneous or "marginal" areas.

At the same time, the weakening of the state has led many groups to seek to establish (or re-establish) local rights of access and control over natural resources. In many countries, the rise of more democratic regimes has led to new opportunities for negotiation between central government and local people.

Policies at all levels can, however, constrain the initiation, perpetuation and expansion of LO initiatives. Indeed, policies can create a stumbling block to effective NRM by local groups, which cannot be offset by good organization, extension, etc. These concerns have led to a flurry of policy changes related to LOs, including legislation about their legal status and rights, new regulations on local resource management, new terms of relationship with public resource agencies, programs to encourage formation and strengthening of LOs, channeling of government or donor financial resources directly to LOs, group marketing initiatives, group credit, and new research partnerships.

Unfortunately, many of these "top-down" policy initiatives have been designed with little understanding of the dynamics and potentials of LOs for different types of activities, under different socioeconomic and resource conditions. Numerous case studies have

documented the exceptional performance of local organizations in eliciting action on the part of local land and resource users to delimit, develop and manage resources that are vital to their sustained well-being. However, it is not clear how and whether these examples of grassroots local organization can be successfully replicated.

Policymakers need to understand LOs better in order to determine how to support them and strengthen their effectiveness in NRM. LOs, particularly those seeking to federate, and agencies supporting LOs (both government and non-government), are beginning to evaluate their own policies to find out what is working and what is not. Some are even undertaking research on public policies so that they can lobby more effectively for changes. Thus, the challenge of doing good research on policies for local organization in natural resource management has become important not only to the academy, development agencies, and governments, but also to LOs.

BACKGROUND TO THIS SYNTHESIS

A brief review of the genesis of this synthesis document on "Designing Policy Research on Local Organizations in Natural Resource Management," explains both its contributions and its limitations.

Identifying the "Gaps" in Research Design

The International Food Policy Research Institute (IFPRI) began to set up a new program of policy research on Property Rights and Collective Action in 1993. The program initiated a literature review on LOs in NRM, focusing on those publications which evaluated existing collections of studies (Rasmussen and Meinzen-Dick 1995). This review identified

not only a gap in coverage of policy issues related to the subject, but also serious gaps in research methodology. Despite a huge number of case studies, reviewers had difficulty drawing solid conclusions from comparing study results. In particular, conceptual frameworks, variables, and indicators used varied widely. IFPRI decided to tackle this problem before initiating a new generation of case studies.

Meanwhile, several scientists from IFPRI, CIFOR, ODI, and ISNAR had begun to discuss possible collaboration in research on LOs. Their previous experience in this type of research confirmed the view that more comparative research was needed, as were better methods for achieving this goal. Thus, they decided to design a forum for international social scientists, experienced with practices and issues of local organizations in natural resource management, to share views and develop strategies for future research.

The Workshop

IFPRI, ODI, and CIFOR organized a workshop with input from ISNAR on *Policies for Local Organizations in Natural Resource Management* to identify a theoretical and methodological focus for pursuing future research efficiently and with the greatest possible impact on policy. A group of 28 social scientists from 22 organizations came together in October, 1994 to consider the research challenges posed by these issues. The workshop included economists, political scientists, geographers, sociologists, anthropologists and natural resource scientists from various resource domains. Participants were experienced in forestry, agroforestry, soil and water conservation, rangelands, irrigation and fisheries. Annex 1 lists the workshop participants with their institutional affiliations.

Prior to the workshop the Steering Committee delivered a collection of background papers to participants. These were selected to familiarize the group with 1) examples of successful management regimes involving local organizations in various resource domains; 2) the diversity of local organizational forms; 3) certain effects of policy on management; and 4) various modes of inquiry within this subject area. These references, together with IFPRI's literature review, were intended to sensitize participants to the theoretical and practical bases for current policies and constraints. They are listed in the bibliography. Participants were requested to bring to the workshop summaries of their own recent, on-going or proposed research concerned with issues that are pertinent to the workshop. These case materials are listed in Annex 2.

Following a sequence of introductory and orientation sessions, the 3-day workshop featured working group and plenary discussions on specific tasks related to research design, including (see Annex 3 for the full agenda):

- Factors affecting the relationship between local groups and natural resource management;
- Policy questions and appropriate methods;
- Indicators of effective resource management;
- Indicators of linkage between group activity and condition of the resource;
- Syntheses of key methodological approaches and research strategies.

The Steering Committee initially planned that the workshop would generate a minimum set of essential data and indicators that could serve multiple disciplines and sectors, allowing for better comparability among future studies. It became evident, however, that the

extreme variability of conditions and the limited theoretical underpinnings inhibited the accomplishment of this task. Workshop deliberations emphasized the context-dependence of local organizational efforts in natural resource management, and their various interactions with policy. Therefore, participants placed priority on identifying key variables for comparative analysis and on generating principles, guidelines and innovative approaches for the design of appropriate studies.

Following the workshop, the Steering Committee convened again several times to digest and further discuss the workshop conclusions. The final outline for this synthesis document came out of this brainstorming. This synthesis integrates workshop discussions with clearer problem definition and outlines of promising new approaches. The objective of publishing and circulating this synthesis is to generate further thinking and promote additional inter-institutional collaboration in this area of research.

CONCEPTS AND TERMS

The workshop and this paper were organized around the theme of "local organizations", rather than "common property institutions." These two types of institutions often, but do not always overlap. LOs can play a critical role in NRM, even where legal property rights in the resource itself are individualized, or are controlled by the state. Examples include organizations of farmers for watershed management, or participation in public forest management by neighboring communities. In all cases, however, there is some element of "common property resource," whether tangible or intangible, which explains the interest of individuals in group organization.

We have defined "local organization" as any organization which is primarily accountable to local people. These may include small self-identified groups of as few as 4 to 5 people; larger groups organized along community, ethnic or other lines; or higher-level organizations, such as localities or federations. Local government which is locally controlled would be considered an LO, while the local office a government agency such as the National Forest Service would not.

Figure 1.1 presents graphically a simple conceptual framework which was developed to guide discussions at the workshop. It traces the impact of policies, as actually implemented, on LO activity directly, and indirectly through impacts on LO members or potential members. These organizational changes affect NRM patterns, which in turn affect a range of outcomes, including human welfare, the condition of the natural resources, and economic output. LOs can themselves have an input into policy, and are influenced both by internal characteristics, and the external environment.

ORGANIZATION OF THE PAPER

We have organized the paper into two parts. Part I clarifies "what we need to know" to begin designing policy research on LOs in NRM. Chapter 2 summarizes some

Figure 1.1

key findings from our literature review, focusing on gaps in existing research and in research design. Chapter 3 discusses key policy objectives, and then identifies three types of policy factors which condition or influence the capacity of local groups to organize and effectively manage natural resources: 1) specific legal and institutional rules that directly affect a group's ability to form and act; 2) the broader political environment that might favor or discourage group activity; and 3) sectoral policies and associated price, credit, subsidy and tax provisions. It also reviews key types of policy research questions. Chapter 4 explores the complex relationship between research and action objectives in studies of LOs in NRM: Who is the research for? Who should be doing the research? How can research help to build local capacity for action? How can the interests of different participants in research be reconciled?

Part II begins to answer the question: "How do we find out?" Chapter 5 explains how to properly define the policies being studied and determine their patterns of implementation. Chapter 6 examines some methodological approaches used in research linking policies and local organizations, and identifies some problems and potential solutions relating to the tension between disciplinary perspectives, the phasing of research, and the tension between comparative and location-specific research.

Chapter 7 develops a tentative list of critical variables in the external environment of LOs which can be expected to affect their response to policy. These relate to the physical and technical environment, the economic environment, the social and cultural environment, and politics and governance. Chapter 8 develops a tentative list of criteria for evaluating the effectiveness of LOs, along with critical aspects of LO internal structure. Chapter 9 presents

tentative lists of variables representing the outcomes of policy, specifically for soil and water conservation, forest management, and irrigation management.

The paper closes with Chapter 10 on "next steps". Here we summarize what we consider to be the priority gaps in policy research on LOs in NRM, and propose a set of actions, mainly at the international level, to further advance the implementation of the policy research, and improve research design and establish standards for comparative research. The workshop and associated activities served an important purpose in identifying and giving shape to this domain of inquiry, but the effort should be viewed as the initiation of an on-going dialogue on these issues and challenges. Further sharing of experience and insights by this group, and the various research networks associated with its members, are likely to yield rich results.

PART I

WHAT DO WE NEED TO KNOW?

2. LOCAL ORGANIZATIONS FOR NATURAL RESOURCE MANAGEMENT: THEMES AND GAPS FROM A LITERATURE REVIEW

Increasingly, people concerned with the sustainable use of natural resources are recognizing the centrality of social actors, their institutions and organizations in the management of these resources. Voluntary organizations at the local level that contribute to collective resource management are receiving particular attention, as alternatives to both state and private management systems. Clearly, improving the outcome of natural resource management practices and supporting transitions to new types of institutional arrangements requires an understanding of the factors which influence local organization in natural resource management.

In the past decade, the number of case studies in the empirical literature that explore management of various natural resources, from varying disciplinary perspectives, has grown rapidly. For example, one single reference, Martin's (1992) bibliography on common pool resources and collective action, holds 7250 citations. The theoretical literature, particularly game theory, is also growing. The literature review prepared as background for this workshop (Rasmussen and Meinzen-Dick 1995) focuses on studies that attempt to synthesize theoretical as well as empirical findings, rather than individual case studies. It draws from work relating to a range of natural resources, including water (especially irrigation), fisheries, forestry, and grazing land, with emphasis on the common lessons that apply across the

different types of resources. The remainder of this chapter draws upon this review to present a basic conceptual framework, and highlight the critical gaps which remain to be addressed.[1]

CONCEPTUAL FRAMEWORK

NRM depends upon, among other things, the interaction within and among organizations. External factors (independent variables) condition the mode of organization. The mode of organization and the pattern of interaction within the organization, in turn, affect the resource management outcome in terms of the natural resource condition, economic output of the system, and welfare of the group of users. Identifying factors that condition the local organization, and the types of organizations which facilitate sustainable natural resource management, are important for policies to assist local organizations.

The "Conference on Common Pool Resource Management," held by the National Academy of Science in 1985, catalyzed efforts to synthesize the findings from a range of case studies and develop a general framework for the analysis of natural resource management situations. The literature from this conference and other sources highlights factors conditioning local organization. These factors can be divided into three categories of variables:

physical and technical characteristics of the resource;

characteristics of the group of users;

attributes of institutional arrangements.

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[1] For a more complete review of the literature, readers are referred to Rasmussen and Meinzen-Dick (1995).

All of these factors condition the decision of individual resource users to participate in the organization. The outcome of the individual and collective decisions, in turn, influences the characteristics of the resource (natural resource outcomes), the characteristics of the group (in terms of size, equity, etc.), and the institutional arrangements (collective choice rules). Figure 2.1 presents a simple, short-run conceptual framework for examining the processes and relationships between local organizations and the environment. Broken lines are used to illustrate the dynamics and complexity of organizational changes.

Figure 2.1--Relationships among factors affecting local organization

The growing body of game theory has also explored issues related to individuals' ability to cooperate and organize voluntarily. The Prisoner's Dilemma Game, which supports a pessimistic view of the likely success of cooperation within NRM, is highly artificial, and misrepresents the conditions actually faced by individuals in most NRM situations. A number of alternative games have been applied to take into account the interactions between individuals. These games have identified the following factors which affect the degree or possibility of cooperation in local organizations:

relative benefits of cooperation (over alternatives);

size of the user group;

users' perceptions of time horizon;

degree of communication between players;

expectations;

degree of trust;

a willingness to try cooperation;

catalysts to start cooperation;

stability of the group;

existence of other cooperative structures;

non-anonymous relationship between members; and

content of social norms.

Although much of the literature on institutions for natural resource management focuses on the economic incentives for individuals and groups, mechanistic explanations cannot capture the full effect of local organizations. While these groups depend upon the

prevailing trust, cooperative structures, and social norms, successful cooperation for resource management also contributes to the likelihood of cooperation in other arenas. Thus, LOs in NRM draw upon and contribute to the stock of social capital, hence facilitating overall economic development.

REMAINING QUESTIONS TO BE ADDRESSED

Despite the burgeoning literature related to local organizations for NRM, and despite the convergence between game theory and empirical synthesis studies, several critical gaps remain. Researchers will always have new natural resource management situations, and more organizations to describe and analyze in detail. The priorities for such work depend on whether these require further research to develop new principles and insights, or simply require the application of existing principles. A number of key areas merit further attention to help explain the critical factors in group formation, and to develop policies which encourage local organizational efforts in NRM.

Although game theory has provided a number of important insights into the incentives for group formation and collective action, and is evolving to include norms, values, and other social factors that make the insights more applicable to the real world, players in the game still have only a limited set of possible strategies. As a result these games do not capture the complex alternative strategies which users actually confront. More refinement is also required to deal with implications for cooperation among large numbers of players, for dealing with heterogeneity among actors, and to address the complexity of natural resource management situations.

Even with the many empirical case studies and attempts to synthesize lessons from studies of local organizations, we are far from having ready prescriptions for successful NRM. One reason for this is the large number of dimensions and variables which need to be taken into account--with very few (if any) studies providing evidence on all of the critical dimensions. Indeed, the number of variables and the ways in which they are measured appear to grow faster than the number of cases, so that systematic analysis is always difficult.

Comparative Research

The lack of rigorous comparative research seriously limits synthesis and testing of factors that affect organizations. Each case study emphasizes different factors explaining the success of certain local organizations, but they rarely provide enough information about other factors to be able to compare cases and generate or test alternative hypotheses. Researchers must, therefore, out of necessity, depend upon the opinion of each study's authors as to what factors led to success or failure. As a result, many case findings remain open to different interpretations. Furthermore, we cannot hope to study every natural resource management context. Comparative analysis should enable us to generalize findings beyond the specific case study sites. Much can be done to draw lessons from synthetic reviews of existing case studies (e.g. Ostrom 1992; Tang 1992). However, new studies that provide information on the full spectrum of critical variables are important to balance the partial nature of information provided in most case studies.

Indicators

Part of the reason for the lack of comparative research lies in the difficulty of operationalizing many of the key concepts relating to the resource base, the users, and the

organizations themselves. Indicators which apply across a broad spectrum of situations are still needed if empirical work is to move beyond insightful, but idiosyncratic, studies. Attempts to reach a consensus on such indicators for the natural resource outcomes (resource condition, human welfare and economic output) during the present workshop demonstrated why this is such a difficult prospect. The variables of interest and means of measuring them vary depending on the research situation, the orientation of the researchers, and the tools and funding available. Indicators of economic output and welfare are more readily available than those of resource condition, but are not generally applied in studies of natural resource management (particularly in a comparative manner).

As difficult as it may be to measure the "independent" variables or factors affecting local organizations, the lack of consensus and coordination regarding indicators of organizational activity presents an even greater impediment to our understanding in this field. Researchers are often adept at identifying which are "good" organizations in the field, but it is much more difficult to specify what constitutes a "good" (or "strong") organization. For example, does a high frequency of meetings indicate an active organization, or an inefficient one? Separating indicators of organization from resource management outcomes also complicates the analysis. Thus, the degree of success in managing the resource is taken as an indicator of whether an organization is operating. Alternatively, the activity of a local organization may be taken as an end in itself that contributes to the stock of social capital, without considering how effective or efficient it is. In order to understand the factors that affect local organizations, and the role of such organizations in NRM, researchers must distinguish between and measure the independent variables, the activities of the organizations

themselves, the costs of participation and who bears those costs, and the outcomes for the resource base.

Selection Bias

While both game theory and empirical studies have shown that collective action is possible, further study of the limitations of voluntary local organizations would also be valuable. Researchers tend to select successful organizations for study. Organizations which have failed, or locations in which collective action has not emerged, are less likely to be examined. This selection bias may have serious repercussions in terms of overestimation of the capacity of LOs. Furthermore, identifying the problems and barriers is important for our understanding of how to facilitate local organizations.

Time

Determining cause and effect is difficult in natural resource management studies. Does the existence of the local organization lead to changes, or is the causality reversed? Sorting this out requires appropriate theoretical frameworks and measurement over time. Management of natural resources is a recursive process, in which activities and outcomes of one time period become the opportunity sets of the next time. These frameworks must capture the repeating scenarios to understand the evolution of management systems. Many valuable studies come from researchers spending two to five years at a site. However, funding for such studies is difficult to obtain, and there are tensions between the demand for researchers to spend years in the field to understand processes at specific sites and the need to collect data across a variety of sites for comparisons. To address this dilemma, researchers need to develop new portfolios of data collection that combine short-term, rapid

appraisal methods with longer term observation methods. Rapid appraisal methods when used in the same site repeatedly over an extended period of time may also strengthen research design. Researchers must develop arrangements to coordinate studies in order to collect complementary data.

Policy Questions

In many studies of local organizations, factors affecting organizations and NRM are treated as exogenous variables, without looking at the dynamics of how they can be changed. This may lead to considerable insight, but provides limited guidance to change or improve resource management outcomes. The latter requires that researchers identify the "leverage points" for change. Some are amenable to policy manipulation, such as through legal frameworks and state regulations. The question to address is what kinds of external support are helpful in strengthening local organizations, rather than taking over or undermining them.

The mechanisms through which local communities shape not only the organizations and the resource management outcomes, but even the environment in which they operate are insufficiently understood. Although process documentation in action research has traced out many of these linkages for particular cases, such feedback loops are missing from many conventional studies. The lobbying efforts of the organizations themselves, and their impact on policies, are often ignored. Thus, in addition to internal dynamics, further attention to the external relations of local organizations is needed. Indeed, one indicator of organizational effectiveness may be the extent to which they are able to influence state policies.

While many studies have focused on traditional organizations, these do not represent the full range of LOs involved in NRM. Customary and modern institutions have different

rules and roles. As states withdraw from attempts to manage natural resources at the local level, the role and complexity of LOs often increases, along with the requirements for formalization. Federations of base-level organizations, for example, allow the users to coordinate between groups and manage resources over a larger area. There are also more instances of joint management between government agencies and LOs. Capturing the crucial features of such complex institutional arrangements requires an understanding of internal arrangements and individuals' incentives to participate in the groups, with even greater attention to inter-group relations.

Finally, one can ask what implications these conclusions have in terms of policy considerations. First, the evidence suggests that voluntary organization for management of common property may be more successful than nationalization or privatization. This does not imply that local organizations will or can solve any collective action problem, and should not be a pretext for inaction by the external agents such as politicians, public servants, and national and international NGOs. Policy initiatives can be designed to reduce or remove potential physical-technical, sociological, economic, or institutional obstacles to local organization with the purpose of facilitating this process. For this, knowledge of the factors which condition local organization can enhance the analysis of policies to support local organizations for natural resource management, both in general analysis and in site-specific situations at the macro as well as the micro level.

3. POLICY RESEARCH ISSUES AND QUESTIONS

The first step in designing research on policies for LOs in NRM is to clarify the research questions. This involves clarifying policy objectives, identifying the policy factors of interest, and specifying the research question.

POLICY OBJECTIVES

Policymakers (broadly defined) usually wish to influence LOs management of natural resources, because they are interested in achieving some impact on a "final" policy objective. Examples may be:

- to increase the level of economic benefits produced by the natural resource base;
- to improve the condition of the natural resources (for environmental objectives);
- to improve the welfare of specific groups of natural resource users; and/or
- to re-distribute control over natural resource assets.

For obvious reasons, these goals may be incompatible, and policymakers must address the tradeoffs in objectives in setting priorities and designing policy instruments and programs.

As Figure 1.1 illustrated, to assess policy options and evaluate their impacts on any of these policy objectives, the policy researcher would ideally be able to clearly show that the policy under study actually influences local organizational activity (and that observed changes in LOs are not due to some other factor), that the change in LO activity actually leads to changes in NRM, and that those NRM changes actually lead to changes in economic benefits, human welfare or environmental quality. A specific research project may focus on only one

link in that chain; however, the other links should not then be merely assumed to occur in drawing research conclusions.

POLICIES WHICH AFFECT LOS IN NRM

In the past, most researchers who have examined local organizations in NRM considered policy variables to be exogenous factors. Nevertheless, existing theory and research findings suggest some priority policy issues and working hypotheses for new research. Specifically, three types of policy factors appear to condition or influence the capacity of local groups to organize and operate effectively:

- Economic policies;
- Legal and institutional policies; and
- Political factors.

Economic policies

Economic theory suggests that economic incentives will play a significant role in explaining the level and nature of local organizational activity in NRM. Policies may change the economic incentives for resource management, relative to other activities, or change the profitability of group, relative to private, resource management activities.

Sectoral policies (such as price stabilization schemes, subsidies, or taxes) affect the prices farmers face for key resource outputs or inputs (or competing substitutes). Special credit lines or co-financing facilities for natural resource investments may become available, reducing the cost of group or individual investments.

Regulations or restrictions on the use of specific natural resources affect their price, while restrictions on use of specific NRM technologies can raise or lower total costs. The level of public investment and maintenance of local and regional infrastructure for communications and transportation may affect groups' orientation to trade, the costs and returns of NRM, and transaction costs of group activity.

The above policy instruments have not often been used explicitly to encourage local organizations in NRM. Research is needed to determine which instruments are most appropriate for this task under different circumstances, and how they can be designed and used most effectively.

Research can determine local organizations' sensitivity to economic variables. This may require collecting fairly detailed information on existing NRM activities, to calculate financial benefits. Sensitivity and simulation analyses can assess the effect of a change in prices, taxes, subsidies, transport costs, or regulations on net benefits. Detailed information concerning the economic returns to alternative activities of individual group members, and from alternative group activities, may also be needed.

To assess producer response to such policies, financial analyses from the group and group members' perspectives would be needed. To assess the broader social impacts of policies, the analysis would need to include the effects of positive and negative externalities of collective action on other groups or resources, and to adjust for subsidies or other price distortions.

Institutional policies

Legal and institutional policies can directly affect the ability of groups to form and be publicly recognized and empowered to act. A growing body of research on this issue supports hypotheses that certain institutional arrangements are more likely to promote effective LO in NRM:

- Clear definition of property rights over the resource (ownership, access, etc., for land, forest or water) by the group, and government recognition of local resource management groups;
- Clear rights to organize locally, and flexible legal rules regarding formation, management and reporting of local organizations;
- Reliable enforcement of contracts/agreements with local organizations, with mechanisms to sanction different parties (including state agencies) if contracts are broken;
- Established mechanisms for conflict negotiation and resolution;
- Administrative and financial rules which create incentives for state agencies to work with local organizations (e.g., user fees helping to fund the agency);
- Effective channels for exchange of critical information about policy, economics, technology, etc., with groups; and
- Availability of adequate support services (e.g., legal, technical, financial, marketing) to local organizations from private sources, public agencies or NGOs.

Research on this category of policy can explore the most effective institutional arrangements to achieve these outcomes. Case studies and comparative research can identify

effective principles of design for legislation, regulations and institutions. For example, Ostrom et al. (1994a) articulated design principles for common property institutions. Comparative description and characterization of a wide range of options, backed by research analyzing their practical effects on organizational activity and NRM, would be a valuable resource for those involved in designing such instruments. Meinzen-Dick's 1994 study of public irrigation agency policy towards user groups provides an example.

Political factors

A third set of factors influencing natural resource management by local organizations relates to the broader political environment within which the organizations must operate. Political factors affect LOs' performance in serving their members, in achieving policy objectives or in influencing policy.

In many cases the relative strength of local government and other local, state, and national institutions with an interest in natural resources will determine the success of policies. The general level of partisanship and factionalism in local policy formulation and implementation can affect the stability and harmony of local organizations. The perceived commitment of government to the devolution of management rights to local people dramatically influences the willingness of individuals to participate in group activities. The potential of different groups of local people (by gender, ethnic group, economic class, etc.) to participate in the policy process can determine the ultimate distribution of benefits of organizational activity in NRM.

These political factors condition the effects of other policy instruments. Design of policy interventions and evaluation of the effectiveness of particular instruments must

consider these conditions. Where the political environment is fundamentally unsupportive to local organization of NRM, explicit attention must be paid to devising means to overcome or circumvent any barriers. Researchers must be careful not to assume that certain conditions preclude local action; rather they may call for innovations, or "second-best" strategies.

The political environment can, in fact, change over time. In designing studies, researchers need to determine which political factors to consider fixed, and which variable, depending upon the time frame of the study.

In this type of research, it is important to test assumptions that the political environment actually does affect LOs significantly. Other factors may, or may not, turn out to be more important, and local groups may find ways to work around the political conditions facing them. A more systematic attempt to assess the level and nature of group activity in NRM, under a range of political conditions, is needed. Poffenberger's (1993) study describing the political conditions which have led to spontaneous activity by forest user groups in the Indian highlands provides a good example of this type of assessment.

Selecting key policy factors for research

The traditional division of labor in research by academic discipline has often driven the research agenda on local organizations in NRM. The decision to focus on economic, institutional or political factors has typically been pre-determined by the discipline of the researcher, rather than the policy problem. Future research should assess the relative importance of these different types of factors in LO behavior, to understand how they interact, and to identify which policy instruments work the best under different economic, social and natural resource conditions.

TYPES OF POLICY RESEARCH QUESTIONS

It became clear during the workshop that many of the apparent conflicts over policy research design for LOs in NRM actually stemmed from participants' focus on different research questions. Research which seeks to document and quantify the *impacts* of particular policy alternatives, and research which seeks to understand the *processes* through which policy impacts NRM through LOs (and the implications for policy design and implementation) will require different methodological approaches. There is a clear difference in design requirements for studies which attempt to reconstruct the past, those which monitor on-going activity, and those which seek to predict the future. Most research questions seem to fall into one of the following categories:

1) How might LOs and their management of NR be influenced by policy action?

This question calls for basic research to deepen understanding among policymakers, organizational leaders and the general public about the relation between external factors, internal characteristics of LOs and NRM behavior, to identify possible "leverage points" for policy action. Such research is likely to require in-depth case studies of particular organizations, as well as broad, comparative analyses.

2) What was the impact of a particular policy on key policy outcomes?

This question calls for a research design that explicitly links a policy with its impact on LO behavior (an intermediate outcome), or beyond that with the resulting change in natural resource conditions, human welfare and/or economic output (final outcomes). This type of study must carefully distinguish effects due to policy from effects due to other internal and external factors.

3) How and why was a given policy (not) effective in influencing LOs in NRM?

The emphasis in this type of process research is not on confirming outcomes, but rather on identifying features of policy design and implementation that contribute to effectiveness. Such research requires studies to monitor and evaluate the mechanisms and pathways of policy impact on the local organization, and the nature of organizational response.

4) How could policy design be improved, from the local groups' and group members' perspectives?

This question might be asked during the process of policy formulation, or re-formulation. The research tools used should facilitate thoughtful and constructive feedback from the groups and individuals affected by the policy.

5) How and why was a certain policy formulated and implemented?

In this type of political economy research, the subject of study is the policy itself and its genesis. Key elements include policymakers' objectives and decisions about LO activity, actors in the policy formulation process, policy input from local people, and incentives for implementation agencies to carry out policies.

6) What might be the impact of a new policy on key policy outcomes?

The purpose of this type of research is to predict likely future impacts. Such an analysis would require some type of qualitative or quantitative model of the nature of policy impacts on outcomes.

Academic researchers, political officeholders, policy analysts and non-governmental policy advocates may ask different questions, in part due to their different time frames. Policymakers may want to be able to quickly model the effect of a new LO policy on, for example, the rate of deforestation, but the initial development of realistic model may take years of basic research on policy-LO-NRM linkages. Given very limited research resources, it makes sense for the international community to identify some priority long-term research questions, whose answers would help to elucidate a wide range of policy questions and provide a solid framework for short-term policy analysis.

4. LINKING RESEARCH AND ACTION OBJECTIVES

"The ultimate objective of all of us is to assist LOs in managing natural resources more effectively. This can be done via research or direct action." Elinor Ostrom.

Just as LOs have come to play a larger role in managing resources, they are also beginning to play a larger role in research about these relationships. There was recurrent discussion during the workshop on the role of local organizations in the research process - how far should research be controlled by them, conducted for them, and linked to their own strengthening as organizations? The workshop came to no single conclusion on this question. The discussion however, was framed by two broader issues: 1) the relationship between who and what the research is for, and 2) the type of methods to use.

In broad terms, research on policies, local organizations and natural resource management is concerned with improving knowledge of how policies enhance or constrain effective action. This type of knowledge presumably leads to better policy. Local organizations concerned with improving their ability to manage effectively, and perhaps their capacity to influence the policy development process, might engage in research to achieve these objectives. At the same time other actors have stakes in the policy research process.

The question of method has two components: 1) how should the research be conducted - the "technical" aspects of methodology, and 2) who should be involved in conducting the research. In the simplest terms, the message emerging was that these two methodological questions can only be addressed once it has been determined who and what the research is for.

WHO IS THE RESEARCH FOR?

Research about local organizations and natural resource management can be conducted for various clients: 1) the development assistance community, 2) policy makers, 3) local organizations, and 4) the researchers and research organizations. The interests of the different client groups are not mutually exclusive; that is, the same research could meet some needs of several of these groups. They will tend however, to have different demands of the research process. They will also have differing conceptions of what makes data credible and findings valid.

Most research is not intended simply for a "client group" that will use the research in their activities. Researchers and clients are often interested in influencing a "target group." In each case there are implications for methodology.

There are at least two components of a research program that these "consumers" of research might use or be influenced by. One is the final product. The other is the process of conducting the research. Often, LOs are interested in research more for the skills and knowledge that are generated in conducting it than for the conclusions. Policy makers generally are likely to focus on conclusions, and will accord these more legitimacy if the process meets their criteria for valid and reliable research. Involving policy makers in a process of participatory research with local groups on the other hand, can alter the policy makers' criteria for credible research. This occurs as they recognize "multiple social realities" and the various constructions of knowledge that are used to explain and support these.

METHODOLOGICAL TENSIONS

Discussion about the role of local organizations in the research process revealed several interrelated tensions of "universal" vs. "locally-specific" knowledge:

- criteria for validity in research;
- policy vs. action research;
- comparative vs. site specific research.

These are discussed below.

What Methods for Whose Criteria of Credible Information?

Policy makers, scientists and members of local organizations may have different criteria for deciding that information is valid and worth paying attention to. Policy makers may prefer to act on the basis of "objectively verifiable facts" that lead to generalizable conclusions. The conventional policy research support system generally aims to meet these criteria. If relying upon case study research for example, it is assumed that conclusions should be derived from rigorous syntheses across numerous, comparable cases.

Local organizations and peoples on the other hand are more likely to accord legitimacy to ideas that derive from a research process in which they are active, and which make sense within their own frames of reference. From this perspective, indicators and data that do not emerge from a participatory process of exploration and negotiation among various social actors are likely to be of dubious validity. This argument stems from premises of the constructivist or interpretative research paradigm that "facts" and "values" are interdependent, and that "facts" are accorded meaning only within a particular value framework (Guba and Lincoln 1989; Strauss and Corbin 1991; Whyte 1991). Consequently the case for the

participation of local organizations and peoples becomes not only an ethical one, but a requirement for the development of "grounded theory" from which legitimate research conclusions can be drawn.

While positivist or objective vs. constructivist or interpretive approaches to inquiry were at the core much of the methodological tension at the workshop, participants did not focus explicitly on this dichotomy. Rather, the group sought practical strategies for selecting and combining approaches and tools that strengthen rather than compromise the quality of research. These are proposed later in this chapter.

Action Research, Capacity Building and Policy Research

Research can build local organizational capacity in a number of ways. It can generate knowledge that is of direct use to the organizations concerned. It can use research approaches that help generate that knowledge by means that ensure it is accumulated within the parts of the locality or organization where it can have the greatest impact. It can train local people in techniques for data gathering and analysis. It can also expand and evaluate knowledge so as to strengthen links between organizations and their members, for example by using the institutional mechanisms of the organization for research planning and evaluation.

If research is to build capacity in local organizations, then the process must involve the organizations from the onset in: 1) establishing research questions, 2) determining an approach, 3) establishing how, where and with whom information will be analyzed, and so on. However, a research process oriented primarily to build capacity in an organization may not generate results that have authority in a policy arena. In order for research to meet both policy

and local capacity development needs, the activity must be negotiated so that it becomes a hybrid.

One suggested approach to this dilemma is to produce research output in multiple forms for different audiences. One workshop participant described the use of video as a form of data (re)presentation that is more accessible to, and useful for local organizations than written reports. A more politically nuanced analysis of policy makers' decision-making behavior suggests another alternative. If local groups are involved in research throughout the process, it can assist these organizations in accumulating knowledge to use in their own advocacy activities. If we accept that policy makers do not decide whether to act on information solely on the basis of its analytical appeal, but also on the basis of social, institutional and political factors (such as, for instance, advocacy pressure from local groups), then we posit that the best way for research to influence policy is precisely through building capacity within local organizations. They can then use the output to exercise pressure on policy makers.

Comparative or Site Specific Research?

The workshop was founded upon a premise that comparative case study research on local organizations and natural resource management is essential to advancing policy-relevant knowledge in this domain. It was suggested that large numbers of comparable cases would be needed to generate convincing conclusions about local organizations and their natural resource management activities and capabilities. While the workshop raised some doubts about the feasibility of this approach to comparative work, participants endorsed the need

to continue striving for well- designed comparative studies, but with greater sensitivity to local needs.

Some of the doubt about comparative research stemmed from doubts about the benefits of this approach to the local organizations' involved. Concerns were expressed also about the technical feasibility of the approach, given the extreme variability in circumstances and perspectives to contend with, even within a particular geographic, disciplinary or resource management domain. The notion that interactions among these and other dimensions are important in research on policies for LOs in NRM implies an even more complex conceptual environment in which to identify and measure relevant variables. Efforts to pre-determine which are most important in order to satisfy the requirements of comparative work were viewed as problematic, and perhaps contentious from the local perspective.

Local organizations are most likely to favor research that helps them address their local problems, and perhaps secondly national problems that influence local resource management and livelihoods. An action research approach that emphasizes the concerns of local organizations and the strengthening of their capacity to act may not be easily compatible with a comparative approach.

Box 1
Community Participation in Protected Areas Management
Larry Fisher, World Neighbors

World Neighbors has proposed a research project on the management of protected areas in eastern Indonesia. The semi-arid climate and rugged topography create diverse conditions which support a broad range of unique fauna, including the Komodo dragon. Recently, conservation interest focussing on protecting the variety of endemic fauna has grown and a number of conservation areas have been proposed. Currently, people on these islands depend upon rainfed agriculture and extensive livestock grazing as their principal livelihood source. The transition to state regulated land management will therefore have a substantial impact on the way these people use their land.

Researchers hope that by establishing a dialogue among communities, NGO's, government, and academics through the research process, they will be facilitating the resolution of conflicting approaches to natural resource management. The primary emphasis of the research project will be on local community participation in the management of designated conservation areas, including the organization and function of traditional management systems within newly formulated management plans for these areas. Because the major questions to be pursued through this study relate to local, traditional mechanisms for natural resource management, the study intends to engage local communities, conservation and community development NGO's, and the Department of Forestry in its design and implementation.

Participatory methods will be integrated into the process of defining conservation management plans for selected sites. The main objective will be to document and assess local perspectives on resource management and development, using stakeholder analysis among the diverse groups from communities to public agencies; the research methodology will incorporate scientific survey and participatory appraisal techniques from various disciplines.

There are cases, nonetheless, where local organizations have sought cross-national comparisons in order to lend new perspective on their own experiences in natural resource policy and management. They have linked these joint learning experiences to their advocacy work. Networks of NGOs involved in policy related NRM research provide examples of this. Coordinating bodies of local organizations within a multi-national region are known to

include the sharing of experiences as an important goal. This is likely also to involve cross-border sharing of programmatic and policy experiences. The general point is that if local organizations are not interested in the comparative research agenda that a researcher proposes, the problem may not lie in the fact that it is a comparative study. Rather the research questions being proposed may not be especially relevant or well conceived from the local organization's point of view.

OTHER CAVEATS ON LOCAL ORGANIZATIONAL INVOLVEMENT IN A RESEARCH PROCESS

Notwithstanding the arguments for involving local organizations in a research program, some cases were mentioned where this would be undesirable, or simply not feasible. Consider, for example, research to analyze the conditions under which local organizations emerge. In cases where a study is considering the failure of this to occur, then of course there would be no organization with whom to work. Consider also situations where local organization involvement is likely to introduce bias. For example, unless excellent rapport is established between "outside" researchers and communities or organizations, data are likely to be invalid and unreliable. Similarly, without a strong basis of trust in both directions, it becomes possible for local organization members to record information that they think makes their organization look good. In the absence of such relations then, a case might be made for not involving local organizations in the collection of data.

Another example is research designed to assess the costs and benefits of investing in local organizations as opposed to other NRM investment options. In these cases, the research

would be aiming to provide evidence for whether scarce public (or in the case of NGOs, quasi-public) funds should be invested in local organizations or in some other means of enhancing natural resource management. Local organizations would be likely to have clear biases. Thus a case could be made for their having only limited involvement in such a program.

Ultimately, whether research treats local organizations as participants or objects should matter less than the quality of the research conducted. Experience strongly suggests that the quality of research is more likely to become compromised if local organizations are not involved as key actors in the process.

RESEARCH ON, WITH, OR FOR LOCAL ORGANIZATIONS?

Perhaps in the end the critical question is whether the research program is conceived as being on, with, or for local organizations. If it is primarily on local organizations, the researcher will define the method, and may rely more on conventional research processes. When it is specifically for local organizations, these LOs will strongly influence the choice of method. Most often the research will be a hybrid endeavor conducted with local organizations in which differences between conceptions of valid research methods will have to be negotiated.

In all cases, the costs and benefits of following a particular methodological path should be made explicit at the beginning of the study, and in the presentation of any conclusions that derive from it. It is important to recognize that while the transaction costs of consulting with clients and stakeholders on research objectives, methods, products and

time frames in a participatory, action-oriented research endeavor may appear high, the synergistic effects of multiple-party "buy-ins" can increase the productivity and impact of the effort. However, it may also lead to further conflict.

METHODOLOGICAL CONSIDERATIONS IN PARTICIPATORY RESEARCH

Participatory research may take many forms, and involve a wide range of research methods. At one extreme, once a research question has been carefully specified, local actors may be content for professional researchers to proceed using their conventional tools. At the other extreme participatory research may call for an alternative approach to research design that enables the active involvement of local people in specifying variables, and collecting and analyzing data. The guiding principle should be that participatory approaches should strengthen, rather than compromise the quality of research.

When the research effort is being driven by communities or groups primarily as an input into their own development process, then the research design needs to generate data which is transparent to the community. Sampling procedures must allow conclusive results at the community level. Professional researchers should design monitoring systems which will continue after the researcher has departed.

If the research effort is being driven by an external interest in comparative analysis across sites, then greater control over research design will probably be needed. Even in these cases, however, there are many ways to make the exercises more participatory, for example:

- Formally meet with the group or community to identify their own research questions, and try to negotiate a jointly-acceptable research plan. This may involve modifying

the design, or adding additional components. Where this seems impossible, a "quid pro quo" arrangement can be negotiated, whereby the group agrees to participate in the research in exchange for concrete contributions to the group or community from the researchers (e.g., training, access to information and technical advice, contribution to group projects).

- Play the "honest broker" in opening discussion about the research to different groups within the community;
- Explore with community members their own definitions of key variables and the indicators which they use, and try to incorporate those into the research design.
- Develop some research tools which structure input from local people, and incorporate this information into the analysis.
- Build a commitment to community-strengthening into the project (with necessary resources). If that is not possible, be honest about it with the community.
- Take care to "do no harm." There have been numerous cases where results of research about local groups were used by policymakers to undermine collective action efforts or target leaders for oppression. Promises of confidentiality should be strictly kept; individuals should not generally be identified; researchers should be sensitive to situations which are politically volatile.
- It has been said that the role of policy researchers is to "speak truth to power." Researchers who are working with local people and groups usually have an obligation to serve as a channel through which local perspectives can be brought to the attention of policy makers.

CONCLUSION: STAKEHOLDERS, NEGOTIATION, TRANSPARENCY

To conclude, in any research endeavor there is a range of "stakeholders" who have differing, though not necessarily conflicting, interests in the research process. Local people have always been stakeholders in research, but usually are insufficiently powerful to voice their stake and influence the process. Researchers who are sensitive to the issue can help overcome this limitation.

In work with local organizations, the organization is more able than individuals to exercise its voice, and can prevent or undermine a research program on local organizations and NRM if members are not satisfied with how the study is being conceived and implemented. They can also jeopardize the outcome of a program if they are given full control of the data recording, even if they are happy with the program in general.

National and international policy makers and researchers are also stakeholders in the process. In the past they have been principally involved in defining a research agenda. They will continue to be involved, but will be joined at the table by more strongly organized local people.

Consequently there will be a greater need to negotiate the research agenda when working with local organizations, and to develop cooperative program management strategies.

A research model to link research and action might involve comparative research across countries, over extended periods of time, linked to action research around policy

processes within countries. The effort would be designed to strengthen links between LOs and policy-makers, as well as the ability of LOs to manage NRs.

The most general implication of the foregoing is that any research procedure has to begin by identifying all the stakeholders involved. It then must create a context in which the different stakeholders can be as honestly transparent about their concerns and interests in the research as possible. Such explicit negotiation of the research agenda will slow the research process. Furthermore, like any negotiation, it will mean that no one stakeholder will get exactly what they want by way of research questions or procedure. However, it is likely to make researchers more aware of local organizations' concerns and capabilities and to improve the relevance of a study's conclusions.

Finally, the process becomes a means of improving the communication and understanding between actors who rarely understand each other at present, and yet whose actions are highly influential on others' activities. Indeed, it may be that because of their apparent authority and independence, CGIAR centers, universities, and international non-governmental institutes can play a special role in creating the space for these different stakeholders to come together in negotiating research agendas in ways that would be impossible without this form of brokerage.

PART II

HOW DO WE FIND OUT?

5. DEFINING AND DISENTANGLING POLICIES TO BE STUDIED

Before one can evaluate the link between specific policy action and local organizational response in natural resource management, with any rigor, the policy variables must be carefully specified. Key questions to resolve include:

- What exactly was the policy?
- Was the policy implemented locally?
- Are there other variables, apart from the policy being studied, which might explain observed changes in local organizations or their NRM activities?
- Can the policy be expected to have different effects on different types of LOs?

DEFINING THE POLICY

Often a wide gap exists between the stated "policy" as specified in a policy speech, written regulation, or government budget, and the policy as implemented in the field. Researchers must accurately assess the latter, before attempting to measure its effects. Unstated objectives of the policy may be more important than the stated objectives, and require assessment of these unstated variables (e.g., politicians signaling unofficially that they will no longer enforce public resource access restrictions, even while these stay on the books). Policies may be interpreted and implemented differently in different places. The policy environment may be quite unstable, with frequent changes in specific policy design or implementation features affecting actual impact. Policies may contradict one another. The

effects of political feedback to an initial policy may lead to important changes in the specifics of local policy design or implementation.

EXAMINING POLICY IMPLEMENTATION

In order to understand how policies alter the incentives of local people to organize and management natural resources, it is critical to identify exactly what has changed--for local people--in the policy environment. The more remote the policy decisions, the more need there is to look at the implementation "filters".

Once the policy has been carefully defined, one should examine five aspects of implementation. The first is to define, geographically, where the policy has actually been implemented. Implementation of administratively-managed policies may be affected by the density of local agency offices, funding, or staffing. The geographic impact of some economic policies may be determined by marketing infrastructure, or the dissemination of information to the public about available credit or price changes.

The second key implementation feature to ascertain is the pattern of influence on local organizations. For example, technical training services for LOs may have broad geographic coverage and theoretically be available to all LOs managing a particular resource. But, in reality, they may be provided only to LOs established under the sponsorship of a particular government or NGO agency.

The third key factor is the degree of implementation. In many cases, only parts of a program are actually implemented. Failure to recognize that resources available to LOs are actually much less than is announced in policy statements, can lead to a mistaken analysis of

the potential impact of a fully-implemented program. On the other hand, examining the variability in implementation can provide critical information on the impact of a policy, akin to a 'dose-response' study in the medical field.

Fourth, there is frequently a long lag between the time an official policy change is announced, implementation begins, and LO response begins. Sufficient time must elapse after implementation for a reasonable assessment of impact to be measured (unless an on-going action research study is undertaken).

Finally, there is the possibility of a counter intentional result. In some countries, for example, the way local forest user groups were implemented in some settings involved registering brand new groups of influential persons and ignoring local organizations that had deep roots in the area. To meet quotas to sign up lots of groups rapidly, officials signed up the non-targeted groups. Research which evaluated these new groups, as representative, would likely have drawn erroneous conclusions about the current and future impacts of the new policy.

DISENTANGLING EFFECTS OF POLICY

Many confounding variables may make it difficult to distinguish the impacts caused by a particular policy from those caused by other external events or conditions, policies in other sectors, or by internal organizational dynamics. Econometric analyses may be able to sort out some of these effects, but it is important for the researcher to systematically assess those confounding factors before designing the research instruments. Researchers may need to pay special attention to sample selection, and the time frame of the study.

Common confounding factors include the following:

- Simultaneous socioeconomic changes may affect NRM by local organizations, such as changes in prices or the discovery of new markets for natural resource-based products;
- Other, simultaneous policy actions may mask or enhance the effects of the policy being studied;
- Changes in the internal dynamics of local organizations may be responsible for changes assumed to be caused by policy factors. For example, a sudden influx of immigrants to a region may create pressures for resource degradation which are mistakenly attributed to a new policy on resource marketing.
- Changes in local organization or in natural resource condition due to the effects of natural factors such as climate and pests may occur simultaneously with the policy change.
- There may be interactions between institutional, political and economic policy variables. For example, where the political environment is highly constrained, even very attractive economic incentives may not encourage group activities. Or, ponderous rules and regulations for local organizations may be an insurmountable barrier under discriminatory economic policies, but only an inconvenience where economic incentives are strong.

Box 2
Managing the Forest Boundary: National and Local Level Constraints and Opportunities in the Case of Korup, Cameroon
Gill Shepherd, ODI

In areas where more than one organization have jurisdiction over a resource the process of researching policy implementation presents particular challenges. ODI is involved in a research project in the National Korup Park area of Cameroon, which examines the ways in which forest boundaries are being managed. In this region official land and forest laws influence land. At the same time local people's land and forest tenure practice may overlap and conflict with these national tenure regimes. Therefore, it is not always obvious which tenure regimes are actually influencing management decisions. In order to investigate the ways in which institutional frameworks at various levels have shaped the kind of policy intervention which is currently possible, ODI's research has initially focussed on disentangling the various tenure regimes that coexist in these areas.

Researchers must determine the mechanisms through which the various laws and tenure regimes ultimately shape the LO's decisions concerning resource use. To address these questions sampling must be stratified across village characteristics, degree of provincial office involvement and mix of land types. This stratification has implications for sample size, as well as for phasing of research activities.

DISTINGUISHING GROUP-SPECIFIC POLICY EFFECTS

Usually, the impact of policy will differ by type and characteristics of local organization. For example, the effects of change in forest product pricing may affect communal forest management organizations differently than local forestry cooperatives based on private forest resources. Different natural resources (e.g., different forest types or water sources) may respond differently to a similar change in management. An understanding of these differences will often facilitate more accurate predictions of policy effects on natural resource, income or welfare objectives.

Yet it may be difficult to group LOs into meaningful strata on the basis of rapid appraisal, because of the heterogeneity of group organization. A common difficulty is distinguishing the way resources are actually managed (*de facto*), from that which is legally mandated (*de jure*). For example, one may wish to test the differential impact of a policy on common property and private property-based local organizations, only to find (after stratification and sampling have already been done), that many organizations which legally fell into one category were, in fact, managed as though they were in the other.

IMPLICATIONS FOR RESEARCH PLANNING

The difficulties of characterizing the policy under study and its implementation, identifying its interactions with or potential confounding of effects with other factors, and determining its differential effects on different actors, call for a systematic research planning process. The collection of data and key informant perspectives on these issues may be a non-trivial task**.** It may be premature to develop formal hypotheses or to design the research instruments or sampling procedures, until this preliminary stage has been completed and analyzed. Guidelines for a more systematic planning process might be a useful contribution to the research community.

6. METHODOLOGICAL CHALLENGES AND OPTIONS

To analytically link policies to changes in local organization behavior, and in turn to changes in natural resource management, poses complex methodological challenges. Even

if appropriate indicators of all of the key variables can be identified, research design must carefully consider the choice of data collection methods, sampling procedures and frequency, and analytical methods. These choices are ideally made after considering the nature of the research question; the needs of those who will use the research findings, in terms of timeliness, precision of results and coverage; the availability of resources for research (financial, technical, logistical); and the quality of the knowledge base which already exists on the subject (Scherr and Vosti 1993).

A wide range of potentially useful methodologies are available. Yet their selection and integration into a coherent research design for studying LOs in NRM is often complicated by:

- tensions between disciplinary perspectives;
- unfamiliarity with the range of data collection and analytical techniques;
- difficulties in reconciling comparative and location-specific research;
- difficulties in acquiring an adequate context for good research design;
- and the need for longer time horizons in research.

Each of these issues will be discussed briefly below, along with some suggestions made by workshop participants.

DISCIPLINARY PERSPECTIVES ON METHODOLOGY

There is a strong tendency for researchers' choice of research methods to be guided mainly by their own disciplinary training and their prior familiarity with specific tools for data collection and analysis, rather than an assessment of the research problem (Scherr and Vosti 1993: 53). This has certainly often been the case in research on LOs in NRM, and a narrow

disciplinary focus in existing studies has contributed to the current difficulties in drawing firm conclusions from the literature.

There is a clear need in this field for cross-disciplinary input into the formulation of research questions, the selection of variables and indicators, and the design of specific tools for data collection and analysis. Most social scientists do acknowledge the need for input from technical experts into research design. However, it may require considerable interchange before there is mutual understanding of the variables which are important from a policy perspective. Also, many social scientists are unfamiliar with potentially useful tools of technical research (e.g., remote sensing methods for resources assessment).

Interaction among social scientists--economists, political scientists, geographers, organizational experts, sociologists, anthropologists--can be even more problematic. Though researchers often recognize their need for specific information from fields outside their own expertise, collaboration is made difficult by fundamental differences in their conceptual frameworks for understanding variable interactions, the assumptions underlying their analysis, definitions of data quality, and criteria for proving hypotheses.

Yet, it is hard to envisage a future research program on LOs in NRM which does not explore economic, social and political variables and explicitly seek to understand their interactions. While any one researcher may not need to cover all of these areas in a particular study, the results will need to fit into a larger analytical framework which does. This will probably demand that researchers become more familiar with paradigms from outside their own discipline (though they need not adopt them), and that they collect a "minimum data set"

of variables outside their disciplinary tradition in each study site, so that their research results can be used by colleagues from other disciplines.

Theoretical and methodological advances within different fields may ease this process. For example, the "new institutional economics," incorporates concerns about political process, ideology and social organization into neo-classical economic theory (North 1995). The new theory of "social capital" draws upon and integrates insights about culture and social organization into analysis of economic growth and political process (Putnam 1993). The increasing application of quantitative data collection and analysis techniques in economic anthropology have made its findings more accessible to economists. Meanwhile, participatory research methods have become widely disseminated among different disciplines and development activities, although they are not yet fully integrated.

Changing the vocabulary which we use can also reduce the conflict between disciplines. Researchers should avoid "deterministic" conclusions, which over-emphasize the importance of particular variables in determining organizational outcomes. The complexity of variable interaction should be recognized, and accounted for in research design. Results should be presented as suggesting "probability" of certain outcomes, rather than definitive relationships. The aim of policy studies should generally be to identify diverse policy options under different conditions, rather than to identify an "optimum" which does best "on average."

Inter-disciplinary tensions are not likely to disappear, but they can become creative tensions. As researchers negotiate with one another in the design of joint research, solutions can be grounded in the field problem, rather than in disciplinary theory. This process can generate a more integrated analysis, and provide richer perspectives on the research questions.

METHODS FOR DATA COLLECTION

Available Methods

For the study of policy effects on LOs in NRM, researchers can draw on a wide range of data collection techniques (summarized in Annex Table 4.4). For the systematic collection of current or historical recall information on socioeconomic or resource management from *a statistically representative sample* of individuals, local groups, or public agencies, researchers may use censuses, single- or multi-visit surveys. These techniques allow us to document and understand the distribution of characteristics within a study population.

Purposive samples can be used to develop a richer qualitative description and explanation of the behavior of those populations. These take numerous forms. Some rely upon interview guides designed by the researcher, such as key informant interviews and rapid appraisal methods. More in-depth interviewing methods include ethnographic techniques and oral histories. Participatory methods, which are designed to encourage identification of key variables and analysis by the population being studied, include participatory appraisals, focus group interviews, and participatory resource mapping.

Methods of *direct observation* may be used to orient the researcher about unfamiliar processes or activities, to provide insights which would help to organize data collection, or to observe variables which are suspected not to be reliably reported. Some examples include participant observation and process documentation (used in action research). Where monitoring is needed, and local people are interested in the information, researchers have successfully established community record-keeping systems.

A variety of methods is available for t*echnical evaluation of the natural resources*, and change over time. Images from remote sensing can provide landscape-level information, and often, in time series. Technical experts and local people together can develop maps of natural resource use, management or condition, at various scales. Natural resource inventories can also be developed collaboratively. To monitor or evaluate particular NRM practices or effects of practices, field or plot-level surveys can be used, with single or multiple visits.

Selecting Methods

Different research tools are useful for collecting different types of data. For example, formal surveys are useful for collecting data about inter-household variation in economic activities. Focus groups are better suited for eliciting information on community experience with different policy instruments. Participatory resource mapping is superior to either in clarifying which natural resources are under heaviest use pressure. Ethnographic methods are likely to be needed for eliciting culturally-defined criteria of natural resource degradation and improvement. Remote sensing tools provide better data than do farm-level surveys on landscape-level natural resource condition.

Box 3
Community-based Tsetse Control in Busia District, Kenya
Brent Swallow, ILRI

Lack of sustainability in previous approaches to tsetse control has partly stemmed from lack of involvement of the intended beneficiaries. Therefore, the World Health Organization, the Kenya Trypanosomiasis Research Institute, the International Livestock Centre for Africa and the International Laboratory for Research on Animal Disease supported a field study of tsetse control efforts in several African countries (including Ethiopia, Kenya, Burkina Faso, Cote d'Ivoire, the Gambia) to assess the social and economic factors that affect local participation in tsetse control.

This study employed a wide variety of tools to address the research questions. In some cases several tools are used to measure the same variable in order improve the accuracy of measurement through triangulation. For example, migration and settlement are measured by key informant interviews, interpretation of remotely sensed data and household surveys. Key indicators of ecosystem structure and biological diversity (e.g. diversity of bird species, density of woody cover) are also being measured. Models of the processes that are stimulated by trypanosomiasis control will allow extrapolation from case study sites to neighboring sites and from case study sites to larger levels of spatial resolution.

Researchers performed a household survey using contingent valuation techniques, in order to assess the willingness of residents to contribute money and labor to tsetse control programmes in their areas. Respondents were presented with a hypothetical situation and asked questions about the maximum amounts of money or labor they would be willing to contribute if the situation became real. Analysis of variance was used to assess differences between villages. Regression, probit and logit techniques were used to test hypotheses about factors affecting the willingness of individuals to contribute.

In many cases, it is useful to "triangulate" results by using multiple methods of collecting data on a specific variable. For example, to understand who chooses to join a local organization and who does not, it may be helpful to use household surveys to capture information about socioeconomic characteristics of the household that influence membership,

but also to hold focus groups to determine if there are also community-wide social or political patterns of membership which may not emerge from the individual interviews.

METHODS FOR DATA ANALYSIS

Our basic methodological challenge is to establish criteria by which we can accept or reject hypotheses about the linkages between policy, LOs, NRM and the outcomes of interest. It is here that inter-disciplinary tension is probably highest. Some disciplines (e.g., economics) demand that causal or associative relationships be established through quantitative analysis and subjected to statistical testing. Others (e.g., anthropology) demand that analysis be confirmed through careful search for consistencies and inconsistencies in the explanations for observed phenomena. Proponents of participatory research more heavily weight the evaluations and conclusions drawn by local people through their experience, and may be more skeptical of evaluations by external "experts" who do not fully understand the local context.

Different groups of researchers may also evaluate findings very differently, depending upon their norms of comparison, and weighting of different outcome variables. For example, economists may be concerned with the efficiency of LO activities, while sociologists emphasize equity concerns, political scientists the implications for local power relations, and natural resource specialists the sustainability of resource use. There is also likely to be a difference in analytical methods used by more academic researchers, who are seeking to mobilize empirical evidence to support theory-building (usually, within their disciplines), and applied researchers who wish to discover practical lessons which can be used directly for

policy formulation or program design. The common types of policy analysis reflect these differing concerns. (A partial listing may be found in Annex Table 4.5)

Quantitative Models

Both economists and political scientists use game theory models to explore the likely outcomes of local organizational behavior, under different conditions. These models are valuable mainly to get insights into the issues, and to incorporate new variables, shown by empirical work to be important, into theory.

The programming models of LO or household response to policy are much more detailed, with empirical data from case studies. These models can be used to simulate the effects of changes in policy. Cost-benefit analyses of activities undertaken by agencies, LOs or households may be used to evaluate the financial or economic returns to NRM activities or program support activities, relative to other activities.

Econometric analysis can be used to quantitatively estimate the importance of various factors influencing policy response. Spatial analysis can be used to assess the linkages between policy implementation and landscape-level change, using geographic information systems.

Qualitative Models

Case study research involves both qualitative and quantitative description of the activities of agencies, LOs, households, etc. This information is mobilized to support or reject hypotheses, though not necessarily through statistical testing. Examples include community histories and ethnographic analyses.

Action Research

Through action research, researchers, program staff and/or local people jointly monitor changes in key variables, following a policy or program change. The selection of variables and indicators reflects an underlying model of impact, and the degree and type of impact are assessed according to some agreed upon outcome objectives. LOs themselves may develop a process of self-evaluation, to monitor effects of their own development initiatives, or their participation in broader programs to support NRM.

RECONCILING COMPARATIVE AND LOCATION-SPECIFIC RESEARCH

A further consideration in the selection of research methodologies, and then in their design, is the focus on comparative versus location-specific research. Must research findings describe the local situation with considerable accuracy, so as to support specific policy changes there? Or is the research principally designed to produce generalizable findings over a broad range of conditions? Section 4 described some of the tensions between the two approaches.

Some modifications in research design may help to reconcile the two perspectives in a particular site. Choosing an appropriate sampling strategy is key. A sample size of LOs which is adequate to draw conclusions about the national-level impact of a policy, may not be large enough, or stratified appropriately, to draw conclusions about policy effects in a particular sub-region. Ideally, sample size should be sufficient to draw policy conclusions at both levels of analysis, to ensure that findings always have some local relevance.

Another option is to combine in-depth case studies of particular organizations, or particular sub-regions, with rapid appraisal studies across a larger number of sites. The latter can provide at least a qualitative check on the generalizability of findings from the concentration sites.

A third suggestion is to design comparative research studies using common *variables* across sites and regions, but with site or region-specific (i.e., locally relevant) *indicators*. This reflects the continued debate as to the utility and validity of comparative research on LOs across different natural resources, such as water, forest, range, and fisheries. Even within a single resource, variations in the physical and cultural contexts between sites may require modifications in the indicators.

A fourth option is to design comparative research, beginning with a common protocol identifying a set of variables to be collected in all sites. That would then be supplemented by additional variables considered to be of importance by local organizations or local researchers.

ENSURING ADEQUATE CONTEXT FOR RESEARCH DESIGN

As suggested by the above discussion, to design high quality research on LOs in NRM requires considerable familiarity by the researcher with local and regional conditions influencing policy-LO-NRM interactions. Contextual information is essential for interpretation of data to assess one's own hypotheses, as well as to eliminate rival hypotheses.

In some research situations, contextual understanding is already high, and key variables, indicators and techniques for their measurement are well-defined. Conventional approaches can then be used to develop the research design over a relatively short time

period. That is, following literature review, secondary data review, and consultation with collaborators, the researcher can specify the research problem. He or she can undertake rapid appraisals and key informant interviews in the study area to address any unresolved issues, and then design and pre-test the analytical framework and data collection instruments.

Because of the underdeveloped state of secondary data sources and pre-existing research on LOs in NRM, however, we expect that in many research situations, the requisite level of familiarity will not exist as the study begins. In these situations, a number of strategies may be used:

- Design a multi-phase research plan, with an extended initial phase of research preparation;
- Commission studies to be done by local professionals who are already familiar with the organizational, political and resource context;
- Collaborate closely with local non-professional "experts" from the community during research design and implementation;
- Spend longer periods of time spent in the study sites during implementation, to learn more about the sites;
- Use more in-depth case studies, to understand processes and explore causal relationships, even in research which emphasizes formal surveys.

LONGER TIME HORIZONS

The research community concerned with policies for LOs in NRM must develop some strategies for the funding and implementation of research over longer time horizons. As

discussed above, longer time periods may be needed to ensure the quality of contextual knowledge. Research designs may need to include monitoring of LOs over several years, to follow the impact of policy change. For example, two to five years of observation are often necessary to begin understanding organizational processes.

In some cases, studies lasting ten to twenty years, involving repeat visits, might be necessary. Similarly long periods may be needed to capture the impacts of policies which have longer time lags in implementation, or when there are significant time lags between a change in management activity and the resulting change in natural resource condition, human welfare or economic output.

FURTHER METHODOLOGY DEVELOPMENT

In summary, a host of methodological issues related to sampling, choice of data collection techniques (including integration of technical, economic and social data), analytical models, and hypothesis-testing still need to be addressed by the policy research community working on LOs in NRM. This is so both to ensure the internal rigor of individual studies, and to permit meaningful cross-study comparisons. Some issues can probably be resolved through workshops focused on specific research questions and resource contexts. But for other issues, it may be necessary to design field studies which systematically evaluate alternative approaches.

7. EXTERNAL FACTORS INFLUENCING LOCAL ORGANIZATIONS

Organizations do not function in a vacuum; all are conditioned by the environment in which they operate. Organizations for natural resource management are especially influenced by the characteristics of the resource and the need for and structure of management. But what are the most relevant features of the environment which affect the organizations?

The empirical and theoretical literature abounds with descriptions and hypotheses about the ways in which external factors shape the effectiveness of local organizations. Unfortunately, each study provides only partial information about the environment. Thus, a study that emphasizes the importance of infrastructure development may neglect to mention the social background of the users, and vice versa, which limits the potential to undertake comparative analysis. In order for lessons to be drawn across studies, studies need to include comparable research variables.

To address this issue, workshop participants met in small groups to identify the major factors external to the local organizations which are expected to influence their ability to manage natural resources. This includes those variables needed to test major hypotheses regarding local organizations, to exclude rival hypotheses, and to contextualize the research site. Each group had an interdisciplinary composition, with expertise on a particular resource: agriculture and soil/water conservation; irrigation; or forestry.

The major factors identified relate to:

- physical and technical environment;
- economic environment;

- social and cultural environment; and
- policies and governance.

PHYSICAL AND TECHNICAL ENVIRONMENT

The characteristics of the resource itself and the setting shape the management requirements and the incentives of local people in using it. A small hill irrigation system in the mountains of Nepal is clearly different from large canal systems on the plains; dry forests in the savannah differ from rain forests in humid areas. The technology employed also has a bearing on the time, skills, and costs required for management. But what are the critical dimensions, especially that are expected to affect local organizations? The working groups identified the following characteristics for which data should be collected:

Site Characteristics

Ecological zones, climate, rainfall, soils, topography, altitude, latitude, and longitude are all basic identifying information for contextualizing the study site. They provide information on the degree of complexity and challenges for crop growth and natural resource management. For example, hillsides with heavy rainfall will face soil erosion, while resource management in flat, semi-arid areas will face water scarcity and considerable variability between years.

Size of Resource Unit

The size of the base units managed by lowest-level groups, as well as the total area of resources managed by contiguous local groups provides important information on the complexity of organizational efforts required. The size and clarity of boundaries, or natural

boundedness of the resource, are important determinants of the degree of excludability in resource management.

Relative Resource Supply

Total availability of water, land, trees, or other resources should be combined with information on uses or users as an indicator of pressure on the resource. In irrigation, Relative Water Supply (RWS), defined as total water supply relative to total crop water requirements, is commonly used as a predictor of management intensity. For other resources, per capita measures are useful. In addition to aggregate resource supply, seasonal variations in supply and demand should be noted.

Ecological Status

Characteristics such as quality, density and resilience of the resource base provide necessary complements to indicators of total quantity of the resource.

Variability of Resource Base

The degree of spatial variability affects management patterns, particularly in resources such as range lands. Temporal variability affects the predictability of the resource.

Larger Ecological Context

Incentives and resources available for resource management differ greatly between an agricultural frontier or area of intensive production.

Accessibility and Infrastructure

The costs and returns to resource management, including the transactions costs of the organization, are greatly affected by transportation, communication, energy, and other infrastructure within the area and outside it.

Complexity and Interdependence

Linkages between local organizational units, particularly in terms of resource management, affects both the incentives and challenges for organization. The degree of externalities between groups in resource management is especially relevant.

Management Regimes/Farming System(s)

Basic elements of past and present human resource use patterns are required to contextualize and understand local organizations.

Technology Characteristics

The cost structure, maintenance requirements, and dependence on local materials versus imports affect the need for organization and resource mobilization patterns.

ECONOMIC ENVIRONMENT

Beyond the immediate physical environment, the economic conditions in which LOs for NRM takes place influence the incentives for individuals to cooperate and the structures for cooperation. For example, the challenges local people face in managing natural resources will depend upon whether the resource is used for direct subsistence or is a marketed commodity. The following features of the economic environment are particularly relevant for interpreting the activity of local organizations.

Market Demand

The incentives and resources available for resource management differ according to whether or not there is a market demand for key products from NRM, the structure of activities, and relative prices.

Contribution of Resource

Is the resource of central or marginal significance to livelihoods? What role does it play in the local and national economy? What are the economic alternatives, especially those available to local people?

Economic Incentives for Sound Management:

Are existing economic incentives, in terms of prices, taxes, subsidies, etc. sound in the ecological and social sense?

Access to Market, Transport, Communication

These affect the value of the product, the costs and returns to resource management, and the information and other resources which can be mobilized by the local organization.

Access to Assets/factors of Production

Exploitation of a resource requires use of other assets, including capital, tools, and labor. Local people's access to such assets has an important bearing on the way in which the resource will be used.

Access to Credit

Credit increases the possibility of adoption of resource management techniques that require considerable investment, and expands the time horizon by making local people less dependent on natural resource exploitation for immediate consumption. Availability of credit to the organizations, rather than only to individual members, can be seen as an indicator of the degree of legal recognition of the organization.

Monetization of Economic Activities

Patterns of resource mobilization, as well as incentives for resource management, are affected by whether transactions are predominantly monetary or exchange.

Dependence of Food Security Strategies upon Group Activity

The extent to which households can act independently of the group, both in natural resource management as well as in other economic activities, affects incentives and structure for collective action.

Size of Resource Management Units

The average and distribution of farm or forest holding sizes affects the degree of benefits and the heterogeneity of interests among local organization members.

Distribution of Wealth

The shape of the wealth distribution curve in the community (including resource-based assets and other sources of wealth) affects the degree of homogeneity, as well as the possibilities for leadership.

SOCIAL AND CULTURAL ENVIRONMENT

The concept of "social capital" has become an important tool for articulating what even casual observation reveals: some societies are more likely to cooperate than others. The networks, norms, and history of a society create a basis for trust or for conflict. Although clearly local organizations themselves play an important role in shaping the social environment by creating patterns of interaction, broader social and cultural factors can be treated as exogenous to the organizations. Examining social and cultural variability at the macro and even at the micro level can help us to understand why organizations are more effective in managing resources in one site than in another. The features which workshop participants identified as most important are:

Culture and History of Collective Action

Established patterns of cooperation, whether for resource management or other activities, have an important bearing on the success of local organizations.

Access and Control over Resources

Information on formal and informal property rights to the resource, including specific products is essential to understanding management patterns. Form many resources there are overlapping bundles of rights held by different people or groups..

Presence of Catalyzing Factor

When a particular leader, problem, or opportunity has contributed to the establishment (or failure) of an organization, this should be noted, even when the catalyzing factor is difficult to predict or replicate.

Cultural Attachment to a Natural Resource

Where a resource has a particular cultural or even religious significance (e.g. irrigation in Bali, or sacred forest groves in India), management patterns may be embedded in specific taboos or other cultural rules, and values placed on the resource may go beyond simple economic values.

Population Characteristics

The degree of cultural homogeneity or heterogeneity, subcategories of population and their spatial distribution, along with density and proximity of people to each other all affect patterns of organization. Demographic change, including growth, decline, in-migration affects the stability of groups.

Local Knowledge

The information and understanding local people have relating to natural resources and management challenges affects perceptions of the costs and benefits of organizing, as well as the scope and content of action for NRM.

Education

Formal education levels, literacy, and numeracy all affect capacity for organization, as well as for NRM.

POLICY AND GOVERNANCE FACTORS

Despite the importance of local people's organizations for managing resources, the state continues to play a vital role. This is clear in the operation of government irrigation or forestry departments and regulations on water use or timber cutting. But indirect policy levers such as the legal framework governing local organizations, property rights, and adjudication of disputes may have as great a bearing on resource management, while broader policies of decentralization and democratization provide a conducive political environment for LOs in NRM. In addition to studying the impact of particular policies (as discussed in Chapter 5), researchers need to account for the conditioning effect of other policy factors, particularly the following:

State Regulations

The extent and content of regulations indicates the extent of state jurisdiction over resource use, and the scope for local action.

Direct Policy Support

Subsidies, investments, and other direct policies affecting the resource will condition local organizational responses.

Property Rights

The legal definition of rights to the resource is one of the strongest policy factors affecting NRM. Who the rights are assigned to, in terms of individuals or communities, local people or outsiders, also has a major bearing on organizational activity for NRM.

Right to Organize and Be Recognized

The legal personality and rights of groups provides the playing field on which LOs operate.

Legislation Regulating Local Organizations

The specific laws for organizing and registering LOs have a substantial bearing on the scope and costs of collective action.

Organizational Density

The presence and activities of many types of LOs and their relationships with external agencies (local, national, international, including donors, NOGS, religious bodies, etc.) are an important component of the social capital to facilitate collective action for NRM.

Conflict Resolution Mechanisms

Formal courts and other mechanisms are needed for LOs to resolve conflict locally and with outsiders.

Commitment to Local Devolution and Development

The overall state policy orientation toward centralized or decentralized power provides the framework and signals for developing and implementing policies influences the scope of action for LOs.

Citizenship and Voting Rights

De jure and de facto rights of diverse groups affect who can participate in LOs.

REMAINING QUESTIONS

Identifying the relevant contextual parameters (summarized in Annex Table 4.6) is an important first step for comparative study. However, the features identified in the literature and by workshop participants largely remain at the conceptual level. To test their effect in comparative research requires translating these concepts (such as "boundedness" of the resource) into specific variables, and further operationalizing them by developing measurable indicators for each. At the workshop, the group discussing irrigation resources was more likely than the other working groups to identify specific variables and indicators. This reflects the longer tradition of interdisciplinary comparative study of irrigation systems, compared to the other resources. For example, the concept of Relative Water Supply (RWS) has a clear definition and measurement technique, which has been applied in a relatively large number of studies to assess irrigation management requirements. Specific studies need to develop clear indicators, along with detailed manuals for data collection, to ensure comparability between sites.

The second major problem lies in reconciling the myriad of environmental parameters which are relevant for LOs in NRM with the limited resources available to any given research study. Researchers need to prioritize among the many potential variables. Ideally this should be on the basis of which factors have the greatest bearing on the functioning of local organizations. Too often the data collected depends on the disciplinary and methodological

orientation of the researchers. Comparative analysis across sites will ultimately require identifying a core data set which all studies will collect.

8. INDICATORS OF GROUP STRUCTURE AND FUNCTION

Comparative analysis of the factors which influence local organizational development and the impact of local organizations on natural resource management depends upon identifying active local organizations. This fundamental variable is very difficult to measure. Simple indicators such as the existence of a registered organization are inadequate. Many registered organizations do not function, while many informal, active organizations are neither registered nor officially chartered. Similarly, the number of meetings can indicate a very active organization or an ineffective and conflict-ridden organization.

One session of the workshop was devoted to tackling this difficult topic. Small working groups were structured along disciplinary lines (economics, sociology/ anthropology, geography, political science, and resource management), in order to identify and discuss a range of salient organizational characteristics. Each group compiled a list, which was discussed in plenary session. The outcome was not a clear list of operational indicators, but rather of features of the organizations which have a bearing on their performance.

The themes which emerged can be grouped under evaluative criteria and internal structure. Evaluative criteria include efficiency; effectiveness; equity; accountability; responsiveness; and adaptability. Key internal structural features relate to governance structure; incentives; trust and sanctions; leadership; legitimacy; shared norms; size of groups

and the influence on group functions and effectiveness. However, for many researchers it is difficult to distinguish between internal structure of the organizations and their effectiveness.

EVALUATIVE CRITERIA

The choice of criteria on which to evaluate LOs often reflects most clearly the disciplinary orientation of researchers. Economists tend to stress concepts such as effectiveness and efficiency in managing resources, while others may highlight equity, accountability and responsiveness to the membership, or adaptability to change. Varying definitions of these concepts further complicate comparative study. From a resource management perspective, organizational effectiveness and efficiency have to be assessed in terms of the functions the organization performs, i.e. what it actually does. Adaptability to change, or the ability of groups to take on new tasks, could also be considered as another indicator of effectiveness. In economic terms, effectiveness often relates to the cost effectiveness of the organization in meeting its objectives. Cost effectiveness (the lowest cost input for a given output) may be a more relevant criteria than efficiency (value of output for a given input).

However, the performance of LOs should not be evaluated solely in material terms. So much behavior goes beyond economic efficiency. Often members are not seeking efficiency when they join groups, but other more intangible benefits. For this, responsiveness of the organization to the needs of its members, as well as to external challenges and opportunities may be more important. Nevertheless, the operational efficiency of a group can affect performance because it can be an important factor affecting members' perceptions of

the costs and benefits of joining and working in a group. Performance in terms of equity of resource distribution often receives less attention in evaluation studies, except as it contributes to a sense of fairness, and hence affects willingness to participate. This points to the need to incorporate local (members' and non-members') evaluations of organizations along with externally identified criteria.

INTERNAL STRUCTURE

In addition to evaluative criteria, studies need to present basic information on how LOs are set up and operate. While there may be no standard or optimal pattern for these indicators, such information is critical for understanding and comparing the performance of LOs.

Governance

The way in which rules and decisions are made tells much about whether LOs are effective vehicles for local participation (and whose participation). A fundamental aspect of this is how membership is defined: whether it includes all local people or only a subset, and whether outsiders are included as members or on boards. The structure of meetings provides important information on whether decisions are made through general meetings and discussion or by executive boards or individuals. The leadership structure of LOs includes the definition of roles and how individuals are selected for these roles. It is often useful to distinguish between organizational leaders (e.g. president, secretary, treasurer) and technical employees of the LO (e.g. common irrigator, forest guard) who may be hired by the

organization to undertake specific NRM tasks. Mechanisms to keep leaders accountable to the members contribute to the responsiveness and effectiveness of organizations.

Many of these governance features are provided in the constitution or by-laws of formal organizations. Where written documentation does not exist, the governance structure can be obtained through interviews. Whatever the source of information on governance structure, it is essential to check the extent to which actual practices follow the formal procedures .

Size

The size of the organization affects its ability to perform roles, manage resources, maintain a committed membership, and develop trust and accountability. A small organization permits face to face interaction, fosters mutual trust and accountability, and allows informal monitoring and sanctioning processes. Hence, at some levels, smaller size can increase effectiveness. Yet larger size is important for effectiveness in making alliances with other organizations and assuming an advocacy role. A potential resolution to these two competing organizational principles is the federated model in which numerous smaller base units are amalgamated into a larger organization for the purposes of advocacy or representation. These multi-tiered structures may provide advantages in both solidarity and scale.

Researchers should be clear to report both the size and number of levels covered by the LOs to ensure that size comparisons are valid. Ideally, size information should cover both number of people involved and the physical area of natural resources covered.

Incentives

Economic study of organizational performance often focusses on the incentives for individuals to engage in collective action. Factors that are both within the local organization and exogenous to it influence the incentive structure. Economists focus on incentives, stressing the importance of assessing the absolute costs of collective action, and the relative costs and benefits of collective action compared with alternative economic activities and/or management systems. The latter, in turn, depends on the availability of alternative income sources and alternative modes of resource management.

More effective organizations appear to ensure that those individuals who put more into the organization reap incrementally more benefits. Therefore, the distribution of costs and benefits should be considered along with the absolute level. However, the costs and benefits can be difficult to assess. Transaction costs, including members' time and "hassle factors" are notoriously hard to quantify. Intangible benefits, such as sociability, can be strong motivators for people to join groups, but these incentives are quite different from those that are traditionally measured. Local perceptions of the costs and benefits may, ultimately, be more important than the externally defined levels.

Time Horizons and Experience

Longer time horizons increase the incentives for cooperation. As individuals cooperate to manage resources, economic benefits from the resource, as well as reputation and other social benefits are expected to increase. Over time, members also develop experience with collective action, both positive and negative. Thus, older organizations are more likely to be

stable, as patterns of interaction become habits. Repeated interactions among members can build up trust (or conflict), which facilitates (hinders) cooperation.

Trust and Sanctions

The relationship between the degree of trust among members in the group and the presence of monitoring mechanisms is not clear. The use of monitoring mechanisms could be viewed as an indicator of lack of trust. On the other hand, monitoring mechanisms, such as regular audits, can help to inspire trust through increased openness and transparency. This is partly related to the size of an organization. In small organizations, where members have face to face relationships, trust can be easier to cultivate and there may be less need for formal monitoring mechanisms. Larger, more complex organizations generally have to rely more on organizational mechanisms. Here monitoring mechanisms are more important and their systematic use can serve as a basis for engendering trust among members. However, there are no obvious size limits at which an organization can no longer rely on mutual trust and cohesion to regulate behavior. The relative diversity or homogeneity of members is also likely to affect the degree to which organizations could rely on mutual trust rather than formal monitoring mechanisms. One indicator of the level of mutual trust within an organization could be how much members are willing to give up for the group without direct benefits for themselves.

Leadership

Leadership plays a critical role in the performance of local organizations in natural resource management. Leaders shape institutions. But what aspects of leadership are most

important, and how should they be measured? First, researchers must distinguish between formal and informal leaders. Indeed, those in formal leadership roles may not be the real leaders of an organization or institution. After researchers identify leaders,

Box 4
Changing Communities: Enhancing Incomes, Local Institutions and Forest Management
Lini Wollenberg, CIFOR

Increasing villagers' income options, especially from nontimber- and nonforest-sources, is widely assumed to reduce incentives for deforestation. Increased incomes are also seen as an end in their own right contributing to villagers' well-being, especially as people living in remote forest areas gain better access to markets and participate more in the commercial economy in which cash incomes are a necessity. Yet, income-generating uses of forests may ultimately increase incentives for further extraction or use. CIFOR is developing a research program in Southeast Asia to test the institutional conditions under which incomes can be enhanced while maintaining sustainable management of the forest.

A substantial part of this research will focus on examining the institutional dynamics of local forest management. The researchers will examine the formal and informal norms, rules, roles and practices underpinning local forest management, how systems evolve as incomes increase and what are the characteristics of effective management systems. Some of the variables which will be included are: existing forest users, distribution of use rights in local communities, norms related to use, sanctions, conflict resolution, management incentives, and management practices.

they must examine more subtle characteristics of leadership, such as leadership traits or skills; motives guiding leaders' behavior and decisions; the extent of the leaders'power; support from external sources; and accountability of leaders to members (i.e., members having processes or mechanisms by which they can get rid of ineffective leaders). Leadership patterns determine whether power is concentrated in the hands of a few or by generation, gender, or class, and can be useful in uncovering patterns of equity.

Legitimacy

The legitimacy of an organization, as perceived both by members and outside actors, affects its ability to manage natural resources. But operationalizing the concept and measuring it empirically is difficult. Although political scientists often talk about legitimacy, they do not measure it. They view legitimacy as a higher level concept involving other factors which are more easily measured, such as stability and continuity of group membership and membership rates. Legitimacy can develop through diverse channels. It may reflect the legal status of the organization or the status given to the organization by government. Religious rules or historical precedents can also be very important in giving local organizations the legitimacy, or right, to regulate the use of resources and impose sanctions.

Shared Norms and Values

Similar concerns apply to operationalizing the concept of shared norms and values. Ideal norms that the group may aspire to often differ from real norms that shape behavior and dictate how the group resolves conflicts and distributes benefits and costs. When trying to understand norms, it is important to look at behavior and compare this with what members articulate as the group's norms and values. Researchers can examine the degree to which behavior in the group conforms to stated norms and values, the degree to which sanctions are adhered to by members, the level and foci of conflict within the group. Often tracing cases of conflict sheds light on real norms.

OUTSTANDING QUESTIONS

All of the factors identified above clearly have a bearing on organizational performance. However, two questions remain unanswered: First, do these characteristics need to be described mainly to facilitate relevant comparative analysis across studies, or do they need to be assessed as determinants of the effectiveness of organizations? For example, is accountability to membership important only as comparative information, or is it a critical aspect of organizational performance? Second, which of the factors listed are amenable to policy interventions? For example, legislation specifying a particular organizational structure or by-laws may be ineffective or even undermine the accountability of LOs to their members. What constructive policy instruments are available to affect organizational structure? Further work is therefore required, not only to develop consistent ways of measuring organizational dimensions, but also to develop policy tools to strengthen the organizations, increase their effectiveness, and support their creation.

9. MEASURING OUTCOMES

The final linkage in the analysis of the effects of policy on local organizations in natural resource management, as shown in Figure 1.1., is that between LO management and final outcomes. In this analysis, several types of indicators are needed:

- the bio-physical indicators that would serve as a baseline for monitoring changes in the resource condition over time;

- the socio-economic indicators that would reveal the changes in human welfare conditions due to LO management of natural resources; and
- the organizational performance or "management" indicators that would identify whether the bio-physical changes observed were the result of effective local organization for natural resource management.

The challenge of developing these final indicators reveals the multi-layered nature of such research and the requirement for multi-disciplinary approaches. It is particularly important for bio-physical and social scientists to collaborate in designing effective measures of resource change under local management.

Although the final social welfare effects of changes in resource management is an important outcome of LO activity in NRM, these types of indicators (e.g., income, food security) are generally well developed through various social science disciplines. Rather, the principal challenge in research on policies for LOs in NRM is in monitoring overall trends in the condition of and access to the natural resource, and then accounting for the influence that management by local organizations had, or failed to have, on this outcome. Workshop discussions thus focused on the resource management/condition variables and indicators.

Small groups, focused on particular natural resource sectors (soil and water conservation, forests and irrigation systems), progressed in identifying priority sector-specific variables, and sometimes indicators, of the condition and availability of natural resources. Plenary discussion on this topic generated useful insights for mapping the way forward and raised further issues to be resolved in the future. The variables and indicators for resource quality and management discussed below are summarized in Annex Table 4.8.

ISSUES IN SELECTING INDICATORS

The workshop discussions about resource quality indicators raised a number of contentious issues and considerable insights. Some key issues were the actual purpose of the indicators; the possibility and desirability of having standardized indicators; how to reflect change due to LO activity; and the choice between researchers' and local people's indicators.

What Do We Need Indicators To Do?

There was lively discussion about exactly what researchers wanted these resource quality indicators to do. While a consensus was not reached, it was apparent that different types of studies might have different types of indicator needs.

Absolute Levels vs Trends vs Thresholds?: Few indicators can reveal significant information about one moment in time. It is the monitoring of change over time that enables insight and understanding of the dynamics of a resource system. The question raised in the workshop was whether there should be emphasis on measuring absolute levels, which would typically require more costly data collection, or whether it was sufficient to monitor the direction and magnitude of trends, for which less precise indicators might be used. For example, in monitoring the successful activity of LOs whose objective is to re-vegetate a major watershed, one could use aerial photos to assess area re-vegetated over time. Quantitative estimates of the proportion of the watershed protected could be calculated using geographic information systems, but this might be costly for an LO. It might be sufficient, for purposes of tracking progress and evaluating impact, to visually evaluate the photos, determine whether the area of vegetated watershed was increasing or not, and whether the increase was considered by the group and/or technical observers to be significant.

In general, the participants concurred that the trend data was most critical and practical. Nonetheless, they felt it would be useful to establish critical bio-physical "warning flags" to help in identifying critical levels when situations may be deteriorating rapidly or irreversibly. For example, in this case, it may be determined that if some critical parts of the watershed were not re-vegetated in a given period of time, there would be irreversible erosion of the riverbanks.

Unfortunately, the selection of "threshold" indicators is problematic, since in many cases the basic research has simply not been done. For example, for many plant and animal species, we do not know how large an area of contiguous forest is required to provide a minimum stable habitat. We may not know how much water can be sustainably pumped from a given aquifer for irrigation. Nonetheless, tentative threshold indicators can be selected, on the basis of expert and local judgement, and efforts made to monitor potential problems on a qualitative basis.

Establishing the baseline: For any of these purposes, it is important to establish baseline levels or composition, as well as specific influences or rates of change prior to introducing a management intervention. This is often best accomplished by examining historical records, or by characterizing the region of concern and then attempting to match that profile with other regions that exhibit similar conditions, where the levels or rates of interest are known. It is normally an expensive and time-consuming process to establish baseline change rates on the basis of empirical data within a particular region. Such efforts are therefore likely to be undertaken only where significant external interventions are proposed, through well-funded initiatives that ensure the presence of adequate expertise for these tasks.

Separating management impacts from natural effects: One of the trickiest issues in monitoring changes in the resource quality is to separate out human-induced effects from the effects of nature. Water flows in a watershed are affected by variations in rainfall patterns, which may mask the effects of changes in watershed-protecting landscape management. Pests can devastate the health of a forest, even where management has improved. Much more technical research will be needed on underlying ecological relationships before we can fully model the impacts of specific types of management within the "noise" of natural variation. However, a research study can at least make a serious effort to identify potentially confounding factors, and maintain a critical perspective as to whether resource improvements or deterioration are due to LO activity or not.

Stand-alone indicators vs clusters: There is considerable pressure from donors, development agencies, international NGO management staff, and others for a few standard indicators which can be used across sites for monitoring progress and impact. Workshop participants warned strongly, however, that individual indicators cannot stand alone. Their meaning is almost always determined by their association with other indicators; this is reflected in the lists below, for all three sectors. For example, indicators of change in land use patterns in a watershed would need to be interpreted very differently if this were associated with a major increase in immigration, than if it were associated with stable population. Thus, even a `minimum data set' of indicators in fact would need to be a list from which selections are made to suit each particular case, and interpreted within the local context.

Capturing spatial variation: One important challenge for any kind of research on natural resource management, is the need to capture information in a spatially-explicit way.

That is, the spatial relationships are important in assessing quality. A thousand hectares of forested area in one contiguous block is a significantly different ecosystem than the same total area of forest broken up into small forest islands surrounded by farmland. The effective protection against erosion in a micro-watershed provided by a given area under soil conservation practices is influenced significantly by where on the slope one finds those practices. Therefore, indicators of absolute levels for different variables must usually be combined with indicators of spatial distribution in order to be properly interpreted.

LO response to indicator change: One working group raised an important point about the analytical use of resource quality indicators in research on LOs. One of the most important variables describing the quality of LO activity, is their responsiveness to a negative change in resource quality. Indeed, one of the hypotheses behind the increased policy support for LOs is that they will have a more rapid response to negative trends than bureaucratic agencies which are not directly dependent on the resource. Thus, it may be valuable to use data on natural resource quality change (including, or even particularly, due to changes in natural conditions or activities of people outside the group) to identify key issues of investigation regarding LO activity.

Can We Use Standard Indicators?

The resource and site specificity of the numerous factors that are needed to comprise a reliable measure of resource condition under local management make it difficult to generalize about the data needed for comparative analysis, or how to measure the effect of policy interventions. Specific indicators that are valid across all sectors may be difficult to generate. Successful cross-site indicators have been developed for water quality in

temperate, developed countries, and considerable progress has been made in adapting these to tropical, developing country conditions. Many standard indicators have also been developed over time for irrigations systems.

There was a widespread perception at the workshop, however, that it would be much more difficult to develop standard indicators for soil and forests, which were much more variable, and that this was perhaps not even a high priority at this time. Even within sectors, it is often vital to capture a full range of diverse, site specific characteristics for an adequate understanding of potential or historical action and change. However, it was felt that there could be greater consensus on the basic types of variables which would be collected. Although the indicators generated for each sector differ appreciably, the analytical framework and methodological principles might be similar. The specific indicators should then be developed based on knowledge of specific local circumstances and practices, and in association with local people who are involved in management practices.

Indicators that Show LO Impact

One of the complications of outcome monitoring for LO impact is the difficulty of separating out observed changes in the landscape which are due directly to LO activity. For example, local agroforestry groups may promote on-farm windbreaks, and provide mutual assistance to group members in windbreak establishment. Yet there may also be individual farmers in the same community or watershed who are investing in windbreaks on their own. Thus, while time series of aerial photographs could be a fairly simple tool to use in assessing landscape-level change in area protected by windbreaks, some additional indicators would be

needed to separate out those windbreaks which are due to group activity. This may involve more time-consuming farm visits, or community resource mapping exercises.

Researchers' vs Local People's Indicators

Indicators differ considerably on the basis of who has devised them. Indicators of effective management or of sustainability, for example, may differ between those generated by local people in a particular area and external agencies aiming to set up or maintain a biodiversity reserve. A standard part of inquiry therefore must be to ask `whose indicators', and to keep these distinct as the research progresses. Indicators that are derived through both participatory methods and selection by professional researchers can play important complementary roles in measuring outcomes of NRM. The process will normally involve negotiation among various stakeholders concerned.

A practical issue in developing indicators concerns the comparatively limited experience that local organizations themselves are likely to have in monitoring and evaluating resource conditions by generally accepted "scientific" criteria and means of measurement. Local people and organizations are likely to have their own criteria and indicators by which to evaluate the status of resources, although these may not always be well-articulated.

It can become an important role for researchers in this field to help in integrating scientific, management agency and local criteria and measurement methods. Researchers can play a role in elaborating and making explicit local people's implicit indicators, and helping to "legitimize" these with the authorities responsible. This involves setting acceptable performance goals and establishing limits or thresholds on the extent, quality and availability

of a resource which can signal warnings that management efforts may not be sufficient, before it is "too late". The validity of these local measures should be tested on an on-going basis.

KEY OUTCOME VARIABLES FOR SOIL AND WATER CONSERVATION

The working group on soil and water conservation prioritized outcome variables related to population pressure, water, soil, land management and biodiversity. All of these variables need to be collected separately for different spaces in the landscape which vary significantly in terms of slope, rainfall patterns and soil characteristics.

Population Pressure

The group felt that one of the key variables to track is the overall population pressure on the natural resources. This may or may not be an outcome variable in itself (e.g., LOs which work to establish woodlots or agroforestry to substitute local sources of fuelwood for wood previously harvested from the forest). Key variables include population density, population growth rate, and size of the population dependent upon the resource.

Water

Like all of the resources, water needs to be assessed in terms of quantity, quality and per capita availability. Water quality may be measured for both human consumption (e.g., contaminants) and for agricultural and irrigation uses (e.g., salinity). The total quantity of water available may be measured in terms of number of dry season water sources, flow rates, etc. Estimates of water use per capita, during different seasons, may be a good measure of access and availability.

Soil

Soil quality can be measured for its chemical, biological and physical composition. The rate of erosion, and spatial patterns of erosion, may be monitored.

Land Management

Actual changes in land management must obviously be assessed. At a landscape level, it is necessary to assess changes in broad land use patterns and in the intensity of land use (for different types of land). Changes in farmers' or groups' use of key soil, crop and pest control management practices should be monitored (in terms of area covered effectively, and proportion of potential users). A second set of key variables relates to the choice, association and configuration of crop types, livestock or tree components. Obviously, the specific variables chosen should relate to those which the project might reasonably be expected to impact. A third set of variables should reflect changes in land access, such as size of landholdings and access to material and labor inputs.

Biodiversity

The working group determined that some variables related to biodiversity should be assessed, however they did not have sufficient time or group expertise to cover this topic. One source on policy-relevant indicators of biodiversity is Reid et al, 1993.

KEY OUTCOME VARIABLES FOR FOREST MANAGEMENT

Forest resources and the response of these to management also must be assessed on the basis of both bio-physical and socio-economic criteria. Key sets of variables are population pressure on the forest, the ecological health of the forest, the environmental

functions of the forest, the economic output of the forest, people's access to forest products, and forest management effectiveness.

Population Pressure on Forest

Changes in population and other pressures on the forest resource may condition (or confound) the effects of local organization efforts in forest management. Such changes may also be an objective of local organization activities (e.g., better protection of the forest from encroachment). Key variables include rate of migration into forested regions of interest, settlement incentives, frequency and extent of commercial logging and other extraction activities by outsiders, population density, and settlement pattern of new migrants..

Ecological Health of Forest

Criteria and region-specific indicators must be identified or developed in order to monitor biological improvement or deterioration through time. Biophysical criteria include species composition and diversity, ecological structure and function, area (e.g. crown cover), health and age of individuals, biomass accumulation, regenerative capacity, relative connectedness to other forests, resilience and stability through time.

Environmental Functions of Forest

Key environmental benefits of the forests can be assessed, including the degree of biodiversity, the quality of the watershed protection function, and the quality of the climate regulation function.

Economic Functions of the Forest

The economic output of the forest might include: number and value of timber and non-timber products, the economic value of forest products, and the stock of forest products.

Assessment of changes in demand for forest products for local, commercial or other needs, relative to the stock would be a useful measure of the capacity of the forest resource to meet demand. Productivity and yield of extracted products is a measure output relative to total inputs.

Access to Forest Products

Some possible variables for measuring access to forest products might include: the ratio of forest area to forest users, area under different types of property and access rights, the spatial distribution of the forest resource relative to sources of demand, and the degree of remoteness from population centers or transport infrastructure type and number of users, and level/proportion of dependency on forest products for household security and commercial needs.

From these, measures of local reliance per unit of stock can be developed. Thus, the forest's capacity to meet local and public needs--ultimately a ratio of forest use to forest area--can be determined. Additional variables to assess include changes in local interpretations of access and property rights over forest resources that affect replenishment of and investment in the forest, and rule changes, including changes in area covered by those rules.

Forest Management

Key variables of the overall level of management of the forest might include level of forest investment, use of particular forest or agroforestry management practices (e.g., number of users or area of forest affected), and proportion of the landscape under permanent farming. Variables related to product use include proportion of products drawn by local people from their own land or from adjacent forest land; potential substitutability of the latter; and changes

in species used, production or consumption technology (e.g. changes in building materials used in homes or fuelwood species).

KEY OUTCOME VARIABLES FOR IRRIGATION SYSTEM

Variables and indicators for assessing irrigation systems are much more developed than in the other areas, due to their longstanding importance to national food production and policymakers. Key sets of variables in assessing irrigation include soil quality, water quality, water supply, water distribution, infrastructure, financial sustainability, productivity and profitability, and extent of services.

Box 5
Decision Making in Irrigation Systems
Shashi Kolavalli, Indian Institute of Management

The Indian Institute of Management designed a research program to understand how water allocation and distribution decisions are made in two medium-sized irrigation systems in Gujarat India. Researchers wanted to determine how operational goals are driven by strategic goals, whether these goals are shared by managers at various levels in the irrigation organization, and how these objectives influence the performance of irrigation organizations.

In order to measure performance of the organizations, the researcher collected data on specific physical features of the irrigation system. These included: area irrigated in a season and the quantity of water supplied per hectare. Area irrigated can be misleading as an indicator because land which receives even a single irrigation application is considered to be irrigated. Though corresponding duty does indicate quantity of water supplied, there may be wide variations within the command area. Measurements of water at lower levels in the system are only estimates. Measurements of equity of water distribution among different parts of the command were based upon percent of area irrigated and therefore also suffered from similar errors.

Soil Quality

Measurements of soil and land condition should include both biophysical and management indicators. Bio-physical indicators include salinity, biological activity, fertility, topsoil depth, depth to water table, distribution of depth to water table, and infiltration rate. Mixed physical and management indicators include degree of leveling and of land preparation/shaping.

Water Quality

The most important indicators of water quality are physical and include salinity, sediment, toxicity, alkalinity, temperature, and biochemical oxygen demand (BOD), detoxification, pathogens and disease vectors.

Water Supply

Watershed water supply indicators must cover physical as well as management criteria. The most important physical indicators are stream flow per unit of time, ground water availability, and return flow rates. Important socio-economic indicators include storage capacity, and units of water allocated within the watershed.

Water Distribution

The most important indicators of water distribution (for the irrigation system) represent a fusion of physical and socio-economic attributes and measurement requirements. These include predictability of water supply and frequency of water delivery. Others are mainly socio-economic in nature, such as timeliness of water delivery and equity of distribution.

Infrastructure

In order to measure infrastructure, researchers need both physical and socio-economic indicators. The most important physical indicators are spatial location of functional structures, condition (proportion of functional structures), and level of accumulation of silt, grass, or other sources of blockage. Socio-economic indicators include unofficial checks or breaches and the proportion and sources of local investment.

Financial Sustainability

All indicators of financial sustainability are management related. These include debt levels, extent of local resource mobilization, proportion of local income resources retained, existence/state of a capital replacement fund, income/expense balance, and organization and management cost per ha and cost per unit of water.

Productivity and Profitability

Productivity and profitability measures include yields per unit area, cropping intensity, crop value, net income/ha, quantity of other benefits such as fuel and fodder produced, and the return on capital invested.

Extent of Services

In order to measure the extent of services provided by irrigation systems, the following indicators are used: area served, duration of service, and number and status of users.

FINAL NOTES

The search for indicators of sustainable natural resource management and resource quality, which could guide policy action and evaluate policy and program impact, is still in an early stage. Many international and national efforts are underway, although more often to assess the effects of management action by private farmers or resource users, or by public agencies, rather than by local organizations. The World Bank, UNEP, UNDP and FAO are currently organizing an international consortia for comparative research in the development of robust policy-relevant indicators (Pieri, et al. 1995). This initiative looks both at participatory and scientific indicators, at project, watershed and regional levels. Another collaborative initiative, the Framework for Evaluation of Sustainable Land Management (FESLM), examines development of indicators of sustainability at the farm and farming system levels (Reid et al 1993).

The research community concerned with local organizations in NRM needs to become more involved with such initiatives. Such collaboration would both benefit from the advantages of a larger network for comparative evaluation of alternative indicators, and also ensure that these efforts explicitly address the special monitoring issues related to action by local organizations.

10. NEXT STEPS: PRIORITIES AND STRATEGIES FOR RESEARCH

Local organizations have a central role in the management of natural resources, and are likely to play an increasing role as state agencies withdraw from direct resource

management in many contexts. In order to encourage the sustainable use of resources and improved local welfare, policies must therefore be founded on a detailed understanding of the local organizational processes and the incentives involved in resource management. Though much is being learned about LOs, there remains a critical need for new research on the effects of policies on these organizations and the resources they manage.

The workshop drew attention to both the need for comparative, policy-oriented research to be conducted about and with LOs, and the substantial challenges involved. This synthesis paper proposes ideas that researchers can use to enhance the value of studies for comparative research. In the authors' view, priority areas for furthering this research agenda lie in the areas of comparative studies, methodology development, and addressing policy questions:

PRIORITIES FOR COMPARATIVE STUDIES

- Develop a set of strategic policy research studies of LOs involved in NRM, using a common interdisciplinary conceptual framework for data collection and analysis. These should cover as many of the key factors of environmental context and internal structure of the LOs as possible, along with the impact on resource management and local welfare. The new CGIAR Inter-Center Initiative on Property Rights and Collective Action provides a good opportunity for such comparative research across countries and resources. However, this workshop also showed that, while key concepts may apply across resources (e.g. water, land, forests), establishing directly comparable indicators may only be possible for studies of a single resource. This

latter approach underlies the International Forestry Resources and Institutions (IFRI) program and IIMI's program to assess the performance impact of irrigation system turnover to local organizations.

- Where comprehensive comparative studies cannot be undertaken, promote the inclusion of broad contextual and organizational information in case studies so that the results can be interpreted correctly and results used more widely. The identification of key factors, as undertaken in this workshop, provides a basis for such comprehensive case studies.

PRIORITIES FOR METHODOLOGY DEVELOPMENT

- Develop indicators of LO activity and effectiveness. Such indicators are needed to identify factors that strengthen or inhibit LOs, and to assess their capacity for NRM.

- To assess the impact of LOs in NRM, develop and disseminate methodologies for participatory monitoring by local people. This would include investment in perceptual studies of natural resource conditions, to identify indicators that can serve as surrogates for technical measurements. Studies that use triangulation of methods to cross-check findings based on perceptual and technical indicators can help establish the validity of the former for the academic and policy communities.
- Document and disseminate experiences with the process of implementing participatory research involving LOs. Particular attention should be given to how the research questions and methods were negotiated, and what local people expected and gained

from the research. Where written documentation would be too sensitive, workshops can bring together researchers and representatives of participating LOs from various studies to share experiences.

PRIORITIES FOR ADDRESSING POLICY QUESTIONS

- Identify four or five important policy questions, and mobilize researchers to address the issues in an integrated, inter-disciplinary framework. IIMI's program to assess the performance outcomes of irrigation management transfer programs in a range of countries is one example of such a comparative study of a major policy affecting LOs in NRM. The concentration of research effort on those questions should not only throw light on the effect of those particular key policies, but also illustrate how to disentangle policy effects, develop suitable methodologies that involve local communities, and document impact on the natural resource and welfare of local people.
- Incorporate more systematic attention to the degree of implementation in all studies of policies affecting LOs in NRM. This is needed both for correct interpretation of the impact of specific policies, and to develop methodologies to measure and understand the "implementation filter" illustrated in Figure 1.1.
- Study and disseminate findings on how LOs attempt to influence policies, and identify factors that contribute to their success. This will promote LOs as partners in both the research and policy formulation process.

The costs of comparative, interdisciplinary research with the necessary time frame to assess changes in natural resource management are certainly high, and the challenges of developing research agendas that satisfy multiple stakeholders can appear daunting. However, the pressing concerns over natural resource degradation, and the costs borne by local people as well as the externality effects borne by society at large, call for more effective management strategies. Local organizations are the critical stewards of the resources in many cases, and their role is increasing as the state withdraws from direct resource management in many countries. The gaps in understanding of these organizations have hindered the development of effective policies to strengthen LOs and their resource management activities. Thus the payoffs for research collaboration with LOs for comparative study are high, not only in advancing the frontiers of knowledge, but also in achieving more equitable and sustainable resource outcomes.

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Annex 1. Workshop Participants

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Annex 2. Case Material

Indigenous organization and indigenous resource management.

Author:	Tony Bebbington
Institution:	International Institute for Environment and Development
Country:	Ecuador
Resource management objective:	Agriculture and soil conservation
Type of local organization:	Federations of indigenous communities

Protected and peripheral area management: Livelihood, governance and tenure relationships.

Author:	Louise Buck
Institution:	Center for International Forestry Research
Country:	Madagascar
Resource management objective:	Forest Management
Type of Local Organization:	Local Communities and Forest Management Institutions

Forest resource use and management in Mt. Canlaon nature park.

Author:	Romana de los Reyes
Institution:	Institute of Philippine Culture
Country:	The Philippines
Resource management objective:	Forest management
Type of local organization:	Forest user groups (Indigenous occupants, tenants, land claimant-cultivators, and landless)

Research activities on local organizations and natural resource management.

Author:	Alison Field-Juma
Institution:	African Centre for Technology Studies
Country:	Kenya
Resource management objective:	Water resources development
Type of local organization:	Local organizations (broadly defined)

Community participation in protected areas management.

Author:	Larry Fisher
Institution:	World Neighbors
Country:	Indonesia
Resource management objective:	Management of protected areas
Type of local organization:	Local communities

Decision making in irrigation systems.
Author: Sashi Kolavalli
Institution: Indian Institute of Management
Country: India
Resource management objective: Irrigation management
Type of local organization: Irrigation organizations

Irrigation management in Zimbabwe.
Author: Ruth Meinzen-Dick
Institution: International Food Policy Research Institute
Country: Zimbabwe
Resource management objective: Irrigation system management and management of dambo wetlands
Type of local organization: Irrigation organizations and local communities

Organizing for farmer-driven resource management research.
Author: Helle Ravnborg
Institution: Centro International de Agricultura Tropical
Region: Latin America
Resource management objective: Agriculture and soil conservation
Type of local organization: Community groups

Farm forestry in North-West India.
Author: N.C. Saxena
Institution: National Academy of Administration, India
Country: India
Resource management objective: Farm forest management
Type of local organization: Villages

Managing the forest boundary: National and local level constraints and opportunities in the case of Korup, Cameroon.
Author: Gill Shepherd
Institution: Overseas Development Institute
Country: Cameroon
Resource management objective: Forest management
Type of local organization: Villages

Community-based Tsetse control in Busia District, Kenya.

Author:	Brent Swallow
Institution:	International Livestock Research Institute
Country:	Kenya
Resource management objective:	Livestock management
Type of local organization:	Villages

Public policies affecting natural resources management in the Humid Tropics of Latin America.

Author:	Jorge Uquillas and Francisco Pichon
Institution:	The World Bank
Country:	Ecuador
Resource management objective:	Forest management
Type of local organization:	Indigenous resource management groups

Enhancing dry season rotational irrigation in West Java, Indonesia: Summary of a participatory action research study.

Author:	Doug Vermillion
Institution:	International Irrigation Management Institute
Country:	Indonesia
Resource management objective:	Irrigation
Type of local organization:	Farmer groups

Changing communities: Enhancing incomes, local institutions and forest management.

Author:	Lini Wollenberg
Institution:	Center for International Forestry Research
Region:	Southeast Asia
Resource management objective:	Forest management
Type of local organization:	Local forest management institutions

Annex 3. Workshop Agenda

WORKSHOP ON POLICIES ON LOCAL ORGANIZATIONS FOR NATURAL RESOURCE MANAGEMENT: TOWARDS AN INTERDISCIPLINARY RESEARCH AGENDA

October 18-21, 1994
Columbia Inn Hotel
Columbia, Maryland

AGENDA

Tuesday, October 18

8:00 p.m. Icebreaker/introductions

Wednesday, October 19

1. INTRODUCTION

Louise Buck - Moderator
Lee Ann Jackson - Rapporteur

8:30 a.m. - 9:15 a.m. Plenary
Background to the workshop and institutional objectives (Sara Scherr)

9:15 a.m. - 10:15 a.m. Plenary
Purpose and focus of current and planned research (2 minutes from each participant describing how the workshop fits into their current research efforts)

10:45 a.m. - 11:30 a.m. Plenary
"Gaps in existing knowledge" - highlights from the literature review (Ruth Meinzen-Dick)

11:30 a.m. - 12:00 p.m. Plenary
"Challenges in Recent Empirical work on LO in NRM" (Elinor Ostrom)

2. INDICATORS OF RESOURCE IMPROVEMENT AND DEGRADATION

Gill Shepherd - Moderator
Sara Scherr - Rapporteur

1:30 p.m. - 1:45 p.m. Plenary
Explanation of small group tasks
(Gill Shepherd)

1:45 p.m. - 3:30 p.m. Small group #1
Develop list of key indicators for assessing the status of improvement/degradation of specific types of resources

3:30 p.m. - 5:30 p.m. Plenary
Synthesis/discussion of small group conclusions

Thursday, October 20

3. FACTORS AFFECTING LOCAL ORGANIZATIONS' MANAGEMENT OF NATURAL RESOURCES
Deborah Merrill-Sands - Moderator
Louise Buck - Rapporteur

8:30 a.m. - 8:45 a.m. Plenary
Explanation of small group task (Ruth Meinzen-Dick)

8:45 a.m. - 10:45 a.m. Small group #2
Identify key variables, external to the local organizations, that affect the likelihood and ability of local organizations to manage natural resources.

10:45 a.m. - 12:00 p.m. Plenary
Synthesis/discussion of small group conclusions

4. CHARACTERISTICS INFLUENCING ORGANIZATIONAL EFFECTIVENESS IN NATURAL RESOURCE MANAGEMENT
Tony Bebbington - Moderator
Deborah Merrill-Sands - Rapporteur

1:30 p.m. - 2:30 p.m. Plenary
Introduction: Indicators "for whom" and explanation of task (Tony Bebbington)

2:30 p.m. - 4:00 p.m. Small group #3
Identify characteristics that influence organizational effectiveness in natural resources management.

4:00 p.m. - 5:30 p.m. Plenary
Synthesis/discussion of small group conclusions

5. INTER-INSTITUTIONAL COLLABORATION
Ruth Meinzen-Dick - Moderator

7:30 p.m. - 9:00 p.m.
Discussion on issues of collaboration
(IARCs, NARs, NGOs, Universities and Local Organizations)

Friday, October 21

6. ISSUES IN DEVELOPING RESEARCH AGENDAS AND STRATEGIES
Sara Scherr - Moderator
Gill Shepherd - Rapporteur

8:30 a.m. - 10:00 a.m. Small group #4
Discussions
1) Negotiating research agendas to meet the needs of local organizations.
2) Developing research designs to link specific policies to organizational performance and natural resource condition

10:30 a.m. - 12:30 p.m. Plenary
Synthesis/discussion on research designs and agendas

7. CONCLUSIONS
Lini Wollenberg - Moderator
Tony Bebbington - Rapporteur

2:00 p.m. - 3:30 p.m. Plenary
Key methodological approaches and research strategies

3:30 p.m. - 3:45 p.m. Plenary
Follow-up

3:45 p.m. - 4:00 p.m. Plenary
Closing Remarks
(Peter Hazell, Neil Byron, and Sara Scherr)

Annex 4. Checklists of Research Variables

Annex Tables:

Annex Table 4.1
Policy Factors Affecting Local Organizations in Natural Resource Management

Sectoral policy factors

- Price policies for resource outputs, key inputs or substitutes (and access by LOs);
- Subsidies or co-financing arrangements for specific resource management activities or groups (and access by LOs);
- Special lines of credits for natural resource management (and access by LOs);
- Regulations on use of specific natural resources or management technologies;
- Taxes or fees charged for use or access to natural resources, or the processing, transport or sale of outputs;
- Public investment and maintenance of infrastructure critical for natural resource use or exploitation.

Legal and institutional factors

- Definition of property rights over resources for groups;
- Legal rules regarding formation, management and reporting of LOs;
- Legal rights to organize locally;
- Government recognition of local resource management groups;
- Enforcement of existing contracts or agreements with LOs;
- Institutional mechanisms for conflict negotiation and resolution;
- Administrative and financial rules in decentralization policies of state agencies;
- Channels for exchange of critical information about policy, economics, technology, etc. by groups;
- Availability of support services for LOs, provided by public agencies or NGOs.

Political factors

- Local strength of government presence and effective control over natural resources;
- Local strength of other institutions potentially competing with LOs for resource control or access (e.g., military, private commercial interests from outside the region; local largeholders);
- Extent of partisanship and factionalism in local policy formulation and implementation;
- Credibility of government commitment to local devolution of management rights over natural resources;
- Extent of effective local participation in policy decisions (e.g., formal citizenship and voting rights; mechanisms for representation by gender, ethnic group, economic class);
- Level and nature of social capital within local communities.

Annex Table 4.2
Major Research Questions

- How might LOs and their management of NR be influenced by policy action?
- What was the impact of a particular policy on key policy outcomes?
- How and why was a given policy (not) effective in influencing LOs in NRM?
- How could policy design be improved, from the local groups' and group members' perspectives?
- How and why was a certain policy formulated and implemented?
- What might be the impact of a new policy on key policy outcomes?

Annex Table 4.3
Disentangling Policy Effects

Define policy
- De jure policy
- De facto policy

Document pattern of implementation

- Geographic area
- Local organization clients/targets
- Degree of implementation

Identify potential confounding variables

- Simultaneous socio-economic change
- Simultaneous policy action
- Changes in internal dynamics of local organization
- Changes in resource conditions due to natural factors
- Interactions between institutional, political and economic variables

Distinguish variation in policy effects by type of group

- Type of access to resources/tenure
- Type of organization
- Type of NRM system

Annex Table 4.4
Data Collection Techniques

Statistical Sample Surveys
- Census of groups or individuals
- Single-visit surveys (individuals, households, groups)
- Multi-visit surveys or monitoring (individuals, households, groups)

Purposive Sample Surveys
- Key informant interviews (individuals, groups)
- Informal surveys or rapid appraisals (individuals or groups)
- Focus groups
- Ethnographic methods (e.g., ethno-ecology, preference ranking)
- Participatory rural appraisals
- Oral histories
- Participatory resource mapping

Direct Observation
- Participant observation
- Community record-keeping
- Process documentation (in action research)

Technical Evaluation of Natural Resources
- Remote sensing (aerial photos, video-images, satellite images)
- Mapping natural resource use, management and/or condition (at landscape, community or farm scales)
- Natural resource inventories
- Field/plot surveys (single-visit, multiple-visit)

Annex Table 4.5
Common Types of Analysis in Policy Research

- Game theory models (economics, political science)
- Simulation models of LO or household response to policy (economics)
- Cost-benefit analyses of LO activity (economics)
- Econometric analysis of factors influencing policy response (economics, sociology)
- Spatial analyses of patterns of change in natural resources use or condition (geography, landscape architecture)
- Case studies exploring historical processes of LO response to policy (various)
- Ethnographic analysis (anthropology)
- Action research ,monitoring changes in LO activity and NRM following policy change (various)
- Group self-evaluation of LO activity and effects of policy or program change on NRM (community development)

Annex Table 4.6
External Factors Influencing Local Organizations

Physical and technical environment

- Site characteristics: ecological zones, climate, rainfall, soils, topography, altitude, latitude, longitude
- Size of resource unit (absolute and relative) and clarity of boundaries
- Relative resource supply (e.g. Relative Water Supply for irrigation) and its seasonal variations
- Ecological status (quality, resilience, density of resource base)
- Internal variability of resource base
- Predictability of flow from resource
- Larger ecological context (agricultural frontier or area of intensive production)
- Accessibility, infrastructure within area and outside it
- Size and complexity and interdependence of resource management between units
- Basic elements of past and present human use patterns and present management regimes/farming system(s)
- Technology characteristics: (e.g. maintenance, costs, and import dependence)

Economic environment

- Existence and nature of market demand (structure of activities and prices)
- Contribution of resource to livelihoods and economy
- Relationship of resource to the economy (national and local)
- Profile of local livelihoods and economic alternatives
- Economic incentives for sound management (sound in ecological and social sense)
- Access to assets/factors of production for use of resource
- Access to market, transport, communication
- Access to credit
- Extent of monetization of economic activities
- Dependence of food security strategies upon group activity
- Average size and distribution of resource management units (farm, forest)
- Shape of wealth distribution curve

Social and cultural environment

- Culture and history of collective action
- Access and control over resources including specific products
- Presence of catalyzing factor (leader, problem, opportunity...)
- Cultural attachment to resource
- Population characteristics (homogeneity-heterogeneity, spatial distribution)
- Density and proximity of people
- Demographic change (growth, decline, in-migration)
- Relevance of local knowledge to management challenges
- Education - literacy, numeracy

Policies and governance

- Extent and content of state regulations over resource use
- Direct policy support for resource (subsidy investment)
- Legal definition of property rights to the resource
- Right to organize and be recognized (legal personality)
- Content of legislation regulating local organizations
- Presence, activities of LOs and relationships with external agencies (local, national, international - donors, NGOs, religious bodies, etc.)
- Availability of mechanisms to resolve conflict locally and with outsiders
- Commitment to local devolution and development
- De jure and de facto citizenship and voting rights of diverse groups

Annex Table 4.7
Indicators of Group Structure and Function

Evaluative Criteria
- Efficiency
- Effectiveness
- Equity
- Accountability
- Responsiveness
- Adaptability

Internal Structure
- Governance
- Size
- Incentives
- Trust and sanctions
- Leadership
- Legitimacy
- Shared norms

Annex Table 4.8
Measuring Outcomes

SOIL AND WATER CONSERVATION

Population pressure
- Population density
- Rate of population change
- Size of population dependent on the resource

Water
- Quality for human consumption (e.g., contaminants)
- Quality for agricultural and irrigation uses (e.g., salinity)
- Number and flow rates of water sources
- Water use per capita

Soil
- Chemical/biological quality (by land use/quality type)
- Rate of erosion (by land use/quality type)

Land management
- Changes in land use patterns and farming systems
- Use of soil management practices (e.g. soil amendments)
- Use of pest management practices
- Use of crop management practices (e.g. tillage)
- Intensity of land use
- Size of landholdings
- Access to materials and inputs

Level of biodiversity

FORESTRY

Population pressure
- Migration into forested regions of interest
- Commercial logging or extraction activities in forest and settlement incentives
- Population density
- Settlement patterns

Ecological health of forest
- Area (crown cover)
- Relative connectedness to other forests
- Species composition, distribution and biomass
- Extent and nature of biodiversity
- Resiliency, stability, regenerative capacity
- Age composition of individual trees
- Health of individual trees
- Biomass

Environmental function of forest
- Quality of watershed function
- Quality of climate regulation function

Economic output of forest
- Number and value of timber and non-timber products
- Economic value
- Stock of forest products
- Capacity to meet local, commercial or public needs
- Productivity and yield of extracted products

Access to forest products
- Ratio of forest area: users
- Tenure access and property rights over forest resources
- Spatial distribution relative to demand
- Remoteness from population centers or transport infrastructure

Forest management effectiveness
- Investment into forest
- Changes in home building technology
- Proportion of landscape under permanent farms
- Use of particular forestry or agroforestry management practice

IRRIGATION

Soil
- Salinity
- Biological activity
- Fertility
- Topsoil depth
- Depth to water table and distribution
- Leveling and land preparation/shaping
- Infiltration rate

Water quality
- Salinity
- Sediment
- Toxicity
- Alkalinity
- Temperature
- Biochemical oxygen demand - detoxification
- Pathogens and disease vectors

Water supply (watershed)
- Stream flow over time available
- Storage capacity
- Water allocation in watershed
- Groundwater availability
- Return flow

Water distribution
- Predictability
- Frequency
- Timeliness
- Equity in distribution

Infrastructure
- Condition (proportion of functional structures)
- Accumulation of silt, grass, etc.
- Unofficial checks or breaches
- Proportion and sources of local investment
- Spatial location of functional structures

Financial sustainability
- Debt level
- Local resource mobilization
- Proportion of local income resources retained
- Capital replacement fund
- Income/expense balance
- Overhead and maintenance cost per hectare
- Overhead and maintenance cost per unit water

Productivity and profitability
- Crop yields
- Cropping intensity
- Crop value
- Net income per hectare
- Biomass produced (for fuel, fodder, etc.)
- Return on capital

Extent of services
- Area served and length
- Number and status of users