AHI Methods Guides

AHI METHODS GUIDES No. B2

A SOCIALLY-OPTIMAL APPROACH TO PARTICIPATORY WATERSHED DIAGNOSIS

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The African Highlands Initiative

The African Highlands Initiative (AHI) is an ecoregional programme of the Consultative Group for International Agricultural Research (CGIAR) and a network of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) convened by the World Agroforestry Centre (ICRAF). AHI works in close partnership with national and international agricultural research centres, local governments and NGO partners to develop innovative methods and approaches for improving livelihoods through integrated natural resource management in the densely settled highlands of eastern Africa.

The AHI Methods Guides

The AHI Methods Guides series was developed as a medium for AHI staff and partners to synthesize the innovative methods and approaches developed, tested and validated in AHI benchmark sites and from institutional change work carried out in the region. Contributions to the series include methods for system diagnosis and planning; targeting intervention strategies; facilitating change at farm, watershed, district or institutional level; monitoring and evaluating change or impacts; and structuring the innovation process overall. AHI Methods Guides are organized under five thematic areas:

- *Theme A* – Strategies for Systems Intensification (with an emphasis on the farm level)
- *Theme B* – Participatory Integrated Watershed Management
- *Theme C* – Collective Action in Natural Resource Management
- *Theme D* – Policy and Institutional Reforms
- *Theme E* – Improving Research-Development Linkages

The targets of these papers include agricultural research, development and extension organizations and practitioners with an interest improving their practice and impacts; and policy-makers interested in more widespread application or institutionalization of methods in their areas of jurisdiction.

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TABLE OF CONTENTS

INTRODUCTION

Most formal research in support of agricultural development has focused on the alleviation of farm-level productivity constraints, with problem diagnosis often occurring through a single disciplinary lens. There is a strong push within national and international arenas to move toward broader units of analysis and intervention, including the landscape, catchment and watershed. However, there is a current imbalance in the strong momentum behind this shift and the paucity of methodological guidelines for operationalizing these new approaches within research and development (R&D) circles.

This series of AHI Methods Guides focusing on watershed management (the "B" Series) outlines a series of approaches for:

- Grounding watershed management in local incentives for improved natural resource management (NRM) beyond the farm level;
- Articulating and managing linkages among diverse system components (crop, livestock, tree, soil, water) to balance livelihood improvements with more equitable and sustainable NRM;
- Improving natural resource governance and the articulation of technological with social and policy dimensions of NRM;
- Bringing integrated development and formal research contributions to bear on a demand-driven NRM agenda.

The "B Series" summarizes methods and approaches for Participatory Integrated Watershed Management. While the Series will be frequently updated to include new contributions, currently envisioned contributions include:

<u>Step</u>	<u>AHI Methods Guide</u>
Step 1: Reaching a Common Conceptual Understanding of "Participatory Integrated Watershed Management"	B1
Step 2: Diagnosing NRM Problems at Landscape / Watershed Scale	
a) Socially-Optimal Approach to Participatory Watershed Diagnosis	B2
b) Watershed Exploration	B3
Step 3: Planning for Integrated Watershed Interventions	
a) Creating an Integrated Research Agenda from Prioritized Watershed Issues	B4
b) Participatory Action Planning at Watershed Level	B5
c) Planning for Integrated Research and Development Interventions	E1
Step 4: Watershed Management	
a) Organizing the Community Interface: Structures and Processes for Watershed Representation	B6
b) Stakeholder Identification and Negotiation Support	B7
c) Participatory Monitoring and Evaluation	B8

The current guide describes a methodology for moving from discrete watershed problems, as identified by local residents, to functional NRM ‘clusters’ that serve as the basis for integrated research and development interventions. The methodology is preceded by AHI Methods Guides B1 and B2. The methodology highlights approaches for moving beyond many disarticulated problems and solutions to a more integrated research and development agenda that clarifies a few higher-level targets around which all activities are oriented. Lessons and findings from the application of the methodology in AHI benchmark sites of Ethiopia, Kenya and Tanzania are selectively presented to illustrate the methodology’s application in practice. These include Lushoto District in the Usambara Mountains of Tanzania; Areka and Ginchi in the southern and central highlands of Ethiopia; and Vihiga District in Western Kenya.

JUSTIFICATION

The primary emphasis of agricultural research, extension and development in eastern Africa and worldwide has been on technical dimensions of agricultural productivity, with a strong emphasis on the generation and dissemination of technologies and on individual decision-making (whether to adopt a technology, and how to fit it into the agricultural system). This focus has left many production and livelihood-related issues whose causes, effects and required levels of management lie beyond farm boundaries largely ignored. Researchers strive to generate solutions from within their own areas of expertise: crop and livestock scientists work to generate varieties and breeds with superior yields of fruit, grain, milk and meat under ideal conditions; foresters and agroforesters to generate trees with superior yields of timber, fruit and fodder; soil scientists to maximize soil fertility; and social scientists to understand factors influencing adoption. Agricultural extension planning strives to do little more than disseminate technologies emanating from such diverse fields (although they have increasingly tried to move down the supply chain through partnership and value-adding strategies). Yet little attempt has been made to optimally integrated diverse components of a system (tree, crop, soil, livestock) to enable smallholder farmers to get more of diverse products from limited resources (land, labor, capital or nutrients). Outside of feed and fertilizer trials on new breeds and varieties, attempts to optimally balance production with sustainable nutrient and water management, or to quantify the trade-offs of focusing on one to the exclusion of the other, have been equally scarce. Efforts to extend to the management of common property resources such as water (for drinking or irrigation), communal grazing areas and forests, or to link such biophysical interventions with improved institutions and governance, exist only outside conventional institutional mandates and funding sources.

Conservation agencies, on the other hand, emphasize conservation of biodiversity and natural resources lying within protected areas and their buffer zones. Conservation targets are generally set by national and international agencies and stakeholders, often building upon local conservation objectives to the extent to which these help to further broader conservation objectives. Local livelihood concerns often enter into the conservation agenda due to the pressure placed by local people on protected area resources, and the need to strengthen relations between local communities and conservation authorities. Yet many natural resource management problems exist within agricultural landscapes themselves, are intimately linked to livelihoods, and when left unaddressed can undermine endogenous and exogenous conservation objectives alike.

Most importantly, this conceptual partitioning of “development” from “conservation” within different institutions has left a gap in the concepts, methods and institutional mandates for linking livelihoods with conservation in densely settled agricultural landscapes. Recent efforts from within the agricultural and conservation establishments have tried to bridge this gap. "Natural resource management" departments and ministries have emerged in research institutions and local government, emphasizing soil conservation and, increasingly, agroforestry. Yet these initiatives often fail to link a livelihoods orientation (increased production or incomes) with natural resource conservation, missing a crucial link in building upon farmer incentives for conservation. Increased emphasis on watershed management in agricultural research and extension has partially overcome this gap through an emphasis on raising productivity through soil and water conservation. Yet the tendency is still to emphasize technological solutions over social, institutional or political dimensions of the problem, leaving the responsibility for corrective change in the hands of individual land owners rather than communities, support institutions, policy-makers or a combination of these. Conservation agencies have also tried to bridge this gap in institutional mandate through an extension outward from protected areas to buffer zones, from biodiversity conservation to local livelihoods. Yet livelihoods-oriented initiatives are often designed to strengthen community-park relations by focusing on priority infrastructure and services rather than sustainable land use per se, and the bulk of smallholder farmers reside in areas outside the reach of such initiatives.

This Guide and other AHI Methods Guides on the watershed theme attempt to fill the *conceptual and methodological* gap in linking individual and collective decision-making on natural resource management, plot and landscape-level processes, conservation and livelihoods within *local* landscapes. It does not try to link local incentives for natural resource conservation with those of off-site or downstream users, as is typical of other watershed management approaches. Rather, it is an approach to harmonize interactions among land users, land use objectives – and perhaps also, generations – within local, densely settled agrarian landscapes. It also makes no recommendations on the appropriate institutions or institutional linkages through which such an approach would be most aptly applied – other than to suggest that *both* research and development organizations should take part. Such an institutional model could only be the outcome of a second phase of action-based research and learning emphasizing the testing of different institutional arrangements within diverse contexts. Such learning is required to distill lessons from practice on the most effect institutional structures and procedures for institutionalizing the approach.

OBJECTIVES

The overall objective of the "B Series" of AHI Methods Guides is to enable national research, extension and development institutions and professionals to assist highland communities to equitably further their livelihood objectives while conserving the natural resource base upon which their livelihoods depend.

Specifically, these methods aim to enable targeted end users (agricultural research, extension and development practitioners) to manage an effective participatory and integrated watershed management agenda through:

- A broadly participatory diagnosis of NRM problems at landscape / watershed scale;
- Integrated planning tools that articulate and attempt to synergize the interests of different stakeholders and linkages among system components;

- Multi-stakeholder approaches and the integration of technological, social and policy interventions for improved natural resource governance; and
- Well-articulated linkages between research and development contributions to watershed management.

SCENARIOS

AHI watershed management methods have been developed within highlands contexts of eastern Africa defined by natural resource degradation, declining agricultural productivity, and high population density – which strengthens the causal interactions (both positive and negative) between adjacent landscape units and users. However, we hypothesize that the principles and methods are general enough to be highly relevant to diverse settings as defined by agroecology (i.e. highland and lowland, high and low rainfall), geography (i.e. Africa, Latin America, Asia) and level of natural resource degradation (limited degradation, highly degraded).

TARGET GROUPS

This methodology is designed for use by agricultural researchers of diverse disciplinary specializations (crop science, animal science, social science, agroforestry, soil science); by extension agencies; and by NGOs involved in agricultural development and natural resource management. Ultimately, the methodology will be most useful for integrated teams (defined by multi-disciplinary composition) and multi-institutional partnerships committed to bringing change through the integration of perspectives, skills and institutional mandates.

KEY STEPS IN THE WATERSHED APPROACH

The overall watershed approach may be broken down into four steps or phases, and specific strategies that come under each.

STEP 1: CONCEPTUAL UNDERSTANDING OF “PARTICIPATORY INTEGRATED WATERSHED MANAGEMENT”

The first step of the methodology is to reach a common understanding of the overall objective and approach to “watershed” management, and the implications for the way problems are diagnosed and intervention strategies designed. For example, the “participation” concept must be clearly understood in terms of: (i) a participatory approach to problem identification that may depart from pre-conceived notions of “watershed” or “NRM,” and reserves judgement on the ultimate meaning of the land users’ perspectives; (ii) whose participation, whether local land users alone or off-site stakeholders as well; and (iii) a disaggregated approach to the solicitation of views at “community” level, given the diversity of perspectives and interests within any local community. On a similar note, the “integration” concept must also be jointly understood, in the sense of both: (i) enabling the emergence of issues associated with diverse livelihood priorities and disciplines, as defined both from agronomic (crop, livestock, tree, soil) and broader livelihood perspectives (markets, domestic water); and (ii) defining higher-level system goals that inscribe research priorities and variables, and make researchers accountable to farmers’ priorities and integrated assessments that cut across disciplinary boundaries.

Other concepts that come into the different stages of watershed management and help to operationalize the approach must also be understood collectively, so as to facilitate communication and management of the process. Most notably, the concepts of "watershed issue," "stakeholder," "natural resource management," "community," "integration" and "representation" are words that take on different meanings to different people, and can greatly facilitate collaborative work if ironed out ahead of time.

STEP 2: DIAGNOSING NRM PROBLEMS AT LANDSCAPE / WATERSHED SCALE

Step 2 emphasizes diagnosis of natural resource management problems that cannot be effectively addressed at farm level or through individual decision-making or action. Methods developed under this step are two.

Socially-Optimal Approach to Participatory Watershed Diagnosis (B2)

This methodology enables diverse social groups residing within the watershed to be systematically consulted when identifying and prioritizing watershed issues. A set of variables likely to influence the relative priority given to watershed issues is used to select interviewees for participatory watershed diagnosis. These include wealth (wealthier and poorer households), gender (male, female), age (elders, youth) and – in watersheds where the location of landholdings differs greatly by household, and may influence the extent to which natural resource degradation influences livelihoods – landscape location. Identification of watershed issues, prioritization of watershed issues and data analysis are all done according to these pre-defined social categories and systematically compared.

Watershed Exploration (B3)

This method emphasizes systematic collection of household-level data, both as a complementary approach to problem diagnosis and to use as a baseline for subsequent monitoring and impact assessment. It enables collection of data on: (i) distribution of assets (financial, natural, human, social, physical) within the population; (ii) major land uses, and the relationship between land use and environmental hot spots; and (iii) institutions influencing natural resource governance, including traditional beliefs and perceptions of natural resource governance.

STEP 3: PLANNING FOR INTEGRATED WATERSHED INTERVENTIONS

AHI Methods Guides for watershed planning are of several types, based on who does the planning – watershed residents or R&D teams, and the content of planning. The latter might include planning for the specific watershed issues to be worked on or how to organize the R&D team for well-coordinated, integrated support to watershed development. Three distinct guides have been developed or envisaged thus far.

Creating an Integrated Research Agenda from Prioritized Watershed Issues (B4)

The first topic is the subject of the current guide, and describes a process for moving from discrete watershed issues identified by local residents to the planning of an integrated research and development agenda. The planning is done at the level of support institutions (R&D teams), but must be harmonized with local watershed planning process.

Participatory Action Planning at Watershed Level (B5)

This guide emphasizes how to facilitate participatory action planning at watershed level. Strategies for enhancing representation of diverse perspectives at this level of planning are stressed, as is the planning process itself.

Planning for Integrated Research and Development Interventions (E1)

This guide is not specific to the watershed or "B" series of AHI Methods Guides. Rather, it is a general approach for planning that strengthens the articulation of research-development linkages. It forces R&D teams to ask the questions, "How can effective and equitable participatory action learning processes be facilitated?;" "What is the role of empirical research in bringing concrete change to local residents or off-site users?;" "What role can action research play in distilling general lessons from the change process?;" and, most importantly, "How can these different contributions be effectively integrated and sequenced so as to maximize returns from R&D investments?"

STEP 4: MANAGING CHANGE IN WATERSHED MANAGEMENT

The final and most important series of guides emphasize the process of watershed management itself. Prominent themes include mechanisms to enhance watershed representation, integration of technical with policy and institutional reforms, and enhancing social learning through systematic monitoring, evaluation and adjustment.

Organizing the Community Interface: Structures & Processes for Watershed Representation (B6)

When moving from the village to the watershed level, it is no longer feasible to consider direct participation of all community members in decision-making and as immediate beneficiaries. For this reason, organizational structures, processes to strengthen indirect participation in decision-making, and rules governing access to and sharing of development resources (technologies, trainings, etc.) are required. This guide discusses different options for organizing the community interface, eliciting views and negotiating benefits, and the relative strengths and weaknesses of each.

Stakeholder Identification and Negotiation Support (B7)

This guide illustrates an approach for identifying divergent local interests or "stakes" around any given watershed issue, and bringing these interest groups to together to negotiate: (i) solutions that minimize the harm caused to one of the interest groups from current land use practices; (ii) contribution levels to watershed management activities that bring unequal benefits to the two parties; or (iii) how benefits will be shared by different watershed residents over time.

Participatory Monitoring and Evaluation (B8)

This guide gives an overview to the principles and practices of participatory M&E and the application of the tool to watershed management. Three levels of the tool's application are emphasized: participatory M&E at the watershed level, with local interest groups, and by the R&D team itself. The tool emphasizes how to move from proscriptive intervention process to an adaptive learning process that acknowledges the uncertainties and subjectivities in any change process.

A SOCIALLY-OPTIMAL APPROACH TO PARTICIPATORY WATERSHED DIAGNOSIS

JUSTIFICATION

Most agricultural research and development (R&D) programs place emphasis on increasing agricultural production and productivity through farm-level technological innovations, with little attention given to biophysical processes that cannot be effectively managed at the farm level. Due in part to the limitations of this approach for considering the integration of components and actors at broader levels (catchment, landscape, community), a number of new approaches have emerged to address new dimensions of natural resource management. "Participatory watershed management," "integrated natural resource management" and "collective action in natural resource management" are but a few (Meinzen-Dick et al., 2002;). Yet methodological guidelines for operationalizing these approaches for research and development practitioners are limited. AHI has therefore been working to develop approaches for a participatory, integrated watershed management approach.

Use of the term "participatory" in watershed management discourse is a curious one, given how the watershed as a conceptual unit is in large part defined by flows of resources (water) and environmental services (water free of sediments or contaminants, flood control, etc.) to downstream and urban users. The potential discrepancy in the terms "participatory" and "watershed management," in terms of who is ultimately benefiting from landscape-level natural resource management innovations, makes it essential that approaches to watershed diagnosis are thought through systematically. We encourage users of this guide to refer first to AHI Methods Guide B1, "Reaching a Common Conceptual Understanding of Participatory Integrated Watershed Management," to determine whether the principles upon which this methodology is based – small-scale, integrative of conservation and livelihoods, and based upon NRM issues of importance to the *local* land user – align with the objectives of your organization and the stakeholders you support. If the answer is yes, then this methods guide can be used as a tool for identifying local incentives for improved natural resource management beyond the farm level, and for enhancing equity in watershed diagnosis by integrating the perspectives of multiple local actors during the exploratory phase.

OBJECTIVES

The objectives of this guide are to assist R&D teams interested in applying a participatory, integrated watershed management approach, to diagnose and prioritize natural resource management issues at landscape or watershed scale that are of *internal* interest to local land users residing in upper catchments.

COMMUNITY ENTRY

In all societies, there are social protocols to be followed when entering a community to initiate collective work. In most eastern African societies, this involves contacting community leaders at the bottom of the government hierarchy. In respect for traditional customs and for the strong role that traditional leaders continue to play in many societies, it is also important to contact local elders. This can be done through informal visits or scheduled meetings, but should always be done through consultation of local residents on the protocol for handling such situations.

Informing the local leadership about the project or programme's aims when entering new communities, or about new dimensions of R&D brought in through the application of the watershed approach in communities where you already have a presence, will go a long way in leveraging support for future activities – even if the local leadership is not directly involved in implementation. Provided these leaders are effective in keeping their constituencies informed, it will reduce suspicions which often arise when newcomers arrive to an area or when support institutions with a longstanding presence in an area begin acting differently. For example, AHI had worked for several years on farm-level innovations with a certain group of farmers; with initiation of watershed-level activities, it was necessary to extend far into watershed communities to consult new people (to ensure broad-based representation) and to ask new types of questions (to diagnose problems at the watershed level). It is essential that such behaviors be explained ahead of time and communicated to local residents. Consulting local leaders or elders can also serve as a means to leverage the acceptability of activities to come are culturally acceptable, as in the case of gender-disaggregated focus group discussions or scheduling visits in accordance with local religious or work calendars. In most cases, this step was straightforward and local government units were highly receptive to the program given AHI's prior work in neighboring villages in the area of farm-level technological innovation. Program objectives were shared with different levels of leadership, where relevant (ward or woreda, village).

Two words of caution should be mentioned. First, it is essential to use caution in what is committed by the project at this time. Most rural communities throughout the developing world hold keeping one's word almost as sacred; if anything is committed early on but subsequently not delivered, local residents will most certainly remember. This can undermine community enthusiasm and trust vis-à-vis outside agencies. It is always best to err on the conservative side, promising less than what can be delivered. Secondly, it is important not to draw the local leadership in too much during early phases of watershed exploration, as they can often obstruct efforts to equitably elicit views – in particular when the leadership has been less than transparent or when latent conflicts exist. It is often best to let community members themselves suggest who should be involved and how at diverse stages of the process, which should assist in identifying those individuals that have the trust and the confidence of local residents.

Equally import at this stage is ensuring the leadership of partner organizations is fully aware of the intended approach and collaboration. This helps leverage the necessary support of research organizations for their staff to engage in more prolonged field work, and of both organizations who must often be convinced of the value of partnering with other organizations. When possible, the work should be integrated into the planning and review process of each organization, so that the work is given the attention it deserves – irrespective of the extent to which it departs from standard professional practice. Otherwise, the approach will be evaluated on the basis of its sub-standard performance rather than its actual potential to bring change.

PARTICIPATORY PROBLEM IDENTIFICATION

Identifying 'Watershed Issues'

Tools for participatory problem diagnosis must enable local identification of constraints at multiple levels, from farms to 'neighborhoods' to landscapes and even the administrative units that govern certain dimensions of land use within these biophysical units. It much also retain a flexible interpretation of watershed boundaries and processes. In other words, problems identified by farmers that manifest themselves beyond the boundaries of the watershed (i.e. resource conflicts with non-watershed residents) or do not easily conform to our notions of a watershed problem should not be ignored due to our own rigid conceptions or interests. They often hold the key to solutions or may hinder our efforts when left unaddressed. A watershed diagnosis exercise conducted with agricultural researchers in southern Ethiopia, for example, led to the identification of declining access to domestic water as a watershed issue. Researchers accustomed to inscribing their mandate along the lines of agricultural productivity felt that these issues fall outside their mandate and should therefore be eliminated from consideration. After some discussion, they agreed to withhold judgement and see where the issue would lead. Farmers ended up ranking the issue as the top priority for them, and identifying as one of its causes the cultivation of 'thirsty' tree species. Not only did this turn out to be an issue related to the management of farm land, it also proved to be an opportunity to tap into a very deep motivation for engaging in collective land use innovations. With water ministries charged with addressing water quality issues alone, ensuring long-term domestic water supply – a water quantity issue – was left outside the mandate of existing institutions. This is perhaps one of the reasons that the issue emerged as a top priority in all of AHI's benchmark sites in the region, as it had been historically ignored due to the artificial partitioning of institutional mandates in the region. The case of flexible boundaries can be illustrated by the Ginchi site, where farmers residing outside the watershed have access to water supplies and grazing land in the watershed. Unless brought into decision-making on the management of these resources, innovations will be made difficult either through failure to cooperate (for example, controlling livestock movement) or from unequal contributions to maintaining a shared resource – which will undermine community enthusiasm for future investments.

Considering how local views are elicited during the "participatory" diagnosis is equally important, as this will influence the responses given and inscribe the scope of issues identified. In doing this in AHI, we considered both the methodology used and the questions asked. For the first, we experimented with the use of interviews (with the use of checklists), participatory mapping and historical trends analysis. We found the first of the three to be most useful in eliciting a wide range of issues, and have therefore chosen to emphasize this approach. However, the second two approaches are complementary and are therefore touched on briefly before moving to the next section.

When using checklists and semi-structured interviews, it is important to look closely at how the questions asked influence the responses given by interviewees. We initiated this process by enabling each of AHI's sites to identify its own research questions that they believed would help to best identify watershed-level NRM problems. The first site began by asking about issues that could benefit more from collective than from individual action. The second site visited decided to focus on problems associated with trans-boundary influences between neighboring farms and villages. A third site decided to focus on natural resource conflicts. And finally, additional questions were crafted that would enable issues only identified through historical trends analysis (i.e. reduced access to fuel wood over time) to be effectively captured through interviews.

Following the identification of these diverse questions, we monitored how they influenced responses given by local land users. Data from Lushoto benchmark site, Tanzania (Table 2), illustrate how the formulation of questions influences the identification of problems. Clearly, the way questions are phrased will bias the answers that are obtained from "participatory" diagnosis. In AHI, we dealt with these biases in two ways. First, we triangulated a wide range of questions by integrating them each into the checklists used in problem identification. The second approach was to triangulate methods for problem identification.

Table 1. Correlation between Questions and Elicited Responses in Lushoto Benchmark Site

Research Question	**Elicited Responses**
1. What activities could benefit from collective action?	Soil and water conservation, farmyard manure application, banana planting Maintaining a community bull Community mill construction and operation Maintenance of roads and community buildings Managing water sources and irrigation infrastructure
2. How do activities of neighboring farms and villages influence your livelihood?	*Eucalyptus* spp. on neighboring plots and boundaries Neighboring fields harboring rodents, pests and weeds Stray fire from neighbors' fields Failure of neighbors to conserve their plots and run-off Lack of respect for farm boundaries
3. Are there any natural resource management conflicts?	Land shortage / boundary encroachment Free grazing Theft of crops and village trees Traditional vs. modern beliefs on NRM Limited drinking / irrigation water
4. Are there any problems associated with the management of communal property?	Water shortage (drinking, irrigation) Water pollution Fires and theft in village forest Impact of crops and *Eucalyptus* spp. on water availability

The final checklist used in semi-structured interviews to identify watershed problems is presented in Box 1. We initially included a host of social and policy questions at this stage of analysis, for example to identify trends in natural resource governance, local institutions that might play a role in watershed management, traditional practices and beliefs on NRM, conflict resolution mechanisms and highly respected individuals that might play a role in mobilizing the community (see Annex II). However, given the specificity of such questions to the particular watershed issues to be addressed, we are now recommending that such dimensions be addressed in subsequent steps of watershed management – following problem identification and prioritization. See Annex III for examples of such second-tier questions.

Box 1. Checklist for Participatory Watershed Diagnosis

1. How have changes in land use (landscapes) over time influenced livelihood?
2. What are the major sources of conflict within the watershed (among & within communities)?
3. Do on-farm management practices of your neighbors' have any influence on your livelihood? How about the management of resources by neighboring communities?
4. What resources are owned or managed communally? Are there any problems associated with the management of these resources?
5. What NRM issues could most benefit from collective action?
6. What are the main constraints affecting agricultural production and income (farm level)? Does collective action have a role to play in minimizing any of these constraints?

Watershed issues identified in AHI sites are summarized in Table 1 and Annex I. From this list of issues, it is clear that while many landscape-level NRM issues conform to watershed boundaries, many others do not. The former include problems associated with water use, supply and quality (for irrigation, livestock and domestic use); flows of soil and water across the landscape; and causal relationships between land use and soil/water outcomes. Issues that do not conform to watershed boundaries or processes include collective (higher-order) dimensions of pest, disease, weed and rodent management; trans-boundary impacts of crops and trees (most notably eucalyptus); management of communal resources (grazing land, livestock, paths); and issues requiring collective action (marketing, input provision, rotational credit functions, conflict resolution). While some of these can be said to be manifested at the landscape level, others do not have an explicit spatial dimension at all. Clearly, a rigid definition of 'watershed' would exclude many of these issues from consideration. Rather than exclude issues of local interest from consideration, we have instead adopted a very loose definition of the watershed concept. We have nevertheless attempted to define what we mean by a "watershed issue," as a way to keep focused rather than to exclude certain issues from consideration. For AHI, a watershed issue is one that:

1. Involves *connectivity between adjacent landscape units,* including flows of materials and causal interactions between neighboring farms, villages, property regimes and components (tree, crop, water, soil, livestock); and/or
2. *Benefits more from collective than from individual action,* involving current interactions among stakeholders or can be more easily addressed / achieved through cooperation.

More specifically, AHI's participatory integrated watershed management concept encompasses:

- Farm-level productivity issues whose benefits cannot be fully realized without widespread uptake of technologies or cooperation in farm management practices;
- Issues involving interactions between system components (tree, crop, soil, livestock, water), for which at least one component has a collective or landscape dimensions – as in the case of water or nutrient flows;
- Trans-boundary interactions between neighboring farms and villages;
- Issues surrounding the management of common property resources (forests, water, grazing land);
- NRM issues generally left out of the agricultural productivity equation of national agricultural research and extension organizations (i.e. trees for fuel, loss of indigenous trees and crops, the effects of deforestation on livelihoods, domestic water supply); and
- Social and policy dimensions of watershed management, including organization for improved market access, equitable negotiation of watershed management targets and benefits, and natural resource governance.

Defining "Community"

Next, it is essential that a broad range of social groups – whose priorities, capabilities and incentives for cooperation are likely to differ – effectively participate in diagnosis and planning. For several decades, the thrust of agricultural research and development work has been on the "local" in terms of who defines priorities, who guides the implementation process, and whose reality matters. Development workers and researchers alike now emphasize the primacy of "the community" when justifying and operationalizing their endeavors. This emphasis has come under scrutiny given the increasing recognition that communities are homogenous entities, with a diversity of aims, capabilities and interests. Experience has shown that farmers have divergent resource endowments influencing their *ability* to innovate, different priorities influencing their *desire* to innovate in different areas, and different levels of political clout influencing their ability to gain access to resources (institutions, information, natural resources). This makes the community-level interface, as operationalized through community fora, PRA tools and community action planning, insufficient for ensuring that diverse interests are captured and addressed. This is particularly true given the tendency for outspoken or dominant groups to co-opt 'participatory' interactions.

In watersheds, such differences manifest themselves in a number of ways. Incentives to invest in improved management of any resource will differ according to an individual's: a) primary domains of activity, b) primary constraints on livelihood, and c) levels of access to the resource (benefits). The first of these is clearly seen in gendered domains of activity, where the importance of fuel wood and watering points to women is a clear reflection of traditional roles (Table 1). The second may be manifested by any social group, but is most apparent among farmers for whom their lesser status (social, economic, political) influences access to basic resources such as water and income. The final issue becomes particularly problematic when a resource that has a strong influence on livelihood is affected by land use practices throughout the watershed yet is unequally accessed (i.e. irrigation water). Here the distribution of costs and benefits of improved management are highly skewed. The importance given to different issues is also likely to vary by age and/or time of residence in the area, an important determinant of awareness on problems that manifest themselves over longer time periods.

These differences make a community-level interface (community-level diagnosis and planning, or PRA) insufficient for capturing and addressing diverse interests. When deciding with whom to elicit watershed issues, we might ask ourselves one basic question: *"Who do we need to talk to so that we can be sure we have broadly-representative findings?"* This question is important both at this stage, to ensure that the identification and prioritization of watershed issues effectively capture the views of different land users, and also for the specific action points to follow when addressing each watershed issue.

In AHI, we have used a series of three steps to ensure that diverse views and interests are effectively captured: a) focus group discussions by gender, age and wealth (and where relevant, ethnicity) to develop a robust list of watershed issues; b) ranking of identified issues with individuals, ensuring representative views are captured according to social parameters likely to influence views on land use and livelihood issues in any location (gender, wealth, age) or in specific locations (ethnicity, landscape position); and c) program- and community-level planning to ensure that diverse interests are clearly addressed in action plans. The last step is outlined in detail in AHI Methods Guides B4 and B5.

Sampling: A Socially-Optimal Approach

When identifying watershed issues, this "representation problem" can be partially addressed by breaking the larger group into sub-groups by gender or age during community fora. This approach proved instrumental in western Kenya for enabling the youth to voice their views on land tenure. Some perspectives may nevertheless fail to be captured through this approach, as people fear repercussions of expressing politically-sensitive ideas openly. It is also difficult to capture differences of opinion around more sensitive dimensions of social difference, given the marginalizing effect or politically sensitivities associated with dividing a group along the lines of wealth or ethnicity. Yet such social variables are often strong determinants of resource access and outspokenness.

One way in which AHI has attempted to capture diverse views more systematically has been to solicit views from small groups of land users grouped according to social categories of presumed relevance during diagnostic, planning and monitoring activities. During watershed diagnosis, for example, resource users were grouped according to gender, wealth, age and, where landholdings are distributed differently on the landscape and relevant spatial categories exist – by landscape location. The importance of such an approach is illustrated in Table 2, where ranks of locally-identified watershed issues (a proxy for the relative importance) in two of AHI's benchmark sites are shown to diverge among individuals representing different social categories (gender, wealth, age, landscape position). In Lushoto, for example, while men prioritized insufficient irrigation water (priority number eight for men and 18 for women) women prioritized insufficient access to potable water (priority number two for women and 15 for men). This break-down reflects the division of customary rights and responsibilities in Lushoto, where men tend to control cash crop production and women household activities. Similar differences were seen in the relative priorities given to securing farm boundaries (a greater priority for men, who tend to own farmland), establishing tree nurseries (a greater priority for women, who see it as a viable income-generating activity irrespective of landholdings) and improving infrastructure (a greater priority for men, who generally take responsibility for maintenance of roads and community buildings).

Table 2. Results of a Socially-Disaggregated Prioritization of Issues in Two AHI Sites

Watershed Issue	Rank[1] by Social Category	Explanation
Lushoto Benchmark Site, Tanzania (n=28)		
1. Limited availability & individual tenure of potable water	Upslope:Downslope=**1:15** Men:Women=**15:2** High:Low Income=**2:15**	Women are responsible for fetching water; water is more available lower on the landscape and to wealthier farmers.
2. Limited irrigation water	High:Low Income=**21:10** Men:Women=**8:18**	Cash cropping is male domain; wealth stems from and enables access to water.
3. Boundary encroachment	Men:Women=**13:27**	Men own most farmland.
4. Need for cooperation in group nurseries	Men:Women=**13:2**	Source of fuel wood; potential income source irrespective of landholdings.
Ginchi Benchmark Site, Ethiopia (n=18)		
1. Water shortage for livestock & humans	High:Low Income:**7:5** Men:Women=**9:7**	Same as above.
2. Shortage of oxen	Men:Women=**10:5**	Women bear much of the labor demand.
3. Shortage of land	Elder:Youth=**6:4**	Youth have limited access to land.

[1] Low values represent issues that are of *highest* priority to the respective social groups.

While such social disaggregation is more effective in eliciting diverse views, it is less effective in building consensus and common understanding of problems and actions and should therefore not be used in isolation from larger village or watershed fora. It is therefore important to consider how diverse "sampling" strategies can be triangulated[1] to balance issues of representation with cost effectiveness. As observed by the Ginchi team, an effective sampling procedure for different actors in the watershed is extremely valuable, but also time-consuming.

[1] Triangulation of methods, information and approaches with others within and beyond the research context as a way of enhancing the quality of research products and outcomes.

Therefore, they wished to find an approach that would simplify this task. While several options exist (Table 3), each has its strengths and weaknesses – which is the basic justification behind the triangulation of methods. At each step of the work plan (in this case, the identification of priority watershed issues from the perspective of diverse local actors), R&D teams might want to consider how they might combine methods. In this case, reliable means not only the quality of information given by each individual, but knowledge of how these perceptions change among different social actors in the watershed. It is important to keep in mind that triangulation is an inherently *creative* process, in which various methods and theoretical frameworks are combined based on researcher knowledge of their respective strengths, weaknesses and complementarities.

Table 3. Triangulation of Alternative Sampling Approaches

Approach	**Strengths & Limitations**
Purposive Sampling of Social Categories of Assumed Relevance	Land user perspectives are sampled according to any number of criteria, including location in the watershed, farm characteristics, gender, wealth and age group. *Strengths*: Researchers can easily trust the social validity of findings because the perspectives of individuals of diverse social categories or farm characteristics are systematically interviewed and contrasted. *Weaknesses*: It is time-consuming, and local empowerment is limited.
Maximum Variation Sampling	Land users are asked their perspective on an issue (i.e. the most urgent needs for collective action), then asked to identify others who think most differently from them. This continues until perspectives begin to overlap and researchers have a clear understanding of diverse stakeholder groups. *Strengths*: Sampling is made more efficient; researchers do not presuppose which social categories are relevant but allow them emerge through inquiry. *Weaknesses:* There is some risk that important perspectives are overlooked; and local empowerment is limited.
Community Fora	Community identifies and prioritizes collectively through dialogue and good facilitation. *Strengths:* Empowers communities in creative problem solving through collective dialogue and visioning. *Limitations:* More outspoken individuals often dominate the discussion, risking lack of representation in perspectives shared. Requires an understanding of these social dynamics and skill to facilitate equitable exchanges and dialogue. The difficulty of disaggregating perspectives during large meetings makes the merits of combining this with a systematic sampling procedure clear.

This idea of triangulation also comes in when considering group vs. individual interviews. The Tanzanian team found that some of the questions (for example, "What activities might benefit from collective action?") were difficult for individuals to understand, whereas in a group, ideas of one farmer facilitated ideas of others. Furthermore, the team had to spend more time helping individuals to visualize what they wanted to know. The question then becomes how to ensure that outspoken individuals do not overly influence the findings, or that you get a clear understanding of the perspectives of different stakeholders (i.e. based on gender, location on the landscape, land ownership, etc.). Ultimately, the best blend of methods at different stages of the process will depend on the objectives of that step (and the implications for how views might diverge), and the particular social dynamics of the location where you work – which may deem some approaches completely unacceptable.

Generating a Consolidated List of Watershed Issues

Once watershed issues have been identified by different social groups, responses from the different groups are lumped into a single list and repetitions eliminated to reduce the list to a manageable number of issues for subsequent ranking and planning. An example from Ginchi site helps to illustrate how this can be done. Thirty-nine watershed issues were identified by local residents in Galessa, and combined on the basis of their similarity into 18 (Table 4). This involved a great deal of discussion, to ensure that the issues had the same meaning when articulated in the farmers' own words before deciding to combine them. You will note that several issues emphasizing collaboration and conflict were reduced to their biophysical manifestations for the purpose of ranking. This is partly due to the subjective preferences of R&D teams, who were composed largely of biophysical scientists, but also due to the intention to revive such dimensions during the planning and implementation stage through multi-stakeholder negotiations and efforts to improve natural resource governance.

It is not surprising if you are asking yourself at this time, "What makes the issues in Table 4 'watershed' issues?" AHI site teams asked themselves the same thing, as many of the issues identified by farmers did look like the same farm-level issues they had been working to address all along. The answer to this question may be found at several levels. First, there is no guarantee that the issues brought out by farmers will have a collective or watershed dimension; participants in diagnostic exercises will not make such discriminations and will therefore mention a diversity of issues that affect them. Yet more common is that our prior orientation to such issues – namely, that they are predominantly technical or biophysical issues that can be effectively managed at the farm level through household-level decision-making – will cause us to look at them as "farm-level" issues when they have clear watershed dimensions. For example, there may be added value to collective solutions to certain problems, as in the case of pest and disease control, limited access to and sharing of improved varieties, managing flows of soil and water on the landscape, shortage of draft power, nursery management, or input and market access. Even issues like soil fertility, a clear "farm-level issue" to most scientists, can have strong watershed or landscape dimensions – through the flow of nutrients between farms (for example, through nutrients in dung and feed diverted from communal grazing areas to individual households) or through the need to negotiate common solutions to the problem. An example of the latter may be seen in Ginchi, where free movement of livestock and open access to dung in outfields pose strong restrictions on individuals' capacity to innovate in the management of organic nutrient resources (dung, crop residues).

There are still other issues that *can* be addressed at farm level may not be addressed because there are insufficient incentives to do so. This is often the case with the management of springs found on private property. Farmers may prefer to emphasize their own economic benefits from the land they own around springs – such as timber yield from the cultivation of fast-growing tree species, or maximizing their land area by cultivating up to the edge of springs (which causes contamination) – over ensuring a clean, reliable source of water for the larger community. Another example involves the management of soil and water in agricultural fields and roads. Farmers living on the upper slopes may be unconcerned about controlling run-off from their fields, while those with plots lower on the landscape may suffer the consequences from uncontrolled run-off as it washes out their soil, seed or fertilizer. Finally, some issues may require mechanisms to minimize conflict and clarify resource sharing and management arrangements – as in the case of water sharing, theft and access to communal grazing areas or forests.

Table 4. Consolidating Watershed Issues into a Condensed List, Ginchi Benchmark Site, Ethiopia

Condensed List of Issues	**Original Farmer Statements**
1. Loss of water, soil, seeds and fertilizer due to excess run off	• Crops washed away in heavy rains • Flooding of cropland • Loss of topsoil due to erosion & insufficient soil conservation • Fertilizer washed away in heavy rains
2. Water shortage for livestock and human beings	• Shortage of water for livestock & humans in dry season • Conflict from competition over water (springs)
3. Poor water quality	• Poor quality of drinking water • Need for cooperation in fencing and cleaning watering points
4. Problems associated with lack of common drainage	• Conflict from drainage of water from fields • Need for cooperation in the location of drainage ditches • Need for cooperation in soil conservation activities
5. Crop failure from shortage of rains	• Crop failure from shortage of rains
6. Soil fertility decline and limited access to fertilizer	• Low soil fertility • High cost of fertilizer • Insufficient farmyard manure • Reduced productivity of crops & livestock from shortened fallow
7. Feed shortage	• Shortage of grazing land • Feed shortage in the dry season • Conflict from grazing of individual fallow land
8. Shortage of oxen	• Lack of oxen for ploughing fields
9. Land shortage due to population pressure	• Land shortage & cultivation of upper slopes due to high population • Effects of population pressure on large families
10. Lack of improved crop varieties	• Lack of improved varieties for certain crops
11. Wood & fuel shortage	• Shortage of fuel wood • Shortage of wood for fencing, houses and livestock structures • Absence of trees for livestock (shade and grazing) • Deforestation due to high population pressure • Dependence on Eucalyptus due to deforestation
12. Loss of indigenous tree species	• Loss of indigenous tree species
13. Effects of eucalyptus on soils, crops and water	• Negative effects of Eucalyptus on crops and soil • Conflict from Eucalyptus on farm boundaries • Negative impact of Eucalyptus on water availability
14. Theft of agricultural produce	• Theft of crops in the field during food shortages
15. Conflict from paths and farm boundaries	• Conflicts from farmland paths and borders
16. Low productivity of animals	• Need for cooperation to reduce the number of livestock
17. Limited sharing of seed	• Need for cooperation in the exchange of seed & planting material
18. Conflict between villages over watering points	• Invasion of livestock drinking area (keta) by neighboring villages • Blockage of paths to watering points

PARTICIPATORY RANKING OF IDENTIFIED WATERSHED ISSUES

Once a condensed list of watershed issues has been identified, a representative sample of watershed residents is again consulted on the basis of established social parameters (gender, wealth, age and – where relevant – landscape location). This time, however, they are asked to rank the relative importance of identified issues. Two ranking methods were tested in AHI: absolute and pairwise ranking. Using the first method, participants are asked to give a rating of 1 to 10 for all identified watershed issues, as illustrated below:

Interviewee Social Category: Women

Watershed Issue	**Interviewee**			
	1	**2**	**3**	**4**
1. Loss of water, soil, seeds and fertilizer due to excess run-off	7	6	4	9
2. Water shortage for livestock and human beings	9	9	10	7
3. Poor water quality	10	9	10	8
4. Problems associated with lack of common drainage	2	3	6	4
5. Crop failure from shortage of rains	5	5	3	7
6. Soil fertility decline and limited access to fertilizer	6	6	8	5
7. Feed shortage	7	8	7	6
8. Shortage of oxen	9	9	8	7
9. Land shortage due to population pressure	8	8	5	6
10. Lack of improved crop varieties	7	6	5	6
11. Wood & fuel shortage	9	6	10	8
12. Loss of indigenous tree species	9	8	10	8
13. Effects of eucalyptus on soils, crops and water	6	7	8	6
14. Theft of agricultural produce	4	6	5	5
15. Conflict from paths and farm boundaries	8	9	7	4
16. Low productivity of animals	5	8	9	7
17. Limited sharing of seed	3	7	4	5
18. Conflict between villages over watering points	7	8	8	9

Names of Interviewees:
1) ____________________________
2) ____________________________
3) ____________________________
4) ____________________________

If using the second option, pairwise ranking, each watershed issue is contrasted all the other issues to systematically discern their *relative* importance. The form this takes is illustrated in Table 5, where the same watershed issues are listed in the top row and the left-hand column. Each issue is compared with each other issue, and the number corresponding to the most important of the two is entered into the box. To finalize the exercise, the number of times each issue was prioritized (for example, the number of times issue number "14" was put in a box) is tabulated, and the corresponding number placed in the right-hand column.

There was a tendency among agricultural researchers to prefer this approach for its greater rigour, given the subjective nature of absolute ranking. For example, what one person means by an "8" may be different from what another person means by an 8. This also complicates the process of averaging ranks, supporting the use of pairwise ranking. Pairwise ranking overcomes this limitation by systematically comparing each issue with each other issue to understand their relative importance. However, it also takes a lot more time and the relative

Table 5. Sample Pairwise Ranking of Watershed Issues

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**Total**
1. Loss of water, soil, seeds and fertilizer due to excess run-off		2	3	1	1	6	1	8	1	1	11	12	1	1	1	16	1	18	9
2. Water shortage for livestock and humans			3	2	2	2	2	2	2	2	11	12	2	2	2	2	2	2	**14**
3. Poor water quality				3	3	3	3	3	3	3	3	12	3	3	3	3	3	3	**16**
4. Problems associated with lack of common drainage					4	6	7	4	4	4	4	12	4	4	4	16	4	4	10
5. Crop failure from shortage of rains						6	7	8	9	10	11	12	13	5	5	16	5	5	4
6. Soil fertility decline and limited access to fertilizer							6	6	6	6	6	12	6	6	6	6	6	6	**14**
7. Feed shortage								7	9	7	11	12	7	7	7	7	7	7	10
8. Shortage of oxen									8	8	8	12	13	8	8	16	8	8	9
9. Land shortage due to population pressure										9	11	12	9	9	9	9	9	9	9
10. Lack of improved crop varieties											11	12	13	10	10	16	10	18	4
11. Wood & fuel shortage												12	11	11	11	11	11	11	12
12. Loss of indigenous tree species													12	12	12	12	12	12	**17**
13. Effects of eucalyptus on soils, crops & water														13	13	13	13	13	8
14. Theft of agricultural produce															14	14	14	14	4
15. Conflict from paths and farm boundaries																16	17	18	0
16. Low productivity of animals																	16	16	8
17. Limited sharing of seed																		18	1
18. Conflict between villages over watering points																			4

benefits must be weighed against the costs of marginal improvements in precision. If 18 issues are being contrasted, for example, each interviewee must make 171 discrete comparisons – which is equivalent to the number of white boxes in Table 5. The tedium of such a method will undermine its precision as interviewees tire from the exercise. Furthermore, the relative benefits of a more tedious ranking method must be compared with the ultimate use of these ranks. When using the clustering method for watershed planning (German et al, 2006), for example, multiple problems are managed simultaneously, thereby reducing the importance of knowing the relative importance of each watershed issue with respect to others. In this case, the primary importance of ranking is to identify entry points of high importance to most watershed residents. In our experience, even if participants did not tire and results could be relied upon, this ultimate use of the method does not warrant the level of methodological precision associated with pairwise ranking.

Following ranking, each interview is entered into a separate worksheet in a spreadsheet program such as Microsoft Excel. The worksheets are labeled according to the village, social group and the number of the interviewee (i.e. “Tiro Male 1”). Village- and watershed-level syntheses are compiled by averaging the ranks of individuals or groups, as follows:

Village-Level Analysis of Ranks (Table 6):

- Prepare village-level averages of ranks for each social group by averaging the ranks given to each watershed issue by individuals belonging to each category (as in section “c” of Table 6) – for example, by averaging all ranks provided by female respondents living in Ameya to derive the figures in the “women” column; and
- Prepare single village-level ranks for each watershed issue by either: (i) averaging the ranks given by all interviewees from the village (as in column “a” of Table 6); or (ii) averaging the ranks of each social group from the village (as in column “b”)[2].

Watershed-Level Analysis of Ranks (Table 7):

- At watershed level, group averages are again compiled. This time, however, averaging is done across social groups at village level rather than across individuals representing these groups – for example, averaging the values in column “c” (as in Table 6) across all watershed villages. This was done by averaging across social groups rather than individuals (i.e. all female interviewees from the watershed) in order to give equal importance to the perspectives of social groups coming from different watershed villages.
- It is also possible to compile watershed-level ranks by village rather than by social unit to see how village priorities differ. This is done by contrasting village-level ranks (the “b” columns from each village, as in Table 6).
- Finally, absolute or pairwise ranks (section “a” of Table 7) are converted to priorities by giving a “1” to the top priority (highest averages) for each social group, a “2” to the second highest priority, and so on. The highest priorities for this watershed are clearly loss of indigenous tree species, which is the highest priority for 4 out of 6 social groups, and poor water quality – which is within the top 3 priorities for 5 out of 6 social groups.

[2] If you are to use the first option, it is important that the number of individuals interviewed from each social group is the same, so that the perspectives of some groups do not overly influence the village averages. The second approach, averaging across social groups (column “b”), avoids this problem. The last column of Table 6, which converts 0 to 10 ranks to priorities, is optional.

Table 6. Sample Database, Socially-Disaggregated Ranks at Village Level (using pairwise ranking)

Watershed Issues	**(a) Village Average** (of all interviewees)	**(b) Village Average** (of group ranks)	**(c) Social Group**						**Overall Priorities of Ameya Village** [a]
			Men	Women	High Wealth	Low Wealth	Old	Young	
Loss of seed, fertilizer, soil from excess runoff	5.00	**4.94**	4.67	**2.33**	5.00	4.00	**5.00**	8.67	2
Water shortage for livestock & humans	5.87	**5.44**	9.67	3.00	**2.00**	4.00	8.00	6.00	5.5[b]
Poor water quality	4.88	**4.75**	5.33	**2.33**	**1.67**	**2.50**	9.67	7.00	1
Conflict from lack of common drainage	8.82	**8.75**	8.00	8.33	8.00	7.50	11.33	9.33	16
Crop failure due to drought	5.71	**5.44**	9.00	9.33	**2.67**	**1.00**	**4.67**	6.00	5.5
Soil fertility decline	5.82	**5.67**	6.00	**2.67**	3.67	3.00	10.00	8.67	8
Feed shortage	5.41	**5.47**	3.67	6.00	4.67	6.50	7.33	4.67	7
Shortage of oxen	5.18	**5.28**	3.67	5.00	6.00	7.00	**2.67**	7.33	4
Land shortage due to high population	5.47	**5.69**	**3.00**	**2.67**	7.33	9.50	6.00	5.67	9
Lack of improved crop varieties	6.65	**6.72**	6.33	6.00	7.67	8.00	7.33	5.00	12
Wood shortage	5.71	**5.72**	3.67	4.67	7.67	6.00	8.00	**4.33**	10
Loss of indigenous tree species	5.06	**5.00**	**1.67**	6.67	7.33	4.00	6.33	**4.00**	3
Effects of Eucalyptus on soils & water	7.59	**7.58**	8.00	7.67	6.67	7.50	9.33	6.33	14
Theft of agricultural products	8.94	**8.89**	12.33	12.00	8.33	8.00	8.00	**4.67**	17
Conflict from paths & farm boundaries	9.47	**9.53**	10.33	10.67	11.00	10.50	8.67	6.00	18
Low productivity of animals	5.71	**5.81**	**3.33**	5.00	8.00	7.50	**5.00**	6.00	11
Lack of access to improved seeds	6.75	**6.97**	7.67	7.67	8.50	9.00	**5.00**	**4.00**	13
Conflict of villagers over watering points	9.13	**8.33**	10.67	11.00	9.00	**2.00**	9.00	8.33	15

[a] These were determined from column “b”.

[b] When average ranks (column “b”) are the same, final priorities are averaged. If, as in this case, two watershed issues have the same average ranks, then their positions (5th and 6th) are averaged.

Table 7. Sample Database, Socially-Disaggregated Ranks at Watershed Level (ranks averaged by social groups across all watershed villages)

No.	Watershed Issue	(a) Group Ranks Averaged Across WS Villages						(b) Watershed Priorities of Each Social Group					
		Men	Women	Elder	Youth	High Wealth	Low Wealth	Men	Women	Elder	Youth	High Wealth	Low Wealth
1	Loss of seed, fertilizer, soil from excess runoff	5.5	5.5	5.3	7.1	6.6	6.3	6	6	**3**	9	6	7
2	Water shortage for livestock & humans	9.3	6.9	8.1	6.6	7.0	5.3	11	9	11	8	7	4
3	**Poor water quality**	3.4	5.2	4.9	5.2	3.1	3.3	**2**	5	**2**	**3**	**1**	**1**
4	Conflict from lack of common drainage	10.8	9.0	10.9	11.3	11.1	11.3	15	12	15	15	16	16
5	Crop failure due to drought	9.6	8.0	6.9	10.4	4.4	7.2	12	10	9	14	**3**	8
6	Soil fertility decline	4.6	4.8	5.7	6.3	4.7	5.3	**3**	4	5	7	4	**3**
7	Feed shortage	6.4	9.1	5.6	7.7	8.4	9.9	7	13	4	10	11	15
8	Shortage of oxen	9.6	4.7	7.3	5.6	7.0	7.4	13	**3**	10	5	8	10
9	Land shortage due to high population	5.4	4.1	5.7	3.7	6.0	6.0	5	**2**	6	**2**	5	5
10	Lack of improved crop varieties	7.0	10.9	8.9	7.7	7.5	9.3	9	15	13	11	10	13
11	Wood shortage	5.0	6.8	6.8	5.4	7.5	6.3	4	8	8	4	9	6
12	**Loss of indigenous tree species**	2.7	3.9	4.3	3.3	4.3	3.3	**1**	**1**	**1**	**1**	**2**	**2**
13	Effects of Eucalyptus on soils & water	9.9	8.2	10.0	9.9	10.1	9.9	14	11	14	13	14	14
14	Theft of agricultural products	14.6	14.6	12.9	12.1	12.4	13.5	18	18	18	18	17	18
15	Conflict from paths & farm boundaries	13.2	13.3	12.3	11.6	12.8	13.5	17	17	16	16	18	17
16	Low productivity of animals	7.4	10.9	8.6	7.9	8.5	7.8	10	16	12	12	12	11
17	Lack of access to improved seeds	6.7	5.8	5.9	5.8	9.7	7.3	8	7	7	6	13	9
18	Conflict of villagers over watering points	12.7	10.5	12.6	11.9	10.2	9.2	16	14	17	17	15	12

METHODS TRIANGULATION IN THE IDENTIFICATION OF WATERSHED ISSUES

In AHI, two complementary approaches have been used for participatory watershed diagnosis. The first, participatory mapping, helps to identify watershed issues with a strong spatial dimension. It also complements semi-structured interviews described above by enabling the identification of environmental "hot spots" – areas on the landscape where identified watershed problems are most acute. As AHI has not given priority attention to methods development for participatory mapping, we encourage you to refer to other organizations who have written extensively on the subject (CITE). It is nevertheless worthwhile mentioning some of our experiences with participatory mapping that illustrate its strengths and weaknesses as a diagnostic tool, and lessons learnt on its modes of application.

Figure 1. Charles Lyamchai from Selian Agricultural Research Institute facilitates a participatory mapping exercise in Lushoto, Tanzania.

The first observation is that unless the tool is well planned in advance, time can be spent developing maps that are fair representations of spatial reality but nevertheless fails to fulfill their diagnostic function. The first reason for this is taking too much time agreeing on the basis features of the landscape and their relation to one another, leaving little time for diagnostic discussions. This can be minimized by preparing base maps with a few select watershed residents prior to larger community meetings. These base maps locate key features in the village or watershed – roads, rivers, prominent buildings and residential areas, forests and agricultural land – leaving interpretations and diagnostic work for a larger group. A second reason that participatory mapping can fail to fulfill its diagnostic function lies in the skill of the facilitator. Those facilitating participatory mapping for diagnostic purposes must seek to orient the discussions away from the spatial accuracy of landscape features, focusing instead on degradation hotspots and *landscape processes* needing improved management.

Secondly, effective participation of large numbers of people in diagnostic mapping can be challenging unless steps are taken to maximize participation. This might include breaking into small groups, generating larger maps that more people can stand around by locating them on the ground rather than on paper, and ensuring that the process is facilitated so that the person holding the pen / stick does not dominate decision-making.

From our experiences, diagnostic mapping should be used as a complementary tool rather than substitute for other diagnostic methods. First, the methodology orients people's thinking toward issues with strong spatial manifestations, marginalizing other issues of potentially greater significance in the minds of local residents. Secondly, prior identification of watershed issues can help to bring our greater detail in diagnostic maps through the role of the facilitator in stimulating dialogue around these issues and their spatial manifestations.

Another diagnostic tool that is complementary to semi-structured interviews is historical trends analysis. The strength of this tool is in elucidating key changes in landscapes and livelihoods over time and their causes. The tool is implemented in two stages: (i) an open-ended dialogue on observed changes in landscapes and livelihoods over time; (ii) identifying the causes behind each observed trend; and (iii) quantifying each of the observed changes and associated causal variables through participatory ranking (Figure 2). Including the first step rather than using pre-defined variables ensures that the variables are of high salience to local residents, and that the tool is effectively capturing issues of local concern.

Figure 2. Historical trends analysis in Ginchi Benchmark Site, Ethiopia.

Sample outputs help to illustrate the use of this tool. Outputs of the first step, open-ended dialogue to identify key changes in landscapes and livelihoods, are written in narrative format, as follows:

> "There was no problem with soil fertility in the valley bottoms between 1930 and 1970 because during that period valley bottoms were not utilized. Though valley bottoms were utilized starting 1970, soil fertility was still high throughout the 80s because during that time sufficient farmyard manure was applied and the soil eroded from sloping hills was fertile. After that time, the soil eroded from the hillsides was of poor quality and began to bury the fertile soil in the valley bottoms"

From such narratives, key variables associated with the problem (declining soil fertility in the valley bottoms) and cause (increased erosion on hillsides) are extracted. Participants are then asked to articulate the rate of change in these variables over time. If they are able to adequately associate key trends with specific dates, then a set of dates can be established at equal intervals (for example, 25-year periods). Alternatively, trends can be assessed relative to key historical junctures: changes in political regimes, implementation of a policy, natural crises (drought, disease, etc.) or other prominent historical events. These dates or periods are placed on a piece of paper or on the ground, and participants are asked to assess each variable according to the level at which it was expressed at each historical juncture / period by placing from 0 to 10 seeds in each column, as in Table 8.

Table 8. Sample tool for historical trends analysis adapted to locally-recognized historical periods, Ginchi benchmark site, Ethiopia

Variable	**Period I** (H. Selasse's reign before Italian invasion)	**Period II** (H. Selasse's reign following Italian invasion)	**Period III** (under the Derg)	**Period IV** (under Meles Zenawi)
Use of wood for fuel	●●●●●●●	●●●●●●	●●●●●	●●
Use of dung for fuel	●●●	●●●●	●●●●●	●●●●●●●●
Prevalence of Eucalyptus			●	●●●●●●●
Water in springs and rivers	●●●●●●●●●●	●●●●●●●●	●●●●●●	●●●
Importance given to traditional beliefs / practices	●●●●●●●●●●	●●●●●●●●	●●●●●●	●●

These data can be written up in narrative form, as in Table 9. They can also be entered into a spreadsheet and graphed, as in Figures 3a through 3d. The latter highlights in graphical form some of the causal processes identified by farmers.

This tool has proven to be even more instrumental than participatory mapping in identifying linked landscape processes due to its emphasis on: (i) open-ended problem identification; and (ii) linking identified problems to their perceived causes. The latter enables cause-and-effect relationships to be observed, and to identify potential entry points for addressing negative trends. A case in point lies in the identification of declining soil fertility in the valley bottoms as a key factor undermining livelihoods. Without such analyses, the symptoms of the problem might be addressed through soil fertility amendments without addressing the underlying cause. By identifying such linked processes, it becomes possible to address problems in the valley bottoms through interventions on hillsides. Soil conservation structures and water harvesting off of rooftops, for example, offer two promising avenues for intervening to address the root causes. Yet once again, this tool should be seen as complementary to other diagnostic tools rather than as a substitute to them, given the different types of problems and opportunities that may be identified. Historical trends analysis is a tool that can distill cause-effect relationships that cut across social, biophysical, economic and institutional dimensions, making it particularly integrative as a diagnostic tool.

COMMUNITY FEEDBACK, VALIDATION AND ACTION PLANNING

When such formalized processes of soliciting views from diverse social groups is used rather than the community fora, it is necessary to feed the results back to the community for interpretation and awareness raising. This step enables the community to 'own' the results by moving from a more extractive mode of data collection (albeit through consultation) to a more interactive approach grounded in collective dialogue. This is generally done as part of the participatory planning exercise, ensuring that the priorities of different social groups are clearly brought to the fore in planning. A detailed description of the participatory planning exercise may be found in AHI Methods Guide B5, *Participatory Action Planning at Watershed Level* (Mowo et al, 2006).

Table 9. Sample Output from Historical Trends Analysis (examples taken from Lushoto Benchmark Site, Tanzania)

Code	Trend	1920	1950	1980	2003	Explanation
1a	Sale of Coffee	3	6	10	5	Market forces.
1b	Sale of Black wattle	6	10	10	7	Market forces.
1c	Sale of Livestock	7	8	10	8	Free grazing until 1980s with growing population; by 2003 most livestock were zero grazed.
1d	Sale of Vegetables	3	6	8	10	In 1930s only in missions; by 1950 regular farmers were cultivating and exporting to Kenya.
2	Cultivation of exotic tree species	1	2	10	10	Between 1950s and 1980s, the project “Tree Dep” worked here.
3	Use of inorganic fertilizer	0	0	10	6	From 1970s farmers were getting up to 300kg free from tea plantations in exchange for selling individual tea harvest back to them. The industry has sinced collapsed.
4	Soil fertility on hillsides	10	8	7	3	1930s: everything intact. By 1970s they were using chemical fertilizer, and today soil fertility has dropped from exhaustion and drought.
5	Soil fertility in valley bottoms	10	10	7	4	From 1980s, decline in vegetation cover and increased use of iron roofing has caused water to wash down in bulk and wash soil away, with increasingly infertile soil being deposited.
6	Level of erosion on hillsides	0	2	4	6	Population growth and opening of the forest for agricultural land.
7	Level of erosion on valley bottoms	0	2	4	6	The trend is the same as #6; the good soil of valley bottoms is being replaced by bad soil on hillslopes.
8	Use of industrial pesticides	0	0	6	10	Out of 10 farmers, most are now using.
9	Incidence of crop pests/diseases	0	6	8	9	The 1930 to 1950 shift is due to fewer people practicing traditional pest control practices (i.e. *Hande*); and toward 1980 fewer still.
10	Water flow in springs/rivers	10	10	6	5	Between 1950 & 1980, Eucalyptus was introduced.
11	Relative importance of customary norms	10	10	6	0	More ‘freedom’ due to: a) a shift from customary to private tenure (i.e. sacred forests), b) chiefs were more suppressed during independence than colonial times (esp. from 1975).
12	Adherance to norms or by-laws	10	10	5	3	Loss of traditional beliefs on NRM; corruption and poor enforcement of modern laws.
13	Access to formal education	1	2	8	10	Schooling introduced during Nyerere’s presidency.
14	Adherance to modern religions	2	5	10	10	Influx of religious institutions.
15	Households using irrigation water	0	0	4	8	Early on, there was little interest because rain was enough. Today 80% have a small amount, although all are trying.

Figure 3. Graphical Representation of Perceived Historical Trends, Lushoto Benchmark Site, Tanzania

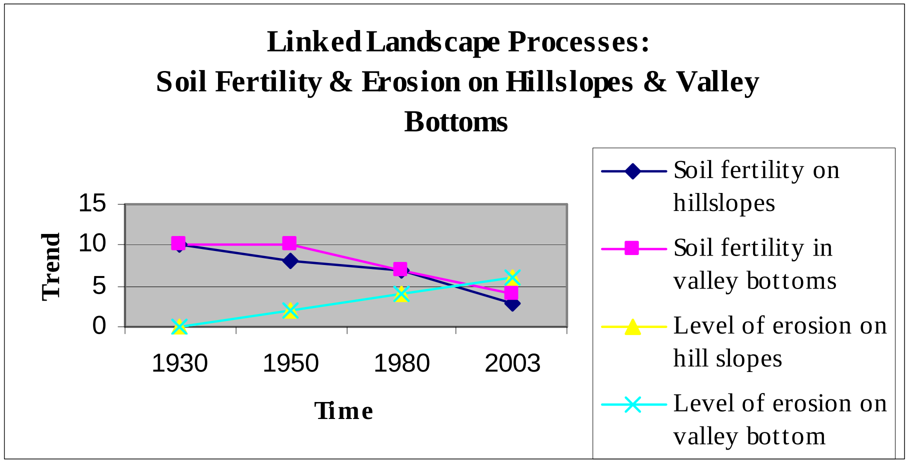

Figure 3a. Trends in Hillside Erosion and Soil Fertility in Valley Bottoms

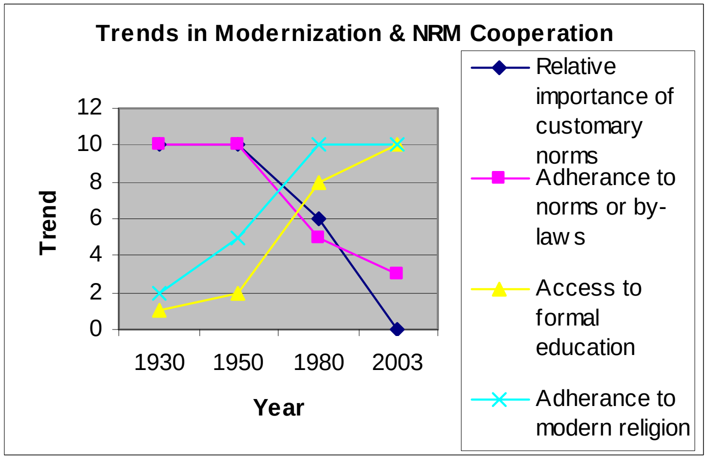

Figure 3b. Trends in NRM Cooperation and "Modernization"

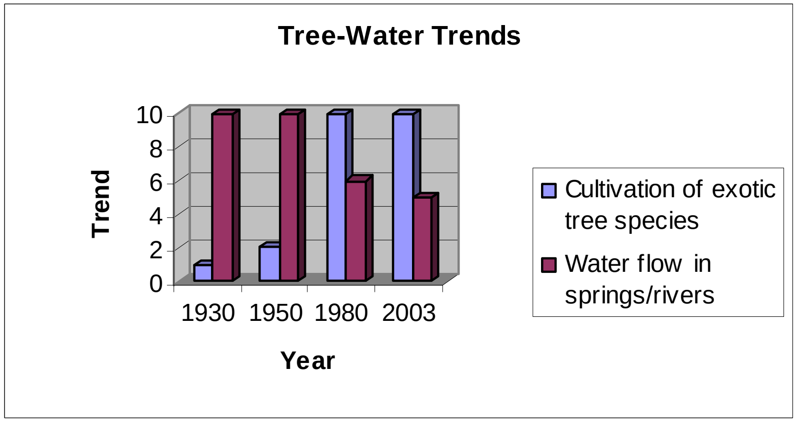

Figure 3c. Trends in Eucalyptus Cultivation and Water Depletion

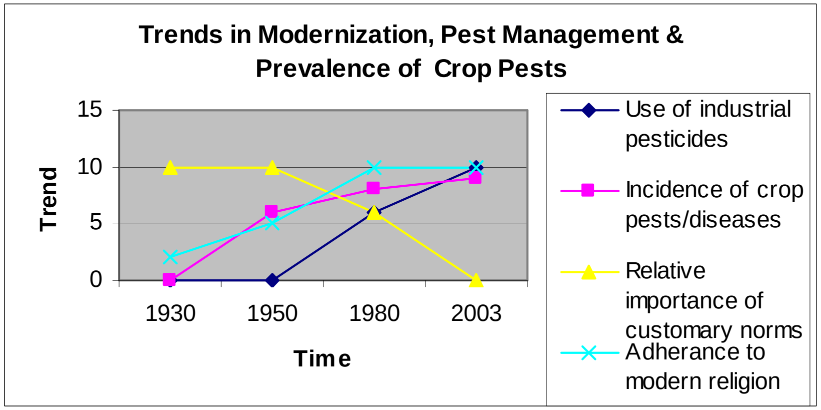

Figure 3d. Trends in Traditional Beliefs (i.e. pest control) and Incidence of Pests

There is a tendency to want to validate the results at this time by asking, "Does this adequately reflect your priorities?" to the group gathered. Yet caution should be used to avoid undermining the systematic efforts used up to this point to capture a diversity of views. All too often, an outspoken individual who disagrees with the ranking will try to tamper with the results by saying, "this is not the main priority, but rather this other one." This can undermine the attempt to equitably elicit views. We would encourage, rather, that you simply seek clarification for why the views of the different groups might differ. This will further collective understanding of such differences rather than marginalize them, helping to ground the participatory planning process in principles of equity and mutual awareness.

CONCLUSIONS AND IMPLICATIONS

This methods guide outlines a "socially-optimal" approach for identifying natural resource management problems at watershed or landscape scale of local importance. The method is designed to add value to extant diagnostic methods in two ways. First, the methods for problem identification ensure that issues involving connectivity between adjacent landscape units or benefiting more from collective than individual action are effectively captured. This is done through a robust set of questions, as well as through the triangulation of social, spatial and historical diagnostic methods. Secondly, it moves beyond the standard PRA or community fora to ensure that diverse views are effectively captured. Rather than assuming that views of "the community" can be adequately captured through a community-level forum in which only a small number of perspectives can be adequately captured, the methodology seeks to systematically identify a diversity of views through the systematic consultation of local residents based on social parameters of assumed relevance. In this guide, examples have included gender, age and wealth as relevant social parameters; however, in many cases, perspectives will differ along the lines of other relevant categories based on social dimensions (i.e. ethnicity) or biophysical dimensions (i.e. landscape location of landholdings).

So what are the implications of such a diagnostic approach for agricultural research and development and natural resource conservation efforts? First, it demands that professionals reserve judgement on the nature of issues articulated by farmers. While many "watershed issues" may look very much like "farm-level issues," they often entail strong social and biophysical interactions among adjacent landscape units or land users. While some may in fact be addressed at the farm level, there may be added value to collective solutions. Other issues that *can* be addressed at farm level may not be addressed because there are insufficient incentives to do so, while others may require mechanisms to minimize conflict and clarify resource sharing and management arrangements. The implication of moving beyond biophysical interpretations of problems is to move beyond technological solutions at farm level to encompass social and governance dimensions of watershed management. Mechanisms for individuals to look beyond their own immediate benefits to the consequences of their actions on other land users may come from either incentives, whether financial or social (i.e. community recognition), or from regulations (i.e. local norms or by-laws to govern what is acceptable behavior). Similarly, strategies to foster collective action so as to capitalize on the value added from collaboration require mechanisms to increase trust among individuals so that they can feel secure that if they invest in collective efforts, the benefits will be forthcoming. This might include informal group rules specifying the contributions that individuals must make toward the collective endeavor, agreements on how financial returns will be shared, mechanisms for transparent decision-making and financial management, or other similar strategies. Clearly, the solutions go beyond technologies and individual decision-making on technology adoption. Finally, the implication of starting with a more labor intensive, "socially-optimal" *diagnostic* approach is that such a strategy aiming at enhancing equity in watershed management will be carried through to *implementation* and *monitoring*. Lessons on doing so can be found in German et al. (2006a, 2006b), Taye et al. (in press) and in AHI Methods Guides on managing change in watershed management.

To aid watershed residents and R&D teams to develop action plans around identified watershed issues, and to manage the change process to ensure it remains participatory and integrated and ultimately achieves established objectives, please refer to complementary AHI Methods Guides. The most pertinent ones for moving forward include:

For Planning:

- AHI Methods Guide B4: "Creating an Integrated Research Agenda from Prioritized Watershed Issues" (German et al., in press)
- AHI Methods Guide B5: "Participatory Action Planning at Watershed Level" (Mowo et al., in press)
- AHI Methods Guide E1: "Planning for Integrated Research and Development Interventions" (German and Stroud, in press)

For Managing Change:

- AHI Methods Guide B6: "Organizing the Community Interface: Structures and Processes for Watershed Representation" (forthcoming)
- AHI Methods Guide B7: "Stakeholder Identification and Negotiation Support" (forthcoming)
- AHI Methods Guide B8: "Participatory Monitoring and Evaluation" (forthcoming)

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REFERENCES

German, L., S. Charamila and T. Tolera (2006a) Managing Trade-Offs in Agroforestry: From Conflict to Collaboration in Natural Resource Management. *AHI Working Papers* No. 10.

German, L. and A. Stroud (in press) Planning for Integrated Research and Development Interventions. *AHI Methods Guide* E1.

German, L., A. Stroud, Getachew A., Yohannes G., Berhane K., Berhanu B., Dagnachew B., Gebremedhin W., Tesema T. and Mesfin H. (in press) Creating an Integrated Research Agenda from Prioritized Watershed Issues. *AHI Methods Guide* B4.

German, L., H. Taye, S. Charamila, T. Tolera and J. Tanui (2006b) The Many Meanings of Collective Action: Lessons on Enhancing Gender Inclusion and Equity in Watershed Management. *AHI Working Papers* No. 17.

Mowo, J.G., et al. (in press) Participatory Action Planning at Watershed Level. *AHI Methods Guide* B5.

Taye, H., L. German, W. Mazengia and K. Abere (in press) Negotiation Processes to Develop Local Policies for Gender-Sensitive and Equitable Access to Agricultural Technologies: The Case of Gununo Watershed, Ethiopia. *CAPRi Working Paper*.

ANNEX I: SAMPLE WATERSHED FINDINGS FROM AHI BENCHMARK SITES

Areka Benchmark Site

The Areka site is located in Wolaita, south-central Ethiopia. The area is a mixed crop-livestock system with a high diversity of staple and cash crops (enset, wheat, maize, barley, sorghum, sweet potato, Irish potato, faba bean, field pea and horticultural crops). Livestock are grazed in a large communal grazing area or in semi-communal fenced plots. Despite the diversity of enterprises characterizing the system, landholdings are extremely small (.74 and .26 hectares on average for high and low wealth categories, respectively) and the area is subject to chronic food deficits.

A participatory watershed diagnosis identified the following NRM problems in the system:

1 Declining water quantity and quality, affecting both humans and livestock
2 Loss of indigenous crop and forage varieties due to drought and extension service
3 Poor soil fertility due to intensive use and erosion
4 Increase in pests and disease for crops and livestock
5 Poor access to and dissemination of new technologies
6 Negative effects of Eucalyptus on water and cropland
7 Limited livestock feed
8 Poor natural resource governance, including poor negotiation capacity and weak by-laws
9 Loss of assets through early harvest, capture of benefits by intermediaries and seed consumption
10 Limited diversity and income generation of enterprises (crops, livestock, other)

Key challenges for watershed management in this site include: a) enhancing the productivity and returns from crop, livestock and tree components without further exacerbating system nutrient decline; b) arresting water resource degradation and resource conflicts through more optimal land management practices and improved governance; and c) increasing the viability of agriculture as a pathway to food security.

Ginchi Benchmark Site

The Ginchi Benchmark Site is located in Western Shewa Zone, Ethiopia. It is a mixed crop-livestock system that is more extensively managed than other sites. The system is very limited in biomass due to extensive outfields almost devoid of tree cover and perennial crops. High-value crops like Irish potato and garlic are grown on fenced homestead plots, while extensive outfield areas are used almost exclusively for barley production. Valley bottoms are used exclusively for livestock grazing. While all land is officially owned by the government, individuals have de facto ownership over all land in the watershed. Yet management is collective in certain spatial and temporal niches. Households own outfield areas on both sides of the catchment, cultivating one side of the catchment and leaving the other side for grazing during the rainy season. The side of the catchment that is left for grazing is done so by all households with contiguous plots, enabling free movement of livestock by those households owning land in the area. Valley bottoms are grazed year-round, with access during the cropping season restricted to those households owning plots of land in these areas. During the dry season, outfields and valley bottoms are open access resources. This scenario makes systems innovation very challenging, requiring collective action not only among households living within the watershed but involving others who graze their livestock in the area. The following problems were prioritized by farmers during the watershed diagnosis:

1 Declining water quality and quantity, affecting both humans and livestock
2 Loss of indigenous tree species
3 Loss of soil, seed and fertilizer from excess runoff

4 Low soil fertility
5 Shortage of oxen
6 Lack of improved seed
7 Feed shortage
8 Fuel shortage

The key challenges for watershed management include: a) increasing the production of crops, livestock and trees while ensuring sustainable nutrient management in the system; and b) reversing water resource degradation by fostering positive synergies between trees, soil conservation structures and water in micro-catchments. Furthermore, seasonal open access grazing makes investments in afforestation and soil conservation structures in the outfields challenging, as cattle can easily destroy such investments. Site teams and local leaders have targeted local negotiations on restricting livestock movement in certain areas of the catchment as these investments stabilize, such that outfield investments are slowly scaled out throughout the entire watershed area. The challenge is to convince farmers outside the protected areas to receive livestock from those farmers whose land is protected from livestock, in exchange for less certain future benefits.

Lushoto Benchmark Site

The Lushoto Benchmark Site is located in the East Usambara Mountains of Tanzania. It is also a mixed crop-livestock system, but the livestock system has decreased in importance relative to the past and to other benchmark sites as population increases and communal grazing areas have become severely restricted. A diverse array of annual and perennial staple and cash crops are found in the system, including maize, beans, tea, coffee and horticultural crops (tomato, onion, cabbage, etc.). The tree component in the system is substantial due to extensive afforestation efforts in recent decades. As the population moves up the steep slopes, cultivation moves into valley bottoms and production becomes more intensive, the following problems have emerged:

1 Decline in water quantity and quality in springs
2 Decline in access to, and poor management of, irrigation water and infrastructure
3 Decline in soil fertility, destruction of crops from uncontrolled runoff from neighboring fields, and burial of fertile valley bottom soils due to hillside erosion
4 Incompatibilities of trees (drying of water, competition with crops)
5 Destruction of neighboring crops through pests, disease, rodents, stray fire and theft
6 Poor natural resource governance, including poor and inequitable by-law enforcement
7 Poor seed quality
8 Decline in livestock productivity, including limited feed, poor manure quality and damage caused by free grazing
9 Land shortage and encroachment
10 Theft of trees from village forests
11 Conflict over traditional and modern beliefs on NRM
12 Insufficient collective action for soil and water conservation, farmyard manure application, banana planting, managing community bulls and infrastructure (roads, mills, schools)

Key challenges for watershed management include: a) minimize the negative and foster positive synergies among components (trees, crops and water; hillside-valley bottom interactions; crop-soil-livestock interactions); and b) improve natural resource governance.

ANNEX II: EARLY VERSION OF INTERVIEW CHECKLIST FOR PARTICIPATORY WATERSHED DIAGNOSIS

The approach used within AHI benchmark sites was to diagnosis social, policy, market and biophysical dimensions of watershed management at the same time (Table 1). However, following the evolution of the approach, it became clear that the second set of questions needed to be explored in depth and often around specific watershed issues. It is therefore more time-efficient to follow up with a second phase of watershed exploration once the watershed issues to be addressed have been prioritized by the community. This also enables the sequencing of entry points with the data collection process, to ensure that community interest is not lost from too much knowledge generation without action.

Table 1. AHI Regional Research Questions for Watershed Exploration (German et al., 2003b)

Primary Questions	Secondary Questions
(Biophysical) What are the key NRM problems, from the community's perspective, requiring a watershed approach or collective action?	1. How have changes in the landscape and land use over time influenced livelihood? 2. Do on-farm management practices of your neighbors' have any influence on your livelihood? How about the management of resources by neighboring communities? 3. Are there any NRM problems that could benefit from collective action? 4. Are there problems associated with common property resources? 5. Are there any conflicts associated land or NR management (within or between villages)? 6. How do different groups (by gender, age, wealth or landscape position) prioritize these issues?
(Social/Policy/Market) What are the key opportunities (social capital, policy mechanisms) and constraints (social & policy barriers) for enabling collective action in the watershed?	1. What local social units (internal) and institutions (external) exist in the watershed? What are their characteristics (history, objectives, strengths & weaknesses, tendency to cooperate with other groups, decision-making processes and importance to diverse social actors)? 2. Are there traditional practices or beliefs influencing NRM? Are there any NRM conflicts? Are there any traditional mechanisms for conflict resolution & decision-making? 3. Who are the influential individuals in the communities? How effective are they in community mobilization? 4. What brings people together for cooperation? Is there anything that keeps people from cooperating? 5. How do local, district or national policies influence land management & use of communal resources? Do any of these policies influence collective action? 6. What strengths & limitations exist for by-law enforcement? 7. Are there any coping strategies for marketing agricultural produce?

ANNEX III: SAMPLE QUESTIONS TO GUIDE FURTHER EXPLORATION OF PRIORITIZED WATERSHED ISSUES

The following are some examples of questions that will require further exploration as part of the planning and strategizing for addressing prioritized watershed problems:

1. Who are the stakeholders that are affecting or that are affected by the issue (those perceived to be causing the problem and those affected)? How do their views differ or align on the cause, the effects and the potential solutions?
2. What are the primary drivers behind the problem's manifestation, and what are the implications for the intervention strategy? What are the external conditions that make it conducive or not to solve the issue?
3. Where are the "hot spots" in the watershed where the problem is most manifested?
4. Are there any norms, by-laws or traditional beliefs governing behavior toward the issue or resource? How effective are they in managing the resource or issue? To what extent are these norms or rules followed? Are there sanctions for non-compliance? What are the enforcement bottlenecks?
5. What is the local knowledge about the issue, and what are the critical uncertainties in local knowledge?
6. What empirical research is required to better understand the issue and target solutions?

In selecting such questions, it is important to prioritize areas of further exploration based on: (i) critical uncertainties in local knowledge or areas of stakeholder disagreement; (ii) research that will assist most in addressing the primary objectives and research questions; and (iii) research that will help to identify strategic entry or leverage points in the change process – whether at a biophysical, social, policy or institutional level (German et al., in press).

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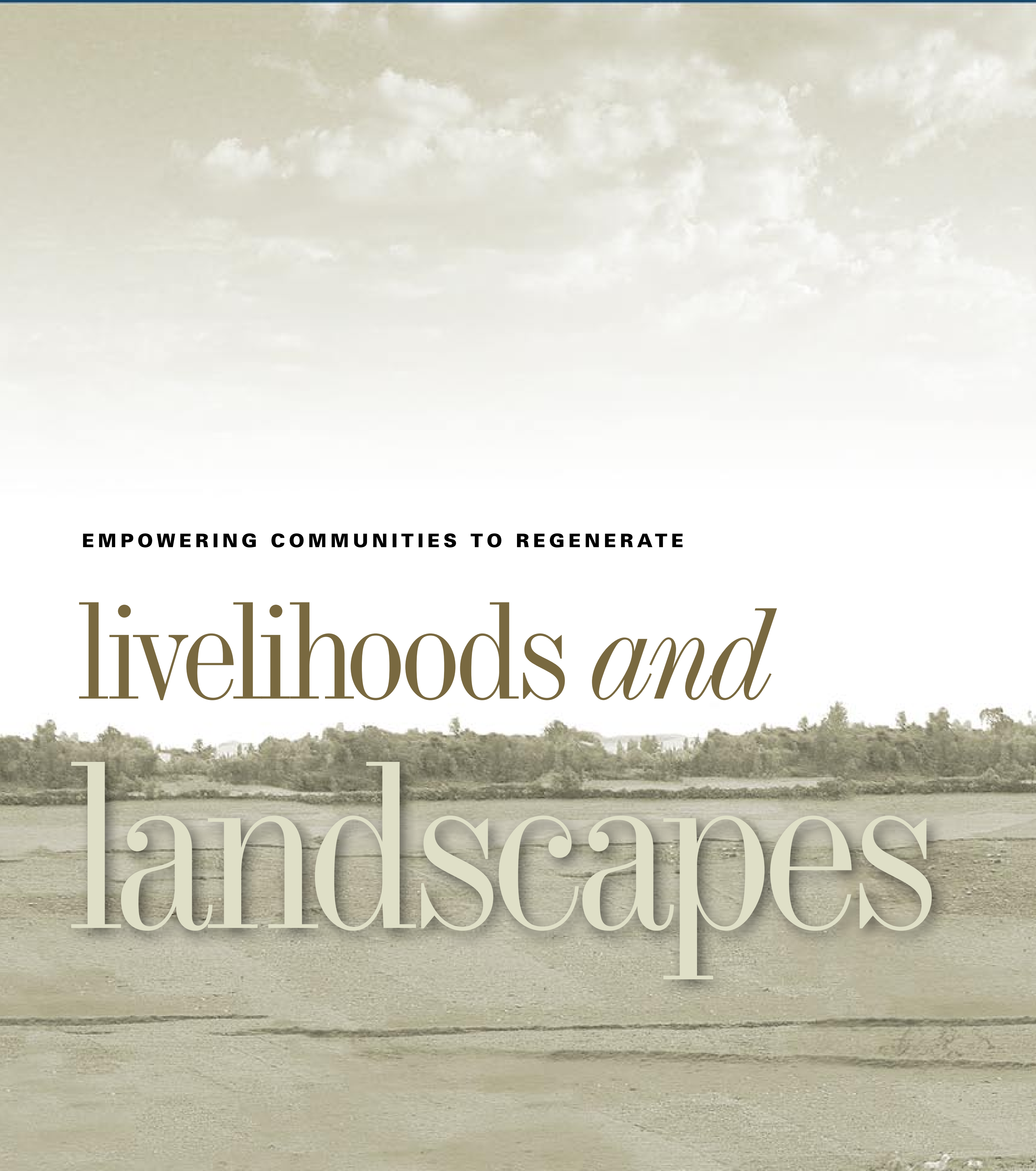

EMPOWERING COMMUNITIES TO REGENERATE

livelihoods *and* landscapes