

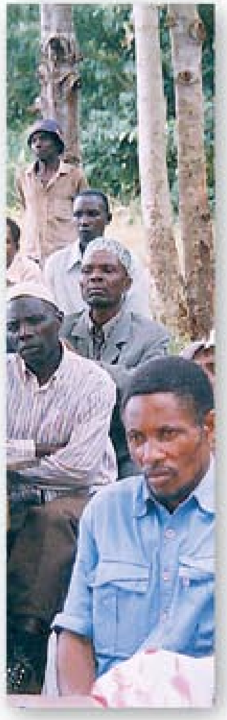


AHI Methods Guides

AHI METHODS GUIDES No. B4

CREATING AN INTEGRATED RESEARCH AGENDA FROM PRIORITIZED WATERSHED ISSUES

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Version 1.0

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.

Acknowledgements

The African Highlands Initiative (AHI) expresses its gratitude to the Department for Research and Development of Tanzania (DRD); Ethiopian Institute of Agricultural Research (EIAR); FOFIFA of Madagascar; Kenyan Agricultural Research Institute (KARI); National Agricultural Research Organization of Uganda (NARO); International Centre for Tropical Agriculture (CIAT); World Agroforestry Centre (ICRAF); Tropical Soils Biology and Fertility Institute of CIAT (TSBF-CIAT); International Maize and Wheat Centre (CIMMYT); International Potato Centre (CIP); International Institute of Tropical Agriculture (IITA); Ministries of Agriculture and NGO partners operating in AHI Benchmark Sites of Ethiopia, Kenya, Tanzania and Uganda for the technical, facilitation and partnership roles they have played in our effort to develop tools and methods in Integrated Natural Resource Management together with local communities.

AHI is very thankful to the donors which tirelessly financed the regional and global engagement of AHI in improving our development and natural resource management research endeavours, namely the Swiss Development Cooperation (SDC); International Development Research Council (IDRC); Ministerie van Buitenlandse Zaken (the Netherlands government); Cooperazione Italiana (Italian government); the Rockefeller Foundation; the European Commission; the World Bank; the Department for International Development (DfID); the Collective Action and Property Rights Programme of the CGIAR (CAPRi); the International Potato Center (CIP) and ECAPAPA.

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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:

Step	AHI Methods Guide
Step 1: 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
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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.

CREATING AN INTEGRATED AGENDA FROM PRIORITIZED WATERSHED ISSUES

JUSTIFICATION

Watershed management programs that inscribe their domain of activity around soil and water conservation alone will have a relatively simple task at this point, which is to catalyze farmer innovation through the identification and adaptive testing of the most viable technological options for managing the movement of soil and water across the landscape. Those programs organized around the management of water flowing from upper to lower catchments, on the other hand, will set about developing institutional structures and rules for governing access to and management of a limited resource. They may require biophysical research to assess the quality and quantity of water emanating from different sub-catchments and land uses. While no simple task, the domain of interest and intervention in this case is closely inscribed around water. The participatory approach to “watershed” problem definition developed by AHI, together with a broad range of open-ended and more directed questions used to elicit farmer responses, will most likely lead to a watershed agenda that encompasses a greater diversity of biophysical processes and the social and institutional dimensions of these (for a summary of these, please see German et al, 2006b). They include aspects of production (crop, livestock, tree) *and* conservation (nutrients, water and, at times, biodiversity), market dynamics and natural resource governance. Furthermore, the solutions to these problems will encompass social, biophysical and institutional dimensions if dealt with objectively. While inscribed within small-scale watersheds, this emphasis nevertheless dramatically increases the complexity of watershed processes being managed. This guide, in many respects, is about managing this complexity.

If this method is applied as a follow-up from AHI methods coming earlier in the watershed sequence, you will have successfully identified a list of 'watershed issues' in your site through systematically capturing the views of diverse social groups. These groups will have prioritized these issues, and you will know – from a socially-differentiated analysis of these priorities – which issues are most important to these different groups. Yet these issues will still be in the form of a “shopping list” of discrete issues to be solved. For purposes of harmonizing existing landscape interactions and the “spin-offs” that will be induced by new interventions, as well as for efficient use of resources (financial, time invested, etc.), it will be necessary to process these findings further to come up with a manageable watershed agenda.

This guide has been used primarily to guide R&D team exploration of the functional interactions among discrete watershed “issues,” and their own identification of higher-level challenges that these issues represent. This guide must be sequenced with watershed-level planning (AHI Methods Guide B4) and, ideally, with efforts to enable watershed communities themselves to identify such higher-level challenges. Yet at this point we can make no conclusive statement on the respective sequencing of these planning levels and steps, as local resource users and R&D teams each have much to learn from one another. We therefore encourage you to adapt this method to the community level, to test R&D team planning in response to locally-identified “clusters,” and to experiment with the sequencing of R&D team and community planning processes. What we are providing you is a tool that is intended to stimulate further experimentation and learning.

Most examples in this guide are drawn from the Ginchi benchmark site, located in West Shewa zone, Ethiopia. A strong biophysical logic underlies these examples. Yet this is not by design;

in other sites we would expect the higher-level challenges and the clustering of issues with strong functional linkages to incorporate biophysical, socio-economic and other dimensions.

OBJECTIVES

The objectives of this guide are to assist R&D teams to move from a set of discrete watershed problems, identified and prioritized by local residents, to an integrated plan for watershed research and development. "Integration" in this sense refers to both the harmonization and sequencing of research and development interventions to enable informed decision-making by local communities, and the identification and management of functional interactions among discrete watershed problems.

CREATION OF FUNCTIONAL NRM CLUSTERS

The first step of this method is the creation of functional "clusters" defined by strong causal relationships between discrete watershed issues, and which simplify the watershed agenda by providing focus and enabling several related issues to be addressed simultaneously. Two criteria were utilized to develop an integrated intervention strategy from the list of identified watershed problems, one grounded in social principles and the other on ecological principles.

Principle 1: Watershed Issues with High Ranks by Most Social Groups

The first principle is to identify issues of high priority to most social groups. The idea behind this is that by focusing on the issues of high relevance to most watershed residents, future R&D efforts are likely to have greater pay-offs as a function of the broad social support they receive within watershed communities. In each AHI benchmark site, a list of watershed issues was generated through systematic consultations with diverse social groups. Issues were solicited from various groups according to gender, wealth categories, physiographic location of plots or homesteads, and age. Once the issues were identified, the groups ranked them and identified the functional/causal linkages between the diverse issues. By looking at the rankings given to these issues by different social groups, it is possible to prioritize those that have broad social support.

Principle 2: Watershed Issues with Strong Functional Relationships

The second principle is to identify watershed issues that are functionally linked. The rationale behind this is that such issues should be managed jointly to enable greater pay-offs from investments and explicit management of the causal interactions and spin-offs (both positive and negative) characterizing interactions between these issues at present and after any intervention.

The first step is therefore to analyze the ranks given by different social groups to the prioritized watershed issues. 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 (German et al., in press):

1. Loss of water, soil, seeds and fertilizer due to excess run off
2. Water shortage for livestock and human beings
3. Poor water quality
4. Problems associated with lack of common drainage
5. Crop failure from shortage of rains
6. Soil fertility decline and limited access to fertilizer

7. Feed shortage
8. Shortage of oxen
9. Land shortage due to population pressure
10. Lack of improved crop varieties
11. Wood & fuel shortage
12. Loss of indigenous tree species
13. Effects of eucalyptus on soils, crops and water
14. Theft of agricultural produce
15. Conflict from paths and farm boundaries
16. Low productivity of animals
17. Limited sharing of seed
18. Conflict between villages over watering points

These 18 issues were then ranked by different social groups in the watershed. The resulting ranks of the priority issues are presented in Table 1.

Table 1. Top Three Issues by Social Group, Ginchi Benchmark Site, Ethiopia

Watershed Issues	**WS Rank**[a]	**Social Categories**					
		Men	**Women**	**Elder**	**Youth**	**High Wealth**	**Low Wealth**
Loss of indigenous tree species	**1** (1.3)	**1**	**1**	**1**	**1**	**2**	**2**
Poor water quality	**2** (2.3)	**2**	**5**	**2**	**3**	**1**	**1**
Land shortage[b]	*3 (4.2)*	*5*	*2*	*6*	*2*	*5*	*5*
Soil fertility decline	**4** (4.3)	**3**	**4**	5	7	**4**	**3**
Loss of fertilizer & seed from runoff	**5** (6.3)	6	6	**3**	9	6	7
Wood & fuel shortage	**6** (6.5)	4	8		**4**	9	6
Shortage of oxen	*7 (8.2)*	*12*	*3*	*10*	*5*	*8*	*10*
Limited access to improved seed	**8** (8.3)	8	7	7	6	10	9
Water shortage for livestock and humans	**9** (8.3)	11	9	11	8	7	4
Crop failure from drought	*10 (9.3)*	*12.5*	*10*	*9*	*14*	*3*	*8*
Feed shortage	**11** (10.0)	7	13	4	10	11	15

[a] This watershed ranked was computed by taking the average of ranks given by each social group.
[b] Issues in italics are those the R&D team considered could only be addressed indirectly, through other activities.

Several issues were considered either beyond the means of the R&D teams to address, or could only be addressed indirectly through other activities, for example addressing land shortages by intensifying crop and livestock systems or addressing drought through soil and water conservation. While the site teams decided to leave these issues out of subsequent clustering activities, this is something that should be re-considered by others applying the methodology as opportunities for addressing these more intractable problems might be lost by eliminating the issues from further discussion and analysis.

Analyzing the top three issues that are both amenable to direct solutions (non-italicized issues) and of top priority by most groups (in bold font), it is clear that loss of indigenous tree species, poor water quality and soil fertility decline are the most salient problems affecting this watershed. It is not necessary to identify these 'top ranking issues' for the subsequent step, as it attempts to articulate the functional relationships among all highly prioritized issues. It was fundamental, however, in identifying entry points for watershed management activities. Given the slow rate of return associated with re-establishing indigenous tree species, we moved to issue number two – poor water quality – when identifying an entry point. Spring protection through physical and vegetative measures was used as an entry point to watershed management in several sites given the high priority given to water quality and quantity by local communities throughout the eastern African highlands. The idea behind this investment was to address an immediate problem (poor water quality and its health consequences) while enhancing community enthusiasm for other watershed activities that have slower rates of return, such as land management practices that contribute to longer-term water resource protection (i.e. soil and water conservation structures, niche-compatible agroforestry).

After applying the first principle – identification of watershed issues prioritized highly by most social groups, it was then necessary to apply the second principle. There are two possible strategies for identifying watershed issues with strong functional relationships. The first is to make a graphical representation of the current causal linkages among the identified watershed issues, as in Figure 1. The diagram illustrates farmer-identified problems (bolded boxes), research-identified problems (non-bolded boxes), and probable causal relations among these (dotted lines and boxes). However, the complexity of such diagrams can confound rather than help to manage the complexity inherent in such systems, and can make it difficult to identify functional clusters around which to organize R&D interventions. For example, "feed shortages" ended up on the opposite side of the diagram from "limited land / grazing sources." The diagram needed to link these issues in a more circular fashion, a step that was constrained by the medium. While there does seem to be a closely-related "soil and water" cluster (top center), identification of a second cluster is difficult from this diagram. Furthermore, each person's diagram might be different, leading to a great deal of subjectivity in the outcomes.

A second process for identifying functional clusters is simply to look at the short list of issues emanating from the participatory ranking exercise, and try to lump them into smaller clusters based on their functional relationships – as defined by biophysical (nutrients, water), social (conflict and cooperation), economic (competition for scarce resources) or other logic. When the Ginchi site did this, they ended up with the following clusters based on what they know about the system:

Cluster 1

- Poor water quality & quantity (for humans and livestock)
- Loss of seed, fertilizer and soil from excess run-off
- Loss of indigenous tree species
- (Crop failure due to drought)

The rationale for this clustering is based on the recognition that: (i) water quality is being affected by seed, fertilizer and soil run-off from fields; (ii) substitution of indigenous trees with Eucalyptus has caused the depletion of groundwater and the drying of springs; (iii) integration of appropriate trees and soil conservation structures on the landscape could enhance spring recharge (water quantity) and reduce the loss of seed, fertilizer and soil from the landscape; and (iv) crop failure due to drought could be ameliorated by reducing water loss from run-off

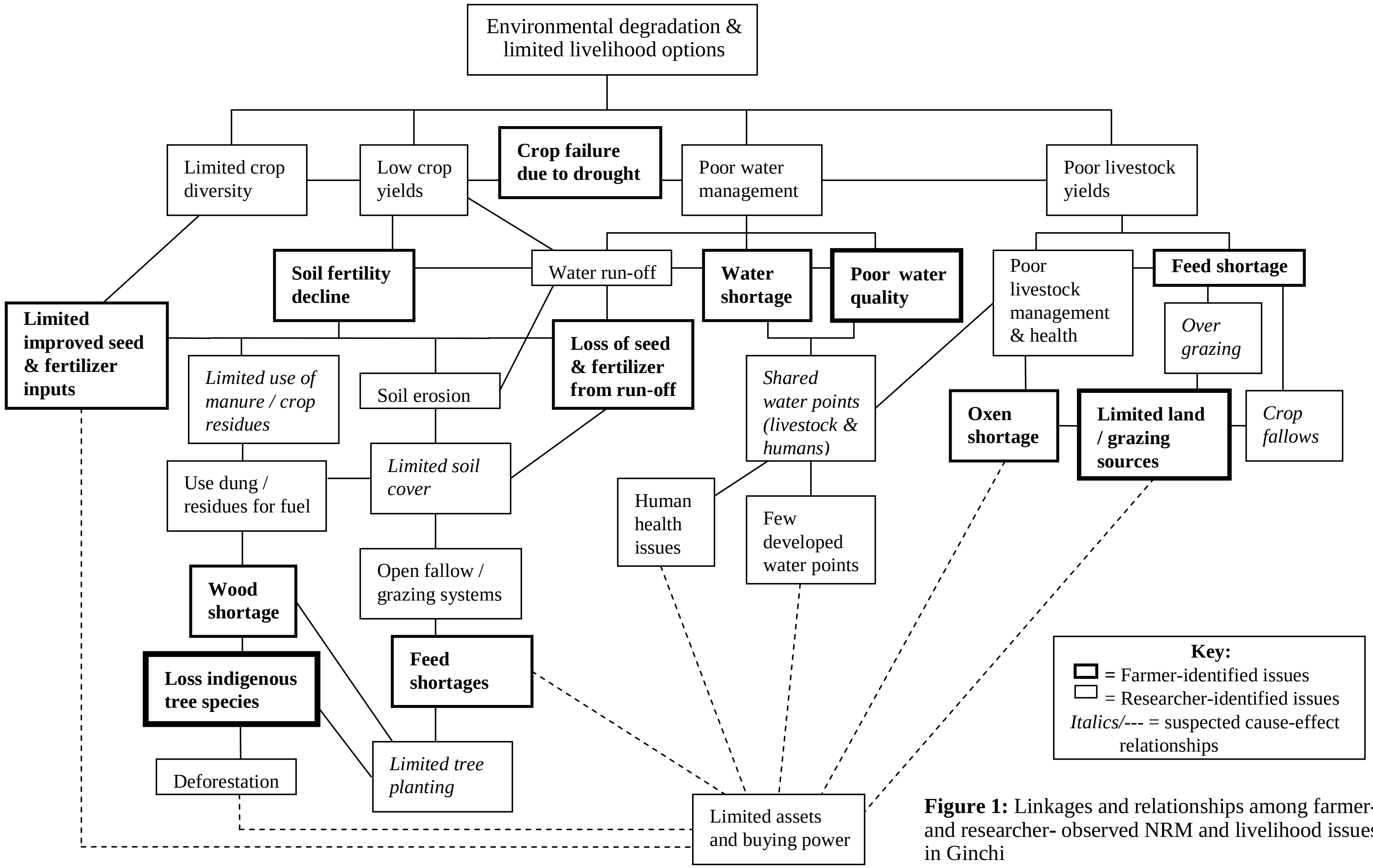

Figure 1: Linkages and relationships among farmer- and researcher- observed NRM and livelihood issues in Ginchi

through water harvesting. The common logic behind these relationships caused the team to name it the "Soil and Water Management" cluster.

Cluster 2
- Soil fertility decline
- Wood & fuel shortage
- Loss of indigenous tree species
- Limited access to improved seed
- Feed shortage
(Land shortage due to population pressure)

The rationale behind this clustering is based on the recognition that: (i) loss of indigenous tree species and fuel wood availability has exacerbated soil fertility decline through the increased use of dung and crop residues for fuel (and the former must be dealt with to ameliorate soil fertility decline); (ii) intensification of the system to reduce land pressure will require a balancing act so that increased agricultural production (crop, livestock, trees) does not further compromise the already ailing nutrient status in the system; (iii) "improved" seed often requires high soil fertility, as well as placing a demand on already limited nutrient resources; and (iv) the traditional practice of rotating between cropland and fallow (for grazing) between seasons and years means that interventions in the livestock system will have a direct impact on the cropping system, and vice-versa. The common logic behind these relationships caused the team to name this the "Integrated Production and Nutrient Management Cluster." Clearly, the identification of such function clusters requires a relative intimate knowledge of the system. It is important to note that this knowledge can be provided either farmers or researchers who have been working in the system in a participatory manner for some time. We would encourage that both options be explored when applying this methodology in new sites.

These clusters were then drawn graphically in terms of the relationship between the problem and the integrated solution (Figures 2 and 3). These diagrams were found to be much more user friendly, given their simplicity as well as their role in moving from problem to solution.

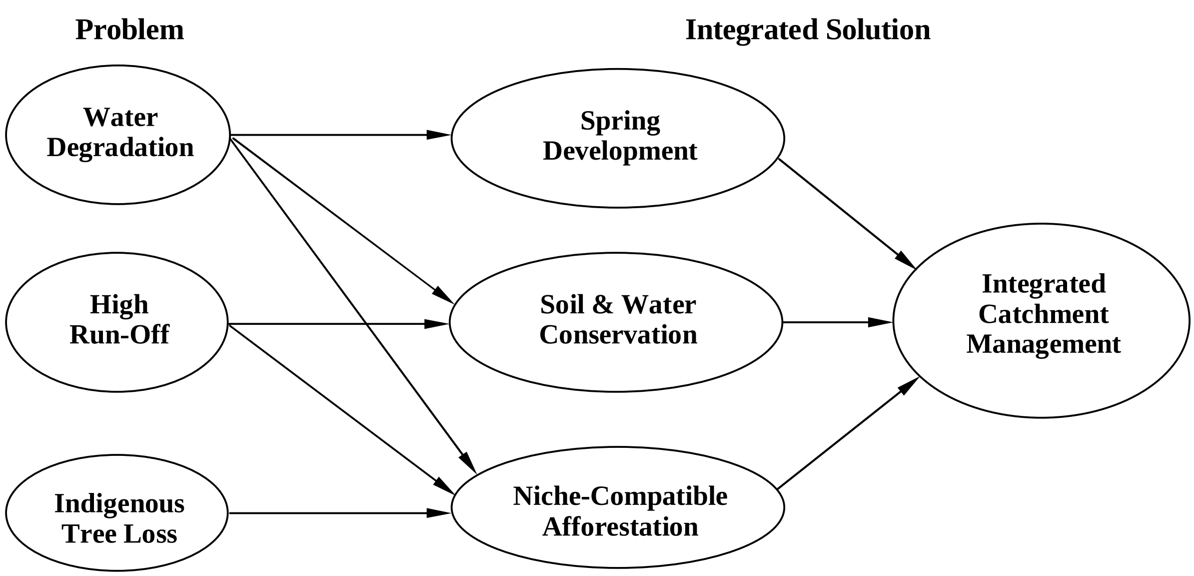

Figure 2. Soil and Water Management Cluster

The arrows on the left side of the figure illustrate how solutions (middle of the diagram) do not address a single problem, but multiple problems simultaneously. In the same way, the three integrated solutions can be further integrated into a single process of integrated (micro-) catchment management in which the whole is greater than the sum of its parts. For example, agroforestry practices should add value to soil and water conservation objectives and water resource protection if the appropriate trees are selected for their functional role in addressing other watershed problems as well as for the direct economic benefits they may bring. Alternatively, by addressing spring development as a high priority entry point, farmers may be more enthusiastic about trying out soil and water conservation measures or investing in the longer term returns associated with the cultivation of tree species compatible with soil bunds, springs and outfields.

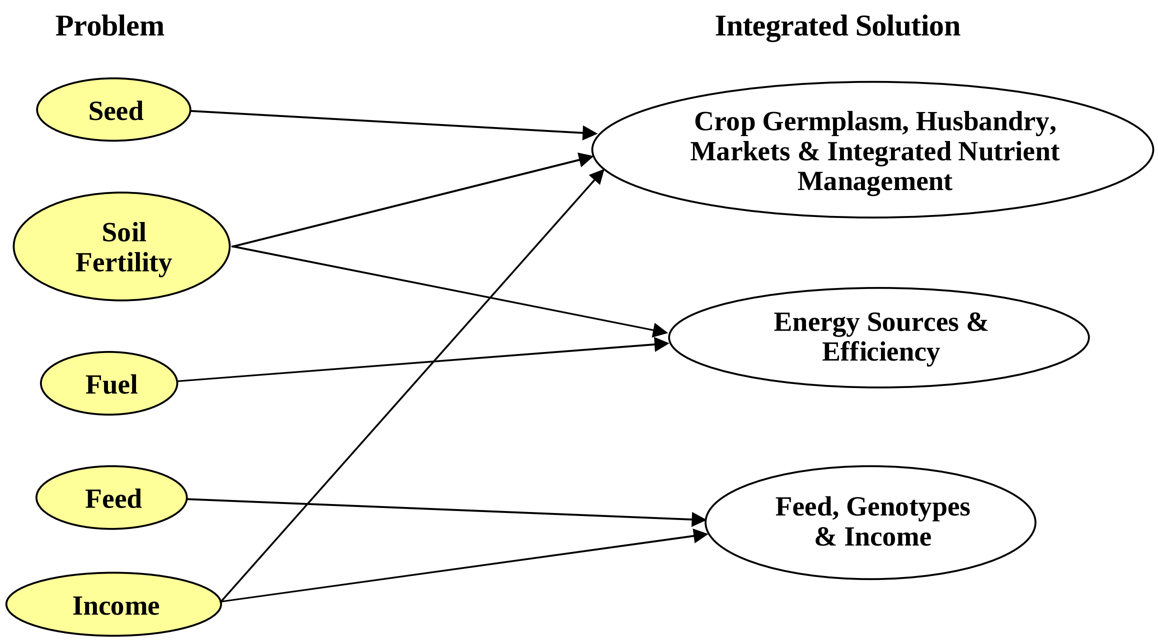

Figure 3. Integrated Production and Nutrient Management Cluster

In the above diagram, all of the issues identified in this cluster are represented with the exception of land shortage. The team decided that this issue was only going to be addressed by intensifying the crop, livestock and tree components of the system, with this dimension of the issue incorporated implicitly. However, this is not to say that such seemingly intractable issues should be marginalized up front; rather, we would encourage that such issues be explored further to identify whether there are other dimensions of the problem that can be taken on board by the communities, the R&D team or other actors.

Limited availability of oxen was another issue identified by farmers but left out of the planning process by the team. Rather than assume some tenuous linkages between labor-saving technologies in other spheres and this issue, we would again encourage the teams to explore such issues further to see if more creative and explicit strategies might be formulated.

INTEGRATED PLANNING

Articulation of Integrated R&D 'Targets' within NRM Clusters

Once clusters are identified, integrated research and community action protocols must be developed to articulate both a vision and an operational plan for bringing change within each cluster. The overall objective of the cluster is first articulated, followed by the objectives of each integrated solution ("sub-cluster"). The objectives must articulate 'higher-level' goals that go beyond any given discipline or system component to an integrated target that involves optimizing returns to different system goals (crop production, livestock production, nutrient conservation) or understanding trade-offs that emerge when giving greater emphasis to one system goal over others (i.e. production over water conservation). Through this approach, interventions within each sub-cluster are aimed at addressing problems within that as well as within other sub-clusters with which functional linkages are strongest. Research and development interventions can be defined at the cluster or sub-cluster level. While the latter enables planning to be more detailed, it also risks loss of integration – due to the tendency for individuals managing each sub-cluster to focus on inward-looking goals (i.e. livestock production) rather than the cluster or system at large (i.e. the role of livestock innovations for the productivity of the livestock component, the crop component, farmer incomes and system nutrient levels).

Sample objectives from the Ginchi site help to illustrate what such higher-level targets look like:

<u>Objective 1</u> (Soil and Water Management Cluster): To enhance the positive synergies between water, soil and tree management in micro-catchments.

Specific objectives corresponding to each sub-cluster are:

- To improve the quantity and quality of water for both human and livestock use and enhance community enthusiasm for future watershed activities
- To reduce runoff (loss of soil, seed, fertilizer, water) to improve productivity (of crops, trees, fodder) and enhance infiltration and groundwater recharge
- To increase the prevalence of trees in their appropriate niches to minimize runoff while increasing the availability of tree resources (fodder, fuel, income, timber)

<u>Objective 2</u> (Integrated Production and Nutrient Management Cluster): To improve farmer incomes and system productivity (including crops, livestock and trees) while ensuring sustainable nutrient management in the system.

Specific objectives corresponding to each sub-cluster are:

- To improve farmer incomes from crops through improved crop husbandry (including varieties and management), integrated nutrient management and marketing [while ensuring sustainable nutrient management in the system]
- To improve the availability and quality of feed resources [while ensuring sustainable nutrient management in the system]
- To enhance the availability of fuel and tree income [while contributing to the restoration of system nutrients]

As originally stated (without the phrases in brackets), these specific objectives are not phrased in such a way that ensures their proper integration. Sub-teams managing each specific objective began to focus on conventional research topics – namely, component-specific goals (livestock productivity, crop productivity, etc.) rather than their integration or optimization. When testing new barley varieties, for example, it is important to monitor not only grain yield – illustrating a bias toward the crop component, but grain yield, biomass yield for feed, and the resulting impact on soil nutrient stocks. When exploring alternatives for improving the productivity of fallows, it is important not only to consider the yield of feed, but the yield of subsequent crops in this same area and the quality of dung which will be recycled into the cropping system. It is for this reason that it is important to manage the entire cluster as a whole rather than its sub-components, and to ensure that farmers – natural systems thinkers seeking to optimize diverse benefits from any given innovation – have strong decision-making and oversight powers to control the options tested and the key parameters to be observed or measured for each.

Planning for Integrated Research and Development

From this point forward, it will be important to develop an integrated research and development work plan in response to the specified R&D targets or objectives. To assist in developing action plans toward the achievement of these targets, it is important to define two types of activities and their respective contributions to learning and change:

1. Community-led learning and change processes; and
2. Research contributions (social, biophysical, economic, policy) that can assist watershed residents or support institutions to make well-informed decisions.

It is important to consider that concrete benefits must be brought early on in the watershed diagnosis and planning process, to maintain community enthusiasm for future collaborative work and for solutions whose pay-offs will only be seen in the medium to long-term. So while researchers may feel they do not have an adequate understanding of some of the watershed issues to be able to intervene confidently, from community and development agency perspectives the preparatory phase will already have been sufficient to engage in activities designed to bring change. So a division of labor is required, based on agreements on points 1 and 2, above. This should be done in the planning stage through community-R&D team dialogue during watershed action planning (see AHI Methods Guide B4), but will also evolve as the learning process evolves – with new research priorities emerging as critical uncertainties hindering informed decision-making emerge.

It is also important to recognize that there are diverse approaches to furthering understanding around any given watershed issue. These might include: (i) empirical biophysical research to understand the current situation (cause and effect relationships, status of the resource, etc.); (ii) empirical research in social science to understand social and governance dimensions of the problem (causes and prevalence of conflict, local perceptions of rules and norms for NRM, local knowledge on the issue); or (iii) observations made by watershed communities or outside actors during efforts to bring change and address the identified problem (participatory action learning, or PAL). We would encourage diverse types of learning to take place simultaneously, with learning on actual change processes (iii) the 'glue' that ties the diverse contributions together. A methods guide (AHI Methods Guide E1) has been developed to assist integrated R&D teams to plan for integrated interventions combining participatory action learning with diverse types of research (social and biophysical, empirical and action-oriented). While planning how participatory action learning will be facilitated is best done through detailed narratives consisting of concrete steps and descriptions of how these will be facilitated (see Annex II for examples), a summary of the diverse contributions envisioned by PAL, action research and empirical research to the Ginchi watershed plan are summarized in Table 2 and Annex I.

Community-Led Learning and Change: A Brief Overview

Operationalizing the diverse contributions in Table 2 requires facilitating change processes in which watershed communities play a leading role. This requires a well-articulated action plan with clear objectives and activities designed to meet these objectives (the "what"), responsibilities (the "who") and timelines ("when"). The "who" can and should include diverse actors, among these members of the R&D team, local leaders, community members and, pending the responsiveness of other actors, local government and other service providers. Yet aside from the simple implementation of agreed activities, facilitating participatory and integrated approach to watershed management requires a number of complementary actions and considerations.

First, any change process as envisioned at the planning phase will only be a "best bet" approach that requires continuous refinement during the implementation process to ensure that responsibilities are being met, and envisioned activities are effective in reaching established objectives. Use of participatory monitoring and evaluation tools at watershed and R&D team level are an important tool for adaptive management of change – namely, the process of adjusting activities to ensure objectives are being met, barriers encountered during implementation are identified and addressed in a timely manner, and emerging opportunities are effectively captured. At the level of R&D teams, the tool should be used to conduct reflections at two levels: the watershed, where the procedures used by the team to facilitate change at the local level are scrutinized for their effectiveness; and within the team itself, to enable reflections on the effectiveness of interdisciplinary interactions, multi-institutional partnerships and team work. AHI Methods Guide B8 provides greater detail on participatory monitoring and evaluation tools.

Secondly, the principles of integration and participation in watershed management are likely to be forgotten if not for explicit facilitation processes. Participation will more often than not fall into the hands of local elites unless principles of equity are systematically observed. For example, when technologies are introduced or trainings given, the more active farmers will tend to consider such "development resources" their personal property unless facilitated to observe principles of sharing and equity from the outset. Criteria can be set that specify which types of farmers should be the first to gain access to such resources before any benefits flow into the community, and mechanisms agreed upon that govern subsequent sharing of such resources with other watershed residents. Secondly, it must be recognized that investments in labor, materials or money must be made by watershed residents to enable certain activities to be conducted. Yet some families can less afford to make such contributions than others. Similarly, different households may experience different levels of benefits from such investments. Therefore, rules for equitable contributions to watershed investments can be set. For example, when developing springs in Ginchi, farmers agreed on different levels of financial investment to be made by different households based on their ability. Similarly, farmers residing on lower slopes were more likely to benefit from controlled drainage of water from plots than farmers residing on upper slopes, requiring negotiations between these groups on investments to be made by different households. Third, some natural resource management

Table 2. Planning Framework for Integrating Diverse Learning Approaches in Research and Development (refer also Annex I for more details)

Major Activity / Step	Objective	FACILITATING PARTICIPATORY ACTION LEARNING	ACTION RESEARCH QUESTIONS	EMPIRICAL RESEARCH QUESTIONS
Watershed Diagnosis	To identify major watershed problems from the perspective of local residents.	*Primary Research Question:* What are effective, equitable processes for participatory diagnosis and planning for watershed management?		
		1. Consultations with diverse social groups to identify key watershed problems, and opportunities and barriers to their resolution. 2. Participatory watershed action plans. 3. Program-level planning for integrated R&D interventions.	1. What is an effective approach for planning at local & program level? 2. How can problem diagnosis be balanced with the need for immediate impact, so as to keep community interest high?	1. What are watershed priorities by gender, age, wealth & landscape position? 2. What are key opportunities and barriers to addressing identified watershed problems? 3. How effective are current by-laws and NR governance?
Soil & Water Conservation and Management	To enhance the positive synergies between water, soil and tree management in micro-catchments.	*Primary Research Question*: How can natural resource management innovations enhance agricultural productivity through decreased run-off (reduced loss of soil, seed, fertilizer, water) while enhancing spring recharge long-term?		
		1. Spring development with spring management plans (responsibilities, rules, sanctions). 2. Negotiation support & local by-law reforms for spring maintenance, common drainage ways, investments in spring recharge and greater niche compatibility in agroforestry. 3. Adaptive research on SWC structures and niche-compatible afforestation to control erosion, enhance water recharge & minimize loss of inputs.	1. If a high-priority entry point (spring development) is used, will outcomes of future R&D investments be greater? 2. What are the necessary conditions for people to invest in a shared resource? 3. What are effective approaches for reaching the overall cluster objective?	1. What is the impact of chosen SWC measures on run-off, soil & nutrient loss, & infiltration? 2. What are farmers key indicators for SWC, and how do these change over time? 3. Which trees are compatible with different niches? How do prioritized tree species perform in different niches? 4. Who are the stakeholders for each issue, and how do they view the cause and solution?
Integrated Production & Nutrient Management	To improve farmer incomes and system productivity (crops, livestock, trees) while enabling sustainable nutrient management.	*Primary Research Question*: How can income be improved through increased agricultural productivity (of crops, livestock and trees) and marketing while maintaining or enhancing system nutrient stocks?		
		1. Test alternative crop, feed and livestock husbandry practices & monitor effects on the system. 2. Raise awareness on fuel-nutrient dynamics; negotiate & test viable alternatives (fuel-efficient stoves, afforestation, regulate dung collection). 3. Negotiation support for benefits sharing and collective investments in outfields (nutrient management, alternative fuel source).	1. What is an effective and sustainable approach for scaling out tested varieties & integrated nutrient management technologies? 2. What are effective approaches for improving livestock & feed production, minimizing system nutrient loss and catalyzing collective investments in a sustainable fuel supply?	1. What is the effect of different varietal-nutrient management combinations on yield, income, plot fertility & system nutrient dynamics? 2. What is the effect of different feed and management innovations on income, livestock productivity and system nutrient dynamics? 3. How much energy / fuel wood is needed to substitute unsustainable fuel sources? What is the "absorption capacity" of trees in different types of households and landscape niches?

issues involve overt or latent conflicts, and must be resolved through negotiation support among local interest groups. One such case in Ginchi involved the owner of land around a spring who had cultivated a Eucalyptus woodlot at the spring, and users of the spring who had experienced a drop in water supply. Negotiation support needed to be used both to address the existing problem of that spring, as well as to negotiate how afforestation activities designed to address the deficient fuel supply could be conducted without further depleting water supplies. Finally, some issues are intractable and require more explicit, informed and intensive negotiation support strategies, such as the management of Ethiopian outfields – made difficult by government land tenure (hindering farmer investments) and the free grazing system (requiring that most innovations be collectively negotiated). For a sample of more detailed planning processes conducted one year after implementation, please refer to Annex II.

As for the integration principle, harmonizing interactions among adjacent land users in micro-watersheds is also only likely to occur if the principle is strongly facilitated into decision-making. For example, households are likely to only focus on their own potential benefits from NRM innovations (private goods) rather than the collective good unless dialogue is facilitated to encourage discussion and rule-setting to govern the innovation process. The dialogue should emphasize how NRM innovations can bring benefit to most households while harming none, and to multiple system components (crop, livestock, tree, water, soil) while harming none. The Lushoto site team is experimenting with an integrated micro-catchment management approach that sets such criteria but subsequently leaves most planning in the hands of catchment residents. We are viewing this as an opportunity to understand the extent to which communities are able to plan in an integrated fashion – minimize any negative social or environmental consequences of innovation – with minimal outside involvement.

Research Contributions to Informed Decision-Making: A Brief Overview

Systematic research that goes beyond community-led learning is of critical importance to guiding watershed management decision-making. However, lack of information should not cripple attempts to "enter the system" and begin innovating. Rather, as crucial information is acquired it can be immediately fed into the innovation process. We have encountered four different uses of such systematized learning in AHI:

1. Detailed characterization of the situation, to inform intervention strategies.

The first type of research provides an understanding of the system – from social, biophysical, economic or governance perspectives – that enables the design of strategic interventions. This entire methods guide is one example of this. However, following the clustering process, many information gaps will still remain. We have found that concrete interventions must begin to sustain farmer interest in watershed management while this deeper exploration continues; however, these interventions should not completely substitute for further inquiry. The following are some examples of questions that will require further exploration as the watershed action plans go into effect:

- 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?
- 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?

- Where are the "hot spots" in the watershed where the problem is most manifested?
- 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?
- What is the local knowledge about the issue, and what are the critical uncertainties in local knowledge?
- 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.

2. Research on biophysical cause-and-effect, to set management and policy targets.

Empirical research has been seen as a necessity for either 'depoliticizing' negotiations or mustering political support for the change process. Such research can be useful in cases where different stakeholders disagree on cause and effect. For example, if one stakeholder states that a certain tree species is depleting water and another disagrees, objective research to clarify such effects can be used to set targets for natural resource policies and decision making (i.e. the distance at which tree x can be planted relative to springs and waterways). However, more common in AHI has been the need to utilize biophysical research to bolster external political support for an emphasis on improved governance of natural resource management. For example, for policy enforcement agencies to consider revising byelaws at district level from experiences in pilot watersheds, it is necessary to leverage empirical data on the problem that these byelaws are designed to address. Research teams in Tanzania, for example, are quantifying the effect of tree lines on adjacent cropland for Eucalyptus and other species seen as harmful to crops. These experiments will provide clear scientific justification not only for increasing emphasis on niche compatibility within forestry programs, but for setting benchmarks for byelaw design. If clear thresholds are identified in the effect of boundary trees on adjacent cropland (Figure 1, scenario b.), for example, then byelaws can be designed to specify the minimum distance at which these trees should be grown relative to farm boundaries.

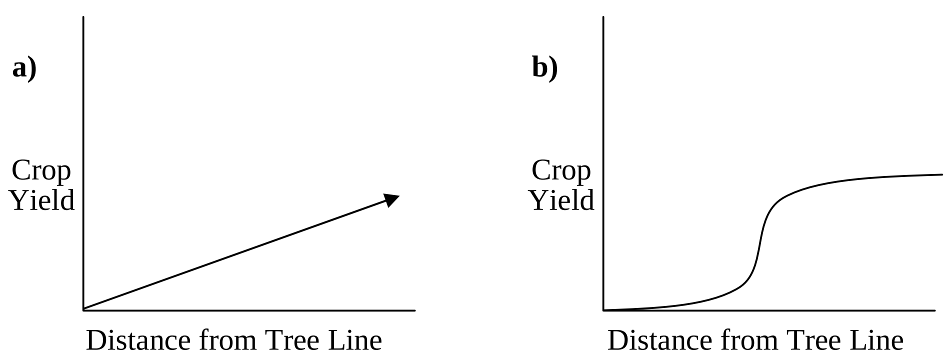

Figure 1. Impact of boundary trees on the yield of adjacent crops in cases with (a) and without (b) thresholds.

In the absence of thresholds, such knowledge can be used to enable multi-stakeholder negotiations to set rules for management (i.e. minimum distance of Eucalytpus from farm boundaries) that can only be set through subjective assessments.

3. Action-based research to understand the principles enabling effective change processes.

Imposing action research on the community-led change process can serve two purposes. First, it can encourage systematic reflection on how things are being done so that they can undergo continuous improvement. Yet this is in essence the function of participatory M&E at watershed level. The second purpose is to derive general principles from the change process that can be of use to other users outside the immediate action arena. In the context of AHI, for example, we have needed to study change processes for the purpose of methods development. Without such scrutiny of the method-in-practice, it would be impossible to make reliable claims about the method's usefulness with respect to the method as originally envisioned prior to its implementation or to current practice. This requires an integration of participatory assessments of the methodology (through participatory M&E) with R&D team assessments. The latter has been done through process documentation, a research tool that formalizes data collection on any facilitated change process and ensures changes are made to adapt the tools to the challenges faced during implementation. For more details on this methodology and its integration into other learning approaches (community-based participatory action learning, empirical research), please see German et al. (in press). A host of process-related publications are outcomes of this type of research (German et al, 2006a; German et al, 2006c; Taye et al, in press).

4. Empirical research to objectively assess impacts.

The final use of more systematic or formalized research in AHI has been impact assessment. While impact assessment strategies were designed in many sites during the watershed planning phase, we are only now exploring their use in practice. However, it is become clear that more formal procedures for assessing impacts are required given the need by donors and national research and development organizations – considering investing in the programme or institutionalizing AHI methods – of objective assessments of cause and effect between the methods used and the impact obtained. We also expect such assessments to be of use to local partners in assessing their own progress and in applying the approach more broadly.

CONCLUSIONS AND IMPLICATIONS

This methods guide outlines a methodology for moving from locally-identified watershed priorities to an integrated research and development agenda based on "clusters" of issues exhibiting strong functional relationships. It is designed to enable an expansion of the watershed agenda from soil and water management to integrated systems, in which landscape processes cutting across components (crop, soil, tree, livestock, water) and resource users are understood and managed for both livelihood and conservation objectives. It enables research and development actors and the watershed communities they support to define a few clear targets for their activities or interventions. These targets will by nature incorporate multiple variables for which there will be synergies or trade-offs, depending on how the process is managed and outcomes negotiated. These might include selection of tree species with sub-optimal yields of timber so as to enable tree compatibility with springs and farmland; or assessing the effects of crop or livestock innovations on system nutrients, other enterprises and other users – so as to actively acknowledge and manage trade-offs. The idea behind this guide is to acknowledge that we are dealing with complex systems and diverse local interests, and to give tools for optimizing returns to diverse system goals (increasing income, crop yield and the yield of diverse tree and livestock products; maintaining soil fertility; water conservation; etc.) and land users.

So what are the implications of such an approach for agricultural research and development and natural resource conservation efforts? First, it suggests that professionals need to balance depth of disciplinary specialization with a broad systems perspective that understands farmers' need to: (i) optimize returns to diverse enterprises and livelihood goals; (ii) balance efforts to conserve their resource base with immediate economic returns; and (iii) ensure their own families' needs are met before or while considering the impacts of their land use behaviors on others. Implicit in this is also a suggestion that highly disciplinary efforts that seek to maximize a single variable (i.e. yield of crop x) without considering the effects this has on other enterprises, resource users or the natural resource base sustaining farmers' livelihoods is irresponsible professional practice. Interactions between adjacent landscape units and users in densely settled highlands of eastern Africa are substantial, and should not be ignored. The second implication is that new institutional models are required that strengthen collaboration between disciplines, ministries and research and development organizations. This could imply the emergence of institutions modeled after different principles from those of today, which are compartmentalized according to disciplinary lines and mandate (research *or* development); or simply new mechanisms for planning, managing and encouraging cross-disciplinary, cross-institutional collaboration.

To aid R&D teams to further develop action plans around the integrated clusters, 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 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)

ACKNOWLEDGEMENTS

The authors would like to acknowledge the support of the Ethiopian Institute for Agricultural Research (EIAR), the Department of Research and Development (DRD) in Tanzania and the Kenyan Agricultural Research Institute (KARI) for their support to research and development teams in AHI benchmark sites; Dr. Tilahun Amede, Mr. Chris Opondo and site team members of the Areka, Ginchi, Lushoto and western Kenya benchmark sites for their conceptual contributions. We are also grateful to our donors, including SDC, IDRC, the Rockefeller Foundation, the Netherlands and Norwegian governments, and the Collective Action and Property Rights Program (CAPRi), for their financial support for this work.

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ANNEX I:
SAMPLE WORK PLAN FOR R&D TEAMS BASED ON CLUSTERS
Ginchi Benchmark Site, Ethiopia

OVERARCHING WATERSHED PROCESS

OBJECTIVE

To enhance overall integration and effectiveness of the PIWM process.

COMMUNITY ACTION PROCESSES

The first dimension is a participatory watershed planning event that will ground change in local priorities and awareness. The second dimension is the overall management of the change process, which will be dealt with at cluster and sub-cluster level (later in this plan). Please note that 'higher-level' research questions are, however, defined for the overarching watershed process at this stage.

The team will facilitate participatory action planning for each cluster through a watershed-level forum inviting farmers from the entire watershed. The process to be used during this forum will involve:

1. Refresh memories on major issues encountered in the WS exploration. Share issues identified within the cluster, capturing a few of the farmers' observations for each issue to validate.
2. Raise awareness on the need to integrate long-term with short-term solutions, and to balance short-term livelihood gains with sustainability. Present the clusters and cluster objectives; seek farmers' reactions (are these the most relevant clusters?).
3. Break into 6 groups based on sub-clusters, with facilitators assigned to each cluster:
   - Soil and Water Conservation
   - Loss of Indigenous Tree Species / Agroforestry
   - Integrated Crop and Nutrient Management
   - Livestock Feed and Productivity
   - Fuel Management (including a discussion of the fuel deficiency–nutrient decline relationship, fuel wood and energy-efficient stoves)
   - Collective Action and Bylaw Reforms

   Give each group the following task:
   - Discuss the problems identified within each component.
   - Ask farmers to propose solutions
   - Only after farmers pose their solutions, R&D team can bring their own ideas into the discussion (including prior research results and possible actions), asking farmers to validate the findings and the feasibility of alternative solutions.
   - Develop a preliminary list of actions ("what") by group, classified according to: (i) issues requiring further research, (ii) issues requiring farmer exposure to real-life examples from elsewhere, and (iii) issues requiring immediate actions.
   - For research and exposure dimensions, discuss the "how" for *each* of the proposed actions: (i) Who to involve (representation by village, age, gender & influential individuals); (ii) How to share the information obtained (research, exposure visits); and (iii) How this additional information will feed into a refined watershed action plan.
   - For immediate actions, discuss: responsibilities, timetable.

The above process will help to validate solutions proposed by the site team, create awareness at the watershed level of AHI activities, integrate local solutions into WS action plans, and enhance community ownership of the WS processes.

Other community action processes are summarized in the cluster work plans, below, and will be subject to watershed-level syntheses following implementation.

RESEARCH QUESTIONS

Action Research

Question 1: What are effective, equitable processes for participatory diagnosis and planning for watershed management?

Methodology:
- Community action process, as above.
- PM&E and process documentation of planning processes.

Analysis:
- Qualitative process documentation (findings from M&E session, team observations, attendance and participation levels, etc.).

Output:
Methods guide on participatory watershed planning.

Question 2: If an integrated approach is taken to NRM issues at watershed level, will outcomes of R&D investments be greater due to multiple benefits?

Methodology:
- Amalgamate the findings of each Sub-Step and Cluster to summarize the impact of the overall watershed process.
- Final participatory M&E session at watershed level at the end of Phase 3 to assess community perceptions on the approach used and its impacts.

Analysis:
- Quantitative (biophysical impacts, returns, etc.) and qualitative.
- Qualitative process documentation (findings from M&E session).

Output:
Written document on the approach used and overall benefits (perceived and measured biophysical, economic and social benefits) from watershed management activities.

Question 2: What are the necessary conditions (market, rules for resource governance, technologies, organizational / negotiation / conflict resolution mechanisms, higher-level policy support) for people to continue investing in NRM activities that lead to collective and system (as opposed to individual) benefits, and how can these be fostered?

Methodology:
- Amalgamate action research findings (process documentation, PM&E results, troubleshooting mechanisms) for each Sub-Step to assess overall elements to successful interventions in the watershed.
- Qualitative synthesis & analysis (extracting success factors, etc. across all Sub-Steps).

Output:
Written report analyzing the necessary conditions for people to continue investing in NRM activities that lead to collective and system (as opposed to individual) benefits, for research and development institutions and policy-makers.

CLUSTER I: SOIL & WATER CONSERVATION AND MANAGEMENT

OVERALL OBJECTIVE

To enhance the positive synergies between water, soil and tree management in micro-catchments.

Specific Objectives

1. To improve the quantity and quality of water for both human and livestock use and enhance community enthusiasm for future watershed activities.

2. To reduce runoff (loss of soil, seed, fertilizer, water) to improve productivity (of crops, trees, fodder) and enhance infiltration and groundwater recharge.

3. To increase the prevalence of trees in appropriate niches to minimize runoff while increasing the availability of tree resources (fodder, fuel, $, timber).

Primary Research Question

How can natural resource management innovations enhance agricultural productivity through decreased run-off (reduced loss of soil, seed, fertilizer, water) while enhancing spring recharge long-term?

SPRING DEVELOPMENT

Objective

To improve the quantity and quality of water for both human and livestock use.

Community Action Process

Following the feasibility study (visiting the watering points to determine their potential for upgrading, determining total cost, etc.), the community organized themselves to propose local contributions of labor, materials (stone) and money. The following actions refer to future interventions.

1. Community mobilization;
2. Community action to implement above plan;
3. Physical construction of springs;
4. Development of community management plan;
5. Periodic monitoring and evaluation.

Hold participatory planning session with watershed villages to brainstorm on the need for management structures and procedures; cross-site visits to successful water point management projects (with WS representatives elected and plan for feedback developed during planning meeting); conduct periodic monitoring (PM&E) to address problems as they arise.

Expected Outcomes

WS has effective management structure (water use committee?); local by-laws and/or rules for management and utilization of watering points are in effect; conflicts and problems are minimized in a timely manner.

Overall expected outcomes:

- Greater trust in AHI activities from the outset
- Alleviation of a major livelihood constraint (short-term)

- Greater farmer investment in long-term solutions to water management (i.e. SWC, agroforestry and other component interventions that can have positive effects on water flow as well as other benefits)
- Greater experience by farmers in organizing collectively, generating confidence in other collective action activities in the watershed
- Water-borne disease for humans and livestock minimized; enhanced water availability and reduced burden on women and children.
- An approach to enabling effective management of water points at watershed level.

Action Research

Question 1: If spring development (as the most immediate solution to the prioritized watershed problems) is used as an entry point, will outcomes of future R&D investments be greater due to increased trust and enthusiasm?

Methodology:

- Interview a sample of farmers living near the 3 developed and two undeveloped springs, as well as from outside the watershed, to compare their enthusiasm and willingness to experiment with other NRM innovations.
- Formal impact assessment after 2 years.

Analysis:
Descriptive analysis of perceptions grouped according to whether local water points were developed; quantitative analysis of technology testing (number of technologies being tested by farmers living in the vicinity of developed and undeveloped watering points).

Outputs:
A paper describing the impact of using a high-priority entry point on broader watershed activities and collective action, targeted to research and development organizations.

Question 2: What are the necessary conditions for people to continue investing in better management of a shared resource?

Methodology:
Document successes and failures in effectively managing the watering points through process documentation of community management plans and PM&E sessions *by watering point*. Both successes and challenges faced, as well as solutions proposed and tested, will be documented.

Analysis:
Descriptive assessment of community experiences and challenges in managing watering points. A comparative assessment will be made comparing the challenges and successes faced by people managing different watering points.

Outputs:
An approach paper on enabling effective management of water points at watershed level; conceptual paper on the *conditions* under which CA is sustained (i.e. local rules, organizational structures, conflict resolution mechanisms, etc.), for research and development organizations.

SOIL & WATER CONSERVATION

Objective

To reduce runoff (loss of soil, seed, fertilizer, water) to improve productivity (of crops, trees, fodder) and enhance infiltration and groundwater recharge.

Community Action Process

The first step will be awareness creation through cross-site visits to successful soil and water conservation programs (Debre Sina). Those to participate should include a balance by gender, age and village. We will discuss an organizational structure for effective representation and feedback (information sharing) at watershed level during the planning session, and work through this structure when selecting farmers for cross-site visits. The farmers participating in the cross-site visit will be responsible for feeding back what they saw to others in their respective villages. The site team and field assistant will help them to develop a process for feedback, and follow up with their experiences.

At this point in time, results of formal research on reasons for non-adoption of SWC measures already conducted in the area will be fed back to farmers. This, together with farmer priorities for SWC structures and observations during cross-site visits, will aid in the participatory design of training content and ultimate actions. Technologies to be tested will be finalized through a more detailed participatory action plan for SWC. This will lead to: what structures to construct, where to construct them (i.e. related to watering point, gulleys, etc.), how (organizational arrangements, participants, etc.), potential for economically-important species on the structures, and a plan for monitoring local indicators. Researchers will bring their criteria to the selection of farmers to be involved in FFS, FRG (i.e. literacy, personal interest, etc. according to experiences of other projects, are respected, willing to share knowledge); farmers will also bring their criteria (discuss whether to 'sample' from local social units when selecting members of FRGs, etc.). According to the combined criteria, people will be selected during the planning meeting or afterwards (for example, if local social units or their leaders must elect their representative on the basis of defined criteria). During the planning session, a mechanism for disseminating knowledge gained through training to other farmers will be discussed and put into place. Discuss the need for preliminary rules that will enable farmers to test these technologies without interference from livestock and human activity.

The next step will involve farmer training demonstrating the construction of the biological and physical structures of their choice. Leaflets will be produced to enable these farmers to learn about these particular structures. After a period in which farmers test diverse structures, other farmers will be invited to observe their experiences on-farm and watershed forum will be called to discuss the need for by-laws to accompany more widespread implementation.

Action Research Process

Question 1: What are effective approaches for improving productivity and enhancing infiltration and groundwater recharge through reduced runoff?

Methodology:

- Process documentation and reflection with the site team after each community interaction and formal research activity, using the Action Research Guide.
- Meet with farmers directly involved in trainings and cross-site visits periodically to monitor successes and challenges (technical, social & policy dimensions); meet with other farmers to see whether and how they have benefited.

Analysis:
Analysis will be qualitative, emphasizing the original design of intervention processes (community action process and formal research) and how these changed through time as important bottlenecks or needs emerged.

Outputs:
A written document describing an effective approach for improving productivity and while enhancing infiltration.

Empirical Research

Question 2: What is the impact of the chosen SWC structures on runoff, soil & nutrient loss, and infiltration (to be deduced from rainfall & runoff data) in the watershed?

Question 3: What are farmers' priority indicators / variables for SWC measures? How do these change over time?

Activities:
Interview farmers to identify key variables of importance to them, and associated indicators.

Methodology:

- Monitor runoff and soil loss from the catchment, starting from when the structures are implemented.
- Focus group discussions (by gender/age/wealth) using semi-structured questionnaire to assess their priority variables (what are the main benefits that can be brought from SWC measures?), and the indicators that help them to monitor change in these key variables. Each focus group will rank the variables.

Analysis:
Will depend on the method selected (Question 1).
Descriptive analysis in which the variables from different focus groups are compiled (assessing frequency with which different variables are mentioned and their rank), and listing the indicators that accompany priority variables.

Outputs:
The output will be a written report on trends in soil and nutrient loss, infiltration and additional variables identified by the farmers over time to monitor the impact of the particular SWC measures implemented in the watershed. The report will be aimed at research and development institutions and policy-makers. Additionally, farmers will gain understanding of the impacts of the SWC measures through local monitoring of key variables.

NICHE-COMPATIBLE AFFORESTATION

Objective

Increase the prevalence of trees in appropriate niches to minimize runoff while increasing the availability of tree resources (fodder, fuel, $, timber).

Community Action Process

During the cross-site visits for SWC practices, farmers will observe what is being cultivated along contours. This should be discussed as one potential niche for the integration of tree and shrub species.

During the preliminary participatory action planning forum, farmers in the tree group will select species appropriate for different niches (contours, homesteads, wastelands, gulleys, farm boundaries, in outfield cropland, around watering points) which cut across both clusters of issues. Research findings will be fed back to them for confirmation and verification (i.e. niche compatibility criteria, actual species in each niche, and species that conform to identified niche criteria). The criteria they identify for niche compatibility will be documented for each niche, and also the best niches for important species / uses (appropriate niches for the species used for fuel, fodder and income generation which don't fit into many niches – such as eucalyptus). The properties of species selected for each niche will be researched through a literature review to ensure its compatibility with the niche (impact on crops, soil, water). A discussion of what collective action and/or policy interventions are needed to minimize the negative effects of existing cultivation patterns, and to maximize positive impacts of trees (i.e. around watering points), will be carried out. Have farmers prioritize one or more niches where they want to begin afforestation activities, to include (minimally) pre-tested niches (homesteads, boundaries). Include 3 or more farmers involved in tree performance evaluation in the tree planning group so they can share their observations as they plan.

Establish a provisional working group with effective representation by village, gender and "stake" (those that are likely to be underrepresented or high-stake) during the village action planning meeting. These farmers will be responsible for identifying the total area and number of trees that can be integrated into prioritized niches, to formulate a plan for nursery establishment (which species, #s of each), and to assist in interviewing different farmers when required (for example, # trees required by each farmer by niche, attitudes regarding potential policy dimensions). Decisions on which species should be cultivated in each niche will in most cases need to be negotiated incorporating the priorities of individuals with collective impacts (i.e. on water, cropland, etc.); such decisions will need to be determined at watershed level (involving most farmers) once the species are verified for each niche. The need for by-laws to ensure cooperation in putting tree species in niches where they are most compatible will be determined at the watershed level, and appropriate strategies for their formulation / implementation decided upon at this time. A mini policy action plan may be the outcome of these deliberations. The decision on which species to be propagated will also depend on whether they have been verified in their adaptability to watershed conditions. Species already verified in particular niches can be propagated for scaling out purposes in those niches (for all farmers who wish to adopt); those not yet verified will be propagated in small numbers for testing purposes.

Based on the outputs of this working group and watershed-level negotiations, nurseries will be established. Potential nursery sites will be identified during the preliminary action planning meeting, and institutional structures and rules for managing and utilizing trees / nurseries established. Conduct training on nursery establishment and management either on the basis of tree working groups or by nursery. If done on the basis of smaller groups, be sure mechanisms are in place for the group to share back with others. Ultimately, we want all farmers to be knowledgeable on nursery establishment, management, etc. Periodic training will also be conducted for nursery management, out-planting and tree management.

Note: Also explore proposed policies on eucalyptus expansion, and how to minimize emerging conflict over eucalyptus near watering points through negotiation of "win-win" solutions.

Action Research

<u>Question 1</u>: What are effective approaches for increasing the prevalence of trees in their appropriate niches?

Methodology:
- Process documentation and reflection with the site team after each community interaction and formal research activity, using the Action Research Guide.
- Meet with farmers directly involved in trainings, nursery management and tree niche management (technical, social & policy dimensions) periodically to monitor successes and challenges; meet with other farmers to see whether and how they have benefited.

Analysis:
Analysis will be qualitative, emphasizing the original design of intervention processes (community action process and formal research) and how these changed through time as important bottlenecks or needs emerged.

Outputs:
A written document describing an effective approach for increasing the prevalence of trees in appropriate niches for multiple benefits.

Empirical Research

Question 2: How do prioritized species perform in the niches that have not yet been researched?

Methodology:

- Archival research to confirm the properties of the prioritized species, in particular with respect to identified niche compatibility criteria.
- Field-testing of species in their respective niches, with a minimum of 10 farmers to test the high-potential species in each niche based on farmer preferences and literature review.
- Data to be collected include: growth parameters (survival rate, height, root collar diameter, biomass), leaf nutrient analsis, farmer observations about the species (monitoring their criteria).

Analysis:

- ANOVA for analysis of growth parameters and leaf nutrient analysis.
- Descriptive statistics for farmers' observations.

Outputs:
Scientific paper compiling the results of species adaptation in different niches and farmer preferences / observations. Additionally, farmers will gain understanding of the importance of different tree species for different niches through their own observations and feedback of scientific results.

Note: No market research will be conducted because market opportunities already exist for these species, and because by the time the species are mature the market conditions are likely to have changed considerably.

CLUSTER 2: INTEGRATED PRODUCTION AND NUTRIENT MANAGEMENT

OVERALL OBJECTIVE

To improve farmer incomes and system productivity (crops, livestock, trees) while ensuring sustainable nutrient management in the system.

Specific Objectives

1. Improve the income from crops (barley, potato) through improved crop husbandry (including varieties and management), integrated nutrient management and marketing.

2. Improve the availability and quality of feed resources.

3. Enhance the availability of fuel and tree income without further depleting system nutrients.

PRIMARY RESEARCH QUESTION

How can income be improved through increased agricultural productivity (of crops, livestock and trees) and marketing while maintaining or enhancing system nutrient stocks?

Note: Given the strong functional relationships among certain dimensions of this cluster, some of the entries will be amalgamated within the intervention strategies. Furthermore, the broad treatment of the agroforestry dimension within the soil and water conservation structure makes the agroforestry interventions for clusters 1 and 2 similar. Nevertheless, agroforestry must be treated together with other components within this cluster due to its relationship to system nutrients and the emphasis on production of tree products (as opposed to water recharge and soil erosion control, which are more strongly emphasized in the SWC cluster).

INTEGRATED CROP & NUTRIENT MANAGEMENT

Objective

Improve the income from crops (barley, potato) through improved crop husbandry (including varieties and management), integrated nutrient management and marketing.

Community Action Process

(i) Barley:
Community actions for barley are divided into two basic activities: scaling out proven food barley varieties with its production package, and testing new varieties (including malt and food barley). *For scaling out*, there are two options: to have larger FRGs that are trained directly, or smaller FRGs whose representatives are trained. The WS committee will simply be the contact persons between FRGs and AHI, so we can respond to any issues in a timely manner as they arise. Which option is selected will be discussed in the planning session. One topic to discuss will be how they would like to organize themselves to access seed and whether to establish joint or individual plots for multiplication. For those FRGs that select group management practices, rules and regulations for group management and associated benefits will need to be formulated. Once the groups are established, training will be conducted on general barley production and integrated nutrient management techniques by group or with their chosen representatives. Barley researchers will follow up and monitor a selection of farmers' fields from each village to ensure that production is going smoothly (nutrient management practices, purity). All farmers will also be advised to report any problems to their representatives in the watershed committee and AHI will contact them frequently to address any problems that emerge. In the ideal case, each FRG will be provided a small amount of starter seed that can be propagated through time. This needs to be negotiated with the Barley Project and Holetta Agricultural Research Centre.

To integrate barley production with integrated nutrient management (sustainability dimension), training will include brief awareness-raising on the need to integrate income generation with long-term soil fertility management due to the declining soil fertility in the outfields. Farmers will be trained on options for INM including: compost-making, FYM management, crop rotations, mineral fertilizer usage and biomass transfer (for species with high NPK and low lignin content). The same farmers being trained on barley production will be trained for INM (entire groups or representatives of groups, as above).

For testing new varieties, a few farmers can be selected for adaptation, demonstration and popularization of new varieties based on interest.

(ii) Potato:
Community action processes will depend on the ultimate objective, whether testing new varieties in the pipeline or scaling out well-tested varieties (i.e. Menagesha) for seed and ware. Strategies may also be defined according to farmers' capacity (wealth) to invest in seed potato inputs.

For scaling out, there are two options: to have larger FRGs that are trained directly, or smaller FRGs whose representatives are trained. The WS committee will simply be the contact persons between FRGs and AHI, so we can respond to any issues in a timely manner as they arise. Which option is selected will be discussed in the planning session. One topic to discuss will be how they would like to organize themselves to access the materials (seed, materials for DLS, inputs) and whether to establish joint or individual plots and DLS. Wealth will be a likely determinant of farmer organization strategies; joint management is one way to address the wealth limitations for poorer farmers. For those FRGs that select group management practices and/or for eventual second-order farmer unions, rules and regulations for group management and associated benefits will need to be formulated. Once the groups are established, training will be conducted on general potato production (seed potato), integrated nutrient management techniques and post-harvest handling and management by group or with their chosen representatives. Potato researchers will follow up and monitor a selection of farmers' fields from each village to ensure that production is going smoothly (purity of the seed, nutrient management practices, disease). All farmers will also be advised to report any problems to their representatives in the watershed committee and AHI will contact them frequently to address any problems that emerge. In the ideal case, each FRG will be provided a small amount of seed that can be either propagated through time, or supplemented with farmer contributions. This needs to be negotiated with the Potato Program and AHI.

To integrate potato seed production with integrated nutrient management (sustainability dimension), training will include brief awareness raising on the need to integrate income generation with long-term soil fertility management due to the tendency of potato to consume many nutrients. Farmers will be trained on options for INM including: compost-making, FYM management, crop rotations, mineral fertilizer usage and biomass transfer (for species with high NPK and low lignin content). The same farmers being trained on seed potato production will be trained for INM (entire groups or representatives of groups, as above).

For scaling out, it was discussed that it is not necessary at this point in time to test new varieties as we already have a high-performing variety and are focusing on scaling out. However, testing of the new varieties is considered useful in the event that Menegesha fails at some point in the future or for diversification purposes. As such, a few farmers can be selected (from those involved in seed potato production or others) for adaptation, demonstration and popularization of new varieties (planting these varieties together with Menegesha).

(iii) Marketing:
Two approaches will be utilized to enhance market access for potato and barley. First, results of a HARC potato market study will be shared with potato FRGs. Second, farmers will be led through a method for market assessment and taken to do their own market opportunity analysis. Representatives of FRGs involved in barley and potato production will visit local, Ginchi & Addis markets during this assessment. The site team will tap into existing methodologies from EARO & CIAT for doing this sort of activity.

Action Research

<u>Question 1</u>: How can soil fertility be maintained while increasing farmer income through increased production of potato and barley?

Methodology:

- Process documentation and reflection with the site team after each community interaction and formal research activity, using the Action Research Guide (Objectives, Approach, Changes in Approach, Challenges / Successes, Insights and Way Forward).
- Meet with farmers directly involved in trainings and crop and nutrient management activities periodically to monitor successes and challenges (of social, technical, policy & market dimensions).

Analysis:
Analysis will be qualitative, emphasizing the original design of intervention processes (community action process and formal research) and how these changed through time as important bottlenecks or needs emerged.

Outputs:
A written document describing an effective approach for managing soil fertility while increasing farmer income through improved crop husbandry.

<u>Question 2</u>: What is an effective approach for scaling out proven crop production packages (i.e. barley and potato)?

Methodology:
- Process documentation and reflection with the site team after each community interaction, using the Action Research Guide (Objectives, Approach, Changes in Approach, Challenges / Successes, Insights and Way Forward).
- Meet with farmers directly involved in trainings and seed/crop production periodically to monitor successes and challenges (for technical, social, policy & market dimensions), to monitor access to improved varieties, and whether they have shared with others.

Analysis:
Analysis will be qualitative, emphasizing the original design of intervention processes (community action process) and how these changed through time as important bottlenecks or needs emerged.

Outputs:
A written document describing an effective approach for scaling out proven crop production practices.

Empirical Research

<u>Question 1:</u> How can soil fertility be maintained while increasing farmer income through increased production of potato and barley?

Activities:
Monitor the impact of selected crop and INM practices.

Methodology:
- Community action processes as above.
- Monitor the impact of selected crop and INM practices on yield, soil fertility and income.
- Yield will be assessed through a comparison of yields obtained through different soil fertility management practices chosen by different farmers.
- Income will be assessed through a comparison of farmers growing potato and barley under the new and the old production practices (including varietal/INM/husbandry dimensions).
- Soil fertility will be assessed before and after implementing diverse INM practices, on the basis of diverse options selected by farmers (sampling different practices).

Analysis:
- Descriptive analysis of farmer assessments.
- Quantitative and qualitative analyses to compare yield and soil fertility under different management practices.

Output:
Report assessing the relative benefits (to yield, income, soil fertility) of diverse management practices.

<u>Question 2:</u> Which new varietial (potato, barley) and INM practice combinations perform best in Galessa watershed?

Note: If varieties are many, then INM practices will remain uniform across all varieties.

Activities:
- Barley and potato adaptation trials for testing and demonstration purposes.
- Popularize and scale out most preferred varieties from trials.

Methodology:
On-farm variety trials combined with different soil fertility management practices with interested farmers. Farmer visits to trials and culinary tests to assess preferred varieties and preference criteria. Preferred varieties will be scaled out according to the approaches outlined above.

Analysis:

- ANOVA (barley and potato)
- Descriptive statistics for preference analysis (potato)
- Qualitative farmer assessments (preference criteria)
- Laboratory analysis for protein content (malt barley)

Output:
Written report of trial results and farmer assessments.

INTEGRATED LIVESTOCK HUSBANDRY

Objectives

To improve the availability and quality of feed resources, and ultimately livestock production more generally.

Community Action Process

Awareness creation will address problems with the existing system (declining productivity and size of grazing areas & productivity of outfields, quality of existing feed resources, productivity of local breeds) and technological alternatives (both feed resources and improved genotypes). Technological options to be presented include feed alternatives (new forage varieties, improved pasture, industrial by-products, alternative fodder sources and improved utilization of crop residues) and livestock breeds (characteristics and management of cross-breeds).

During the participatory planning meeting at watershed level, one of the groups will discuss feed and livestock interventions. The technical alternatives for feed will be introduced at this time, and farmers will identify which options are viable for different types of farmers (based on # livestock, amount land, wealth). If the options differ a lot according to wealth or another factor, then groups will be based on the different options selected. Out of this group discussion we would have basic design of groups established and a preliminary selection of technologies to be tested.

Once livestock groups have been established, they will work on technical interventions on a group basis, but local policy / by-law dimensions should also be discussed collectively. These can be fed up to the watershed committee for broader consideration at watershed level.
Interventions will be sequenced as follows: a) cross-site visits to farmers experimenting with both improved genotypes and feed resources, b) activities to improve feed resources, and c) introduction of improved genotypes. To increase the availability of feed resources, the following activities will be carried out:

a) Scaling out tested forage varieties with interested farmers (FRG with membership selected according to representation by wealth (minimally one cow), village and gender); carry out adaptation trials with new forage varieties.

b) Begin by exploring existing property rights and collective action practices in communal grazing areas to assess the potential for collective investments in improved pasture. Also need to bring results from prior studies on native pasture quality into the assessment of whether improved pasture will lead to improved productivity. If results are favourable (rights to exclude others are present, existing pasture is of poor quality), then engage communities around shared pasture areas in discussions on pasture improvement and rules or by-laws that would enable cooperation on the management of communal grazing lands. Land tenure reforms under discussion at national level will also be explored so we know which tenure systems will exist in the future and where to concentrate our efforts (i.e. communal grazing lands or other).

If farmers select alternative fodder sources (multi-purpose trees & shrubs) as a priority source of fodder, then already tested species will be promoted within the livestock FRGs. Ideally, these species would be propagated within the community nurseries. Berhane and Aemero would provide the farmers with research results on nutritional quality and other characteristics of these species. Alternatively, management advice for existing species will be provided. By-laws required for establishment of trees, shrubs and nurseries will be discussed in line with the process defined in Cluster 1. If farmers believe that improved utilization of crop residues is viable at this time (prior to any change in genotype), then this will be demonstrated as one of the options for on-farm testing.

To introduce improved genotypes, artificial insemination in collaboration with the Ministry of Agriculture was discussed as the best alternative due to the difficulty of managing a pure-bred bull in the area and the increased possibility of scaling out (as opposed to introducing a few half-breed dairy cattle) for experimentation. Cross-site visits as discussed above would be used to raise awareness on management and benefits of cross-bred dairy cows. If some farmers can afford to purchase half-breed cows, then they will be also promoted for demonstration purposes. This would include the whole package: medical care, management, etc.

After cross-bred cattle are introduced and returns are increased, other more expensive feed options can be promoted such as industrial by-products (as supplementary feed during periods of shortage) and improved utilization of crop residues. During the market visit, representatives of the livestock groups will visit the market to explore market opportunities for diverse livestock products (i.e. butter).

Action Research

<u>Question 1</u>*:* What is an effective approach for improving the availability and quality of feed resources, and ultimately livestock production more generally?

Methodology:
- Process documentation and reflection with the site team after each community interaction, using the Action Research Guide.
- Meet with farmers directly involved in feed / livestock activities periodically to monitor successes and challenges (for technical, social, policy & market dimensions), whether they have shared with others, etc.

Analysis:
Analysis will be qualitative, emphasizing the original design of intervention processes (community action process) and how these changed through time as important bottlenecks or needs emerged.

Outputs:
A written document describing an effective approach for improving the availability and quality of feed resources and livestock production more generally.

Empirical Research

Formal research questions will depend on the options the farmers select for testing. Some biophysical measurements will be conducted on whichever options are chosen to validate the relative benefits of different options.

INTEGRATED ENERGY & NUTRIENT MANAGEMENT

Objectives

To enhance the availability of fuel without further depleting system nutrients.

Community Action Process

The approach utilized here will be similar to that used in Cluster 1. To address total fuel needs in a way that minimizes system nutrient decline from the use of dung for fuel, additional activities will be carried out. After determining the total potential of the system to incorporate more trees and the amount of fuel required to minimize the use of dung and crop residues for fuel, the team will raise awareness on the need to come up with alternative fuel sources. This should help to promote community interest in afforestation activities and energy-saving stoves. Energy-saving stoves will be introduced through partnership with the Ministry of Agriculture and GTZ.

Organization mechanisms and rules will need to be established in such a way that those who learn the technology will have both the incentive and the responsibility to share with others. Those selected for demonstration and training will be trained through Home Agents from the Woreda Agricultural Office. Dialogue on the need for collective action to bring up system nutrients in the outfields will be fostered, and the need for relevant by-laws discussed.

Action Research

Question 1: What are effective approaches for meeting fuel needs in the watershed without further depleting system nutrients?

Methodology:

- Process documentation and reflection with the site team after each community interaction and formal research activity, using the Action Research Guide.
- Meet with farmers directly involved in trainings and alternative fuel activities (energy-saving stoves, afforestation) periodically to monitor successes and challenges (technical, social & policy dimensions); meet with other farmers to see whether and how they have benefited.

Analysis:
Analysis will be qualitative, emphasizing the original design of intervention processes (community action process and formal research) and how these changed through time as important bottlenecks or needs emerged.

Outputs:
A written document describing an effective approach for meeting fuel needs in the watershed without further depleting system nutrients.

Empirical Research

Question 2: What is the difference between required fuel needs in the watershed and that currently derived from "sustainable" sources (cultivated timber as opposed to dung & Chilimo forest)? Can energy-saving stoves and integration of trees into their respective niches meet the current demand for fuel?

Methodology:

- Quantify fuel use by type (dung, wood, other), source (Chilimo vs. household), season and total amount in different wealth households. Use focus group discussions to identify all fuel sources and utilization patterns (by season & households); adapt household survey accordingly; utilize household surveys and informant recall to monitor fuel use throughout 12 months in a representative number of households.
- Assess total potential of different niches / households to absorb more trees through a combination of mapping (existing trees and their location/density) and social scientific tools (to assess potential of the system to absorb more trees).

Analysis:
Quantitative (fuel use patterns, quantifying farm niches where more trees could be absorbed) and qualitative (absorption potential by niche for different types of households).

Outputs:
Scientific paper compiling the results of the assessment of total need vs. ability of the system to provide; policy brief assessing the need for broader policy to address current fuel needs.

Outcomes:
Farmers will gain understanding of the importance of fuel alternatives (sources & efficiency) to address system nutrient decline through their own observations and feedback of scientific results.

ANNEX II: NEGOTIATION SUPPORT STRATEGIES IN GALESSA WATERSHED

THEME I: COLLECTIVE ACTION IN SOIL CONSERVATION

TITLE

"Enabling Outfield Conservation Investments through Local Negotiations, Participatory by-Law Reforms and Market Opportunities in Galessa, Ethiopia"

BACKGROUND

Throughout highland Ethiopia, outfield areas continue to be mined of nutrients and to experience a loss of productive potential due to a host of proximate and ultimate causes. Proximate causes include collection of dung from outfields for fuel (removing a potential soil amendment); failure to invest in conservation investments such as soil conservation structures and trees; and free movement of livestock during certain seasons – which limits choices available to farmers as grazing and trampling make many technological innovations inviable. Ultimate causes include prior land reforms and policies that undermine perceived tenure security as well as incentives for investing in outfields; customary tenure systems that encourage free movement of livestock (limited access grazing in the rainy season and free grazing in the dry season); and deforestation and its effect on household fuel availability (placing added pressure on the use of dung for fuel).

While national policies seek to ban free grazing entirely, this is not an option for many smallholder farmers until viable feed alternatives exist. Intermediate solutions are therefore needed that enable farmers to invest in outfield improvements without an absolute ban on livestock movement. These might include temporary bans on livestock movement in small areas of the watershed for a period of 2 to 3 years until trees and conservation structures can be established, and then moving to new areas as these areas are opened up to grazing. While this might be difficult to do given the reluctance of farmers outside of these areas to receive livestock of those farms falling within the restricted area, it may be made possible through negotiations between these two groups to ensure all watershed residents that they will eventually benefit from these innovations (by reinforcing agreements through local by-law development). Another strategy toward such "intermediate" solutions would be to enhance farmers' interest in outfield innovations and investments through the integration of conservation activities (soil conservation structures, trees) with high-value enterprises such as fruit trees or high-value crops suitable to the outfields. This serves as a "pull" – an incentive for farmers to begin innovating to take better advantage of their outfields. The current solution, where individuals plant trees along soil bunds and must expend a lot of material (fencing material) or labor (for "policing" their trees against livestock), will only detract others from implementing soil conservation activities in the future.

This action research theme therefore seeks to develop such an intermediate management scheme through local negotiations, by-law reforms and income generation. Local negotiations will enable diverse local interests to be negotiated toward more optimal solutions, for example enabling conserving and non-conserving farmers to negotiate soil and water conservation practices acceptable to both parties - and negotiating temporary restrictions on livestock movement in certain areas until trees and conservation structures can be established. Participatory by-law reforms, on the other hand, will ensure that resolutions encompass diverse local interests and give local resolutions the force of law. Market opportunities for the outfields, on the other hand, will enhance farmers' interest in investing in these areas.

Provisional discussions on the negotiations and by-law reforms needed to improve outfield management during the Ambo workshop will be used as a starting point for this action research theme:

- Farmers agree that collective action should be fostered in purchasing fencing material for trees planted to secure outfield soil conservation structures.
- Participants did not agree on the need for temporary restrictions of livestock movement, but did agree that such a proposal should be discussed with the watershed community.
- Farmers have already established by-laws that non-conserving farmers will pay for any loss to downslope farmers from their actions, and to punish "free riders" (in money or labor). Implementation of these agreements will be followed.
- Farmers furthermore agree that new technologies and by-laws are required to avoid gulley formation.

OBJECTIVES

The *Primary Objective* is to develop "intermediate" solutions to outfield management that enable farmer investments in soil and water conservation and tree planting in outfields.

Secondary Objectives are:
1. To provide negotiation support to watershed residents to enable outfield investments;

2. To enable participatory by-law reforms in support of local resolutions, so that local residents can trust that agreements will be implemented;

3. To integrate these resolutions with income-generating technological activities of the AHI site team; and

4. To understand the factors enabling collective investments in outfields so that others throughout the Ethiopian highlands may learn from our experience.

METHODOLOGY

Fostering Collective Action in Soil and Water Conservation

1. Validation of the following local stakeholder groups:

Local groups with diverse interests must be brought together for negotiations to enable collective action in soil conservation. The following stakeholder groups have been identified thus far:

(i) *Upslope farmers* and *downslope farmers.* Upslope farmers will benefit less from soil conservation structures, but can damage crops of downslope farmers if they fail to conserve. Bringing these two groups together to negotiate a "middle ground" acceptable to both parties may be needed.

(ii) *Conserving farmers* and *non-conserving farmers,* irrespective of landscape location. The main conserving and non-conserving farmers may not be based on landscape location, but more on the innovativeness of different farmers. In this case, the landscape-based delineation in (a) may be less relevant than simply calling together farmers according to whether they have conserved - to negotiate common drainage channels and discuss how to avoid damaging each other's crops and structures.

(iii) *Farmers with neighboring landholdings.* The need to develop common drainage ways and to protect these so that gulleys do not form is also an important subject of negotiations. Thus, all landowners with adjacent properties in a given catchment area can also be brought together for negotiations.
The methodology used to validate which local interest groups are most important to bring together for negotiations will be key informant interviews with local leaders, and conserving and non-conserving farmers.

2. Meet with individual stakeholders to identify their positions on the issue, and encourage them to come to meetings with other interest groups.

3. Facilitation of multi-stakeholder negotiations among the most important local interest groups to develop action plans that foster collective action in soil conservation while ensuring that the interests of each group is considered. After resolutions are reached, the need for local by-laws to strengthen these resolutions will be determined. If all are in agreement that local by-laws are needed, they will be designed during these meetings. Examples might include:

- Compensation to neighboring or downslope farmers for damage caused to their fields
- By laws that establish the location of structures on the landscape so that they may be continuous across farm boundaries
- By laws establishing the location of common drainage ways, how these will be stabilized to avoid gulley formation, and the contributions in labor / materials to be made by different households.

4. Periodic participatory M&E with each stakeholder or local interest group, beginning with the identification of indicators (biophysical, economic or social) and continuing with periodic monitoring of the performance of identified indicators and of progress toward identified goals (i.e. reduced loss of soil, seed and fertilizer from established structures).

5. Impact assessment, including biophysical (water quantity/quality) and social (equity, conflict, etc.) indicators.

Negotiating Temporary Restrictions of Livestock Movement in Certain Areas of the Catchment

1. Watershed fora bringing together male and female farmers from every watershed village to discuss the possibility of testing temporary restrictions on livestock movement in certain areas of the catchment for diverse benefits (spring recharge through enhanced infiltration, fuel wood and income from established trees, income from other cropland innovations they might want to test during the same period). If the community can agree to test such an innovation, priority areas for banning grazing will be negotiated. Ideally, they could start with areas above springs, so that soil conservation structures and trees can enhance spring recharge.

2. Meet with farmers whose plots are located within the prioritized area, and those falling outside this area, to document their positions on the issue.

3. Facilitate negotiations among each of these local interest groups (benefiting farmers, and others who must receive their livestock on their land) to develop action plans that bring benefits to all parties over time. Technological innovations and by-laws supporting the practice, and ensuring that all watershed residents eventually benefit from these innovations, will be identified at this time. Concrete actions to be taken shall be established, along with assignments of roles and responsibilities of different actors and institutions.

4. Periodic participatory M&E with each local interest group to monitor progress. Local indicators (biophysical, economic and social) will be established, monitored and updated as activities progress. Progress toward identified goals (water conservation, soil conservation, income) will be tracked.

5. Impact assessment, including biophysical (water quantity/quality) and social (equity, conflict, etc.) indicators.

6. Process documentation of every community interaction to distill lessons about the process from the perspective of site team members.

Data to be Collected

Data will be collected through: a) Process documentation of every community interaction to distill lessons about the process from the perspective of site team members and local interest groups; b) Participatory monitoring with different local interest groups; and c) a final impact assessment.

The following data shall be collected through each of the three activities:

- Views of different local interest groups on the nature of the problem and their proposed solutions.
- Local indicators of successful soil conservation and outfield innovation processes, including (minimally) biophysical and social indicators.
- How local indicators are performing through time, as perceived by each local interest group and gender.
- Qualitative observations on the impact of the process used on equity, participation, empowerment and "voice" of different local interest groups and by gender (process documentation).
- Attendance at community meetings (for planning and monitoring), including name, age, gender, education, wealth status, village and other social data.
- Socio-economic data on who is obeying and disobeying by-laws, and reasons for this.

THEME II: SPRING MAINTENANCE AND USE

TITLE

"Collective Action for Spring Maintenance and Use: The Role of Local Negotiation and By-Laws in Galessa, Ethiopia"

BACKGROUND

Provision of safe drinking water to rural populations throughout much of the developing world is replete with problems. These problems often stem from failure to consider the management challenges of newly developed springs. The water resource department operating in the area around Galessa is knowledgeable about what is required for spring management and upkeep due to years working with local communities. Yet the Galessa case is also unique: springs lying within the watershed constitute an "island" of protected water resources – with all spring within neighboring communities remaining unprotected. Due to a well-known collective action principle in which "free riders" (those benefiting but not contributing) undermine the incentives of others to manage/protect a resource, this may become a source and poor management unless effective management arrangements and by-laws are put into place. For example, many farmers contributed to spring development, yet a wider group of people (neighboring villages who are passing by, non-contributing farmers) is using the resource. Ongoing investments in maintenance are needed, and will require that these diverse groups of people agree on who will invest in this upkeep, who shall benefit (preferably anyone who needs this vital resource), and how this shall be managed. This project therefore seeks to build sustainability into the spring protection activities conducted thus far at Galessa through local negotiations, by-law reforms, institutional development and monitoring.

Policy discussions during the Ambo stakeholder meeting will inform activities under this theme, namely:

- By-laws are required to govern spring maintenance (to ensure equal contributions from different households and villages over time), and
- Negotiations with non-contributing farmers (from the watershed & other villages) are required to balance *contributions* with *benefits.*

OBJECTIVE

To ensure good governance of springs in the Galessa watershed.

Secondary Objectives

1. To enable negotiations between those who contributed and did not contribute to spring development to ensure that nobody is excluded from using the resource, but the efforts of those contributing are nevertheless compensated by other users.

2. To develop by-laws on spring maintenance to ensure that the structures are well managed and maintained.

3. To understand the factors enabling good governance of springs.

METHODOLOGY

1. Validate the following local stakeholders:
a) Contributing and non-contributing spring users. An important principle of collective action is that those benefiting must also contribute, or people's incentive for good management of the resource will be undermined. Therefore, the contributions of farmers who already contributed in spring development must be balanced with future contributions of those farmers who have not yet contributed (from inside or outside the watershed).
b) Owners of land around springs and spring users. Many of the conflicts around springs are due to conflicts between the land owner, who feels their land tenure gives them more rights to the resource, and land users who feel water is the right of all. If this is true in Galessa, then these two local interest groups should be brought together for negotiations.

The methodology used to validate which local interest groups are most important to bring together for negotiations will be key informant interviews with local leaders, spring owners and spring users (women and men).

2. Informal interviews with members of individual interest groups (based on the above assessment) to understand their perceptions of: a) what must be done to ensure there is no conflict over water resources (between watershed residents and other villages, and between those farmers who did and did not contribute to spring development); b) what must be done to balance good maintenance and upkeep with broad distribution of benefits (given that people do not want to invest if others are benefiting but not investing).

3. Multi-stakeholder engagement among local interest groups to develop action plans that bring benefits to all parties (together with Water Resource ministry). Agreements should be made on responsibilities for spring maintenance, how benefits will be shared, and whether by-laws are needed to reinforce any agreements that are reached.

4. Periodic participatory M&E with each local interest group to monitor progress relative to identified goals of the activity and pre-identified local indicators (biophysical and social).

5. Impact assessment, including biophysical (water quality, integrity of the structures) and social (equity, conflict, etc.) indicators.

DATA TO BE COLLECTED

Data will be collected through: a) Process documentation of every community interaction to distill lessons about the process from the perspective of site team members and local interest groups; b) Participatory monitoring with different local interest groups; and c) A final impact assessment.

The following data shall be collected through each of these three activities:

- Perceptions of different stakeholder groups on the problem, solutions, and progress made in spring management.
- The process followed and the outcomes (resolutions reached) of negotiations (process documentation).
- Local indicators for good governance of springs (social and biophysical).
- The performance of local indicators through time, as perceived by each local interest group and gender.
- Qualitative observations on the impact of the process used on equity, participation, empowerment and "voice" of different local interest groups and by gender (process documentation).
- Attendance at community meetings (for planning and monitoring), including name, age, gender, education, wealth status, village and other social data.
- Socio-economic data on who is obeying and disobeying by-laws, and reasons for this.
- Impacts of actions on conflict, by-law implementation (including who obeys and ignores their responsibilities), biophysical impacts (i.e. water quality, integrity of the structures).

THEME III: NICHE-COMPATIBLE AGROFORESTRY

TITLE

"Fostering Niche-Compatible Agroforestry through Collective Action, Social Negotiation and Local Policy Formulations: The Case of Galessa, Ethiopia"

BACKGROUND

During the watershed diagnosis, a number of tree-related problems were identified:

1. Loss of indigenous tree species;
2. Limited fuel wood;
3. Drying of springs from cultivation of inappropriate tree species; and
4. Tree-crop competition.

From a scientific perspective, the system has very limited biomass – a key constraint to improving the productivity of the system. The challenge, therefore, becomes how to increase tree biomass and related tree products without making tree-related problems (drying of springs and competition with crops) worse. The answer lies in niche-compatible agroforestry – selecting the appropriate tree species for the appropriate niches. This can be done through technological assistance (making appropriate species available), organizational processes to ensure those managing nurseries have niche compatibility in mind, and participatory by-law reforms to regulate which species should be restricted in their density and/or location.

During the stakeholder workshop, the following niches were prioritized for niche-compatible agroforestry:

- Near springs
- Near cropland

A niche compatibility study conducted by German et al. (2005) identified species that are compatible and incompatible with each of these niches. The problem was that Eucalytpus, an economically important tree, was found to be incompatible with each of these niches. Farmers indicated that the best location for Eucalyptus is in degraded areas, so this niche was included in the study.

This research will seek to foster niche compatibility around springs and farm boundaries through: a) local negotiations, b) participatory by-law reforms, and c) recommendations to the AHI site team on technological innovations required to support niche-compatible agroforestry. Species identified as harmful by niche will be scrutinized further with farmers – to understand whether any regulations on their cultivation are required. The work may also spill over into other niches (i.e. degraded areas) due to the need to find an appropriate place for harmful but otherwise economically important species.

Preliminary negotiations were conducted at the Ameya spring to balance the interests of the land owner with the spring users. After some debate, a decision was reached that the owner would cut down his Eucalyptus woodlot if every other household planted a replacement tree elsewhere on his farm. This solution balanced the needs of each stakeholder, but needs to be followed up given poor implementation of the agreement. Actions to improve management of trees near farmland have not yet been undertaken, but will be under this project.

Provisional by-laws for improved niche management were also formulated during the Ambo workshop, and will be validated and implemented during this project:

1. Only water-friendly trees (*Hagenia abyssinica*, *Buddleja polystachya*, *Juniperus procera*, *Dombeya torrida*, *Olea africana*, Hinnee, Baroddoo) to be planted within: a) 100 m from springs upslope from springs; and b) 25m from springs downslope from springs.

2. Eucalyptus should be planted at least 10 m from cultivated land; if ignored, the cultivating farmers should pay damages to their neighbor. Its continuous cultivation should be ensured by identifying appropriate niches (degraded areas, wetlands, stony areas).

OBJECTIVE

1. To provide negotiation support to local stakeholders with divergent interests regarding the management of each prioritized niche,

2. To identify regulations and/or by-laws required to enhance niche-compatible agroforestry and ensure the interests of diverse stakeholder groups are protected, and

3. To understand the factors (technologies, management arrangements for nurseries, by-laws or negotiations, alternative niches for harmful but important species) that enable niche-compatible agroforestry in Galessa.

METHODOLOGY

1. Validate local stakeholders by niche:

<u>Springs</u>: *spring owners* vs. *spring users.* Owners of land around springs want to maximize their returns from the area, and often choose to cultivate Eucalyptus or other species that can grow faster near waterways. Trees are these farmers' bank account, and an important source of income and risk avoidance during times of need. Yet spring users complain about dwindling water resources from springs, and have a legitimate right to improved management of land around springs. The challenge becomes integrating the needs of each party.

Farmland: *farmers with woodlots of harmful species* vs. *affected farmers*. Those farmers with woodlots of economically beneficial species often create negative impacts on their own cropland, as well as on neighbors' cropland. While Galessa residents have implemented some actions to address this problem, they feel that more needs to be done to balance the needs of the different interest groups.

2. Meet with individual members of each stakeholder group (spring owners, spring users, woodlot owners, affected farmers) to understand their position on the issue and their proposed solutions, and to encourage them to come together and negotiation with the other interest groups. Note: this can often be done more effectively by involving individuals respected by both parties – in this case, local elders (German and Tolera, 2004).

3. Provide negotiation support to the local interest groups involved in each niche (springs, farmland) through multi-stakeholder meetings to develop action plans that bring benefits to all parties (together with representatives of the Ministries of Agriculture and Environment). Agreements should be made on which trees need to be regulated in each niche, how alternative tree species will be made available, and which by-laws are required to support local agreements.

4. Periodic participatory M&E with each local interest group to monitor progress relative to identified goals of the activity and pre-identified local indicators (biophysical and social).

5. Impact assessment, focusing on social indicators (equity, conflict, etc.) given the long time before biophysical changes are seen.

DATA TO BE COLLECTED

Data will be collected through: a) Process documentation of every community interaction to distill lessons about the process from the perspective of site team members and local interest groups; b) Participatory monitoring with different local interest groups; and c) A final impact assessment.

The following data shall be collected through each of these three activities:

- Perceptions of different stakeholder groups on the problem, solutions, and progress made *by niche* (solutions required for different niches are likely to differ, as are the relevant local interest groups, so they should be managed separately – with the possible exception of nurseries, which could be integrated across all niches).
- The process followed and the outcomes (resolutions reached) of negotiations (process documentation).
- Local indicators for improved niche management (social and biophysical).
- The performance of local indicators through time, as perceived by each local interest group and genders.
- Qualitative observations on the impact of the process used on equity, participation, empowerment and "voice" of different local interest groups and by gender (process documentation).
- Attendance at community meetings (for planning and monitoring), including name, age, gender, education, wealth status, village and other social data.
- Socio-economic data on who is obeying and disobeying by-laws, and reasons for this.
- Impacts of actions on conflict, by-law implementation (including who obeys and ignores their responsibilities) and perceived progress toward identified objectives.

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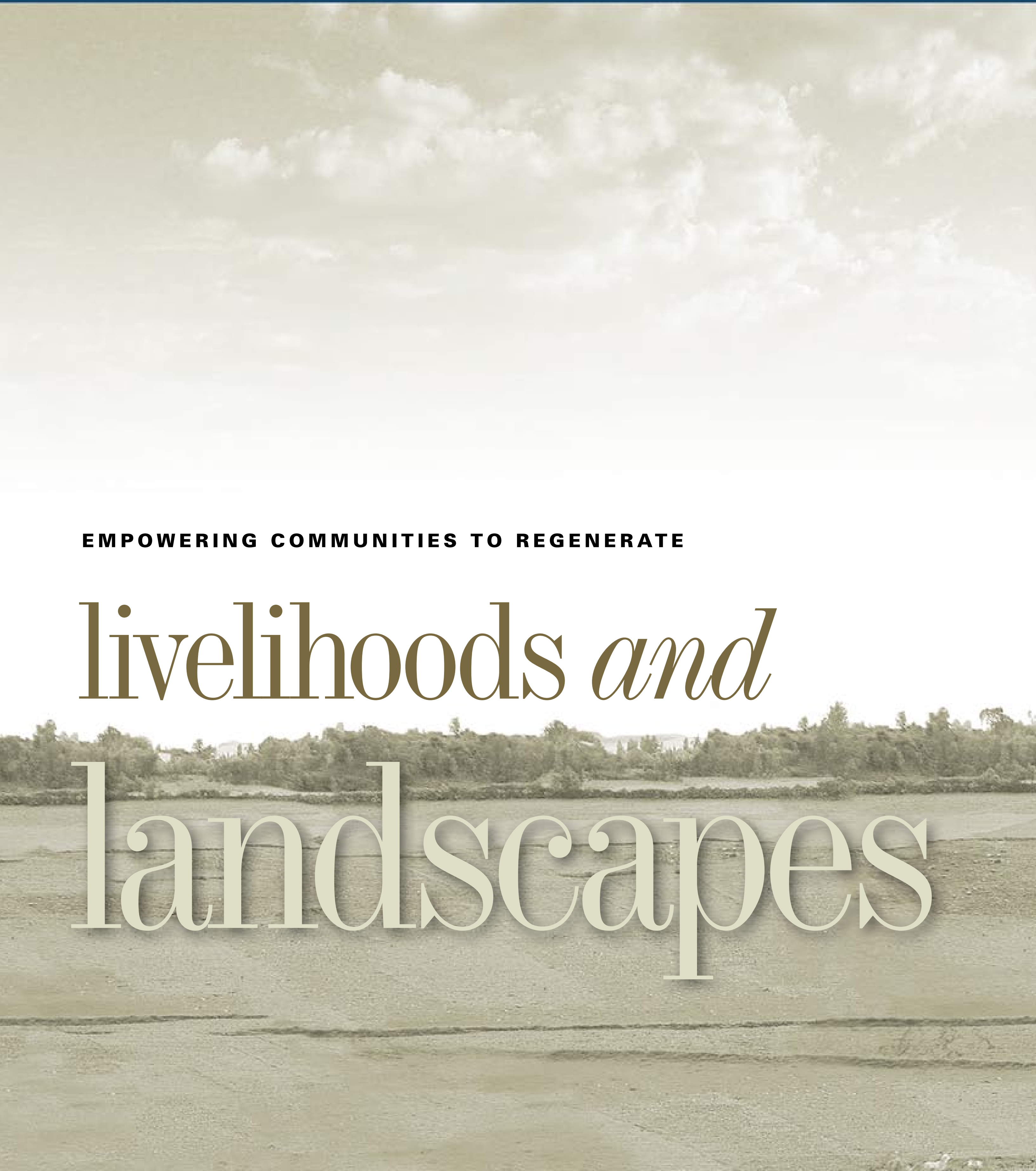

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