

African Highlands Initiative

Report for the
2005 AHI Priority Setting Exercise

AHI Strategy for ASARECA 2005–2010

Compiled by Ann Stroud
and Derek Peden

African Highlands Initiative
P.O. Box 26416
Kampala, Uganda

www.africanhighlands.org
ahi@cgiar.org

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Preface

This document provides a comprehensive situational analysis of the intensively cultivated East and Central African highlands where the African Highlands Initiative (AHI) has been targeting its research since 1995. It provides an updated assessment, highlighting constraints and opportunities, of the past and current situation and projects future trends related to the poverty-degradation nexus in this ecoregion. It reviews a complex of socio-cultural, economic, political, environmental and institutional issues that contribute to the degradation of the natural resource base. The assessment used a multi-disciplinary and holistic approach, which AHI is developing and promoting, to understand and address INRM concerns. The document also includes an assessment of past approaches' successes and failures, leading to the evolving INRM approach that has elements deemed most strategic in reaching the common goal of enhancing the productivity and management of the resource base for poverty alleviation through enhanced agricultural production and resulting in more sustainable livelihoods.

Research themes, linked to the ASARECA NRM strategy, are identified from the situation analysis and are on aspects related to AHI's mandate and where AHI has a comparative advantage. In Part B, 9 highland Livelihood Agro-ecosystems (LAE) and these potential research themes are described. Priority setting is done through scoring their contribution towards ASARECA's objectives: economic growth, social welfare, environmental quality, regionality and contribution towards capacity building. AHI will use this information to refine its strategy, highlighting major implementation mechanisms and principles for carrying out future research.

This document further refines the situation analysis presented in the NRM strategy for ASARECA (2005-2015) (Hatibu et al 2004) and for AHI (Wangati and Loevinsohn 1995; Alumira 2000). This analysis adds value in two ways: (i) it identifies 'pathways' and potentials that INRM can contribute towards achieving the ASARECA objectives; and (ii) there is an improved spatial analysis coupled with AHI's extensive survey information that brings characteristics, issues and possible combinations of solutions (via research themes) for what is called "Livelihood Agro-ecosystems" which are relatively homogeneous areas having similar dimensions of biophysical, social and human determinants.

The ECA highlands and its populace are the focus of AHI as these environments are challenged with the following complex of issues that we call the poverty-degradation nexus.

Farmers have very small land holdings, high incidence of fragmentation and in some most cases untenable land tenancy regimes. Generally, they are unable to produce enough food or derive income, which led them to be food insecure. Limited income also translates into limited investments in land management and maintenance of land cover, which leads to more erosion risk; in fertility amendments, which leads to nutrient mining; or in pest control, which is exacerbated by limited ability to rotate crops or keep up soil fertility maintenance. Therefore, yields are declining.

Population pressure causes people to expand into marginal hilly areas, which increases soil and water loss, and destroys unique habitats due to encroachment on wetlands, forested and protected areas, and through burning. By eliminating microhabitats within agricultural lands and removal / disturbance of highland forest ecosystems biodiversity is declining. There is weak protection, poor land tenure policies and limited incentives to invest in conservation. Often highland people have to pay for environmental services that also benefit lowlanders.

There is increasing scarcity due to inefficient use of water for agriculture, livestock and other competing uses within the mountains themselves and along mountain to lowland gradients. There is also declining ability of livestock to positively contribute to the maintenance of the system due to poorly intensified feed systems, poor links to markets and break down of traditional management systems. In some systems this is causing decline of grazing lands and leading to an increased number of conflicts. Water use and livestock management issues interact with collective action and management of grazing and water resources.

Social welfare issues also interact with livelihoods and NRM: inequitable gender relations, health epidemics and their ensuing impacts (malaria, HIV/AIDS) result in declining labour sources. These are challenged by

limited availability of health and education services. Lastly, development has not strongly reached into most mountain areas. There are still relatively poor public services and infrastructure seriously limiting access to inputs, credit, and markets.

The interplay of these conditions limits people's ability to cope, is leading to increased marginalization of some groups, and is exacerbating poverty in the highlands. The economic conditions and policy environment have not provided the necessary incentives to highland dwellers to make long-term investments to better manage their natural resources. Limited ability to invest is exacerbated partly by limited credit, low local wage rates and increased landlessness. HIV-AIDS has created additional stress, where families are losing their assets and labour. There is an increase in migrant labour to seek cash, which in turn limits family labour to undertake the farm work. Inequitable gender and power relations and inadequate policy formulation, implementation and governance reduce stakeholders capacity to participate in INRM..

It is hypothesized that limited impact on these complex challenges is largely due to unfavourable market and resource use policy, extreme poverty that limit investments on INRM, limited sharing and management of knowledge and technologies, coupled to the continued use of reductionist¹ research approaches that are not augmented with systems and more holistic approaches. This analysis led AHI to work on an INRM approach towards organizing research for development and ensuring that these system constraints are tackled holistically and systemically. It attempts to link diverse scientific and local knowledge through different institutional arrangements towards forming holistic research for development strategies and thrusts that will guide INRM initiatives in ECA highlands in the near future.

This document (Part A) presents the current situational analysis and future prospects. The follow-up document (Part B) provides the necessary comprehensive description of potential themes and their potential contribution to solving livelihood and NRM issues in various highland scenarios. Part C describes potential pathways that the highland livelihood agro-ecosystems and research themes can lead to the ASARECA objectives. Stakeholders involved in the priority setting process for AHI are asked to use this document to broaden their understanding of the issues at stake so that they may make an informed choice regarding the priorities selected. We hope to involve various types of expertise and perspectives in this process, so as to glean views generated from different experiences across the region.

This document is written to cater for a diverse readership and seeks to provide a platform where actors from all disciplines can gain a comprehensive understanding of the complexities involved in INRM issues including the impacts of problematic conditions and factors and their solutions, and to envision their potential role in future work in this regard.

¹ Reductionist: A philosophy dictating that the nature of complex things can be reduced to smaller fundamental things. This is said of observed phenomena, theories, explanations, meanings, etc. Scientific reductions refers to reductionism employed in the scientific process.

Executive Summary

The African Highlands Initiative (AHI) was launched in 1995 and has a dual role as an ASARECA regional research program and as a CGIAR ecoregional program, and is hosted by the World Agroforestry Centre (ICRAF). AHI operates as a research for development consortium using partnerships and stakeholder participation to improve the livelihoods of poor people living in the highlands of East and Central Africa while reversing natural resource exploitation and degradation. AHI was borne from a desire to enhance impact and to undertake necessary changes in R&D practice and policies to do so. To accomplish this, AHI is developing and testing an integrated R&D approach that combines technological, social, economic and institutional innovations and methods aimed at improving R&D support services, development strategies and policies, and local capacities. The highland ecoregion of ECA is AHI's target area and has been the focus of AHI's activities since 1995. The ecoregion has high population densities of poor people struggling to live in a situation where there is a declining natural resource base that is constraining agricultural production, where there are few alternative livelihood options, and limited development.

There has been considerable research conducted by AHI and partners on approaches, methods and tools that are aimed at improving the effectiveness and outcomes of improved NRM from the perspectives of the managers themselves, as well as those that are providing services and information on NRM. Four main approach and method areas that have each added value include: (i) those that enhance user participation in the technology generation and promote better NRM at farm and landscape scales, such as participatory technology development, community-based NRM, integrated watershed management, etc; (ii) those that include the livelihood concepts including human, social and other assets, risks and vulnerability factors; (iii) those that recognize hierarchies and levels that are interlinked and integrated (plots, farms, watersheds) such as the agro-ecosystem management approach; and (iv) those that recognize and incorporate diversity in the stakeholders themselves and their stakes such as in gender and multiple stakeholder analyses.

Tools have been developed aimed at improving participation and awareness building; bio-economic models that help researchers to understand systems and management trade-offs; and decision guides to facilitate decision of farmers, communities and policy makers. Since 2003 AHI has embarked on a new approach "Integrated Natural Resources Management" (INRM) which incorporates two major thrusts, INRM approach development and INRM institutionalization, with 4 main strategic results areas:

1. INRM innovations developed and utilized to advance community-based participation in watersheds;
2. Development strategies, policies, and practices for INRM are facilitated;
3. Supportive institutions and institutional arrangements for INRM are piloted;
4. INRM information that enhances knowledge base of R&D actors is provided.

AHI has set its strategy iteratively since inception using evaluation results, reflection by stakeholders and robust analyses. This priority setting exercise is meant to build upon AHI's comparative advantage through a renewed look at the situation, using the ASARECA NRM strategy as the taking off point. This document provides a summary of the situational analysis (Part A) and provides an updated assessment, highlighting constraints and opportunities, of the past and current situation and projects future trends related to the poverty-degradation nexus in this ecoregion. It reviews a complex of socio-cultural, economic, political, environmental and institutional issues that contribute to the degradation of the natural resource base. The assessment used a multi-disciplinary and holistic approach to understand the issues, and includes an assessment of past approaches' successes and failures.

Research thrusts, linked to the ASARECA NRM strategy are identified from the situation analysis. Then, drawing upon this information and in relation to the NRM results areas identified for the ASARECA region, AHI identifies and describes specific priority areas where it has a comparative advantage to lead or collaborate with others. These potential areas for research are to be reviewed and priority set through scoring their contribution towards economic growth, well-being, sustainable environment, regionality and contribution towards capacity building by stakeholders from the ASARECA countries. The strategy was refined highlighting major implementation mechanisms and principles and the major focus of the research. AHI adopted an experimental methodology for the execution of this Priority Setting Exercise. Rather than hold costly workshop bringing participants from abroad, the entire exercise was conducted via internet

communication. As an experimental method, the entire methodology was modified iteratively throughout the process to solve challenges faced and insure result quality. By using Internet, it was hypothesised that a greater participatory potential was probably while stimulating valuable discussion leading to greater synthesis and expert analysis of critical priority issues for INRM. The exercise went through several phases, the first being the dissemination of information for literature review and subsequent participant discussion. Following this, scoring sheets were sent to all participants for the purpose of establishing priority amongst the nine LAE. Once the LAE were prioritized by a scoring analysis, the second set of scoring sheets were used to priority score the presented AHI research themes. Following a secondary analysis, conceptual tools were developed to filter and sequence prioritized research themes into more strategic malleable structures for future INRM initiatives.

Concluding a final analysis of all priority scores for Livelihood Agro-Ecosystems (LAE), research themes, and development of the sequencing methods to strategize prospective INRM initiatives, the final results of the priority scoring according to each LAE are as follows:

	LAE 2	LAE 3	LAE 4	LAE 5	LAE 9
ASARECA NRM IR1					
AHI 1.1: More effective participation in resource to consumption chains	11.19	13.14	12.65	12.87	8.65
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	10.85	12.22	11.9	14.76	6.36
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	15.36	14.42	14.09	12.4	8.93
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	15.53	15.7	11.61	11.27	7.67
ASARECA NRM IR2					
AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	9.05	11.96	12.7	10.46	14.34
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	14.07	13.96	13.83	8.86	15.34
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	15.39	14.82	11.21	9.49	15.77
ASARECA NRM IR3					
AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	11.62	16	13.08	13.08	11.86
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	15.85	16	15.49	8.46	14.5
ASARECA NRM IR4					
AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	14.46	16.14	13.9	13.09	10.94
AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	16.51	15.44	14.61	12.31	9.53

ASARECA NRM IR5					
AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios	9.2	12.4	12.41	11.2	10.17
AHI 5.2: Support to community-action policy and by-law reform improves local NRM	13.88	16.24	14.44	15.59	14.78
AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support	13.62	13.42	14.08	12.45	9.8
ASARECA NRM IR6					
AHI 6.1: Local residents equitably engage and participate in integrated watershed management	15.61	17.6	16.04	13.69	13.18
AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor	12.3	13.36	14.27	12.9	13.33
AHI 6.3: Research institutions have improved their support for their staff implementing INRM	14.37	10.16	10.42	10.16	7.74
AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development	15.11	14.36	11.87	10.89	9.76
ASARECA NRM IR7					
AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries	11.37	17.88	12.5	10.16	7.92
AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions	11.83	13.3	9.61	9.03	7.01
AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach	13.32	13.16	11.88	12.72	11.23
ASARECA NRM IR8					
AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders	13.43	17.46	16.14	16.51	12.49
AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies	14.04	16.52	14.52	15.4	10.72

AHI RESEARCH THEME ECA REGIONAL PRIORITIZATION BY OVERALL RANKING

AHI Theme	Total Score	RANK or Priority
AHI 6.1: Local residents equitably engage and participate in integrated watershed management	76.12	1
AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders	76.03	2
AHI 5.2: Support to community-action policy and by-law reform improves local NRM	74.93	3
AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies	71.2	4
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	70.3	5

AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	68.53	6
AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	68.4	7
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	66.68	8
AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor	66.16	9
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	66.06	10
AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	65.64	11
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	65.2	12
AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support	63.37	13
AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach	62.31	14
AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development	61.99	15
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	61.08	16
AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries	59.83	17
AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	58.51	18
AHI 1.1: More effective participation in resource to consumption chains	58.5	19
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	56.09	20
AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios	55.38	21
AHI 6.3: Research institutions have improved their support for their staff implementing INRM	52.85	22
AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions	50.78	23

AHI is pleased and confident that through this comprehensive Priority Setting Exercise, addressing many social and human dimensions of INRM, actors may utilise these results for enhanced strategy and greater impact in their endeavours, providing desperately needed assistance to rectify and reverse the catastrophic environmental degradation in the ECA highlands that threatens millions with starvation each year.

Introduction

The African Highlands Initiative (AHI) was launched in 1995 and is an ASARECA regional research program hosted by the World Agroforestry Centre (ICRAF). AHI operates as a research for development (R4D) consortium using partnerships and stakeholder participation to improve the livelihoods of poor people living in the highlands of East and Central Africa while reversing natural resource exploitation and degradation. AHI was born from a desire to enhance impact and to undertake necessary changes in R&D practice and policies to do so. To accomplish this, AHI is developing and testing an integrated R&D approach that combines technological, social, economic and institutional innovations and methods aimed at improving R&D support services, development strategies and policies, and local capacities to manage their natural resources while deriving their livelihoods.

In the case of ECA, there had been significant research in the highland ecosystems; however, impact had been minimal. The reason for limited impact is related to deficits in the 'way R&D was being done' rather than due to major technological gaps (Wangati and Loevinsohn 1995). Since its inception, AHI has experimented and tested new ways of working so as to improve the effectiveness of research and create faster impact, particularly on NRM issues. AHI's strategy and overall research focus has been 'how' to develop tools and methods to reverse resource degradation and increasing poverty in these eco-systems. This approach has evolved through iterative consultation, practice, reflection and evaluation involving implementers, beneficiaries, and other stakeholders. National and international agricultural research entities that bought into AHI's mission and vision have been the main partners in the consortium.

AHI, as an ASARECA program, has been working in 5 ASARECA countries: Tanzania, Kenya, Uganda, Ethiopia and Madagascar, each of which expressed early interest and commitment and has the ecoregion within its boundaries. Partners involved in AHI include several of the IARCs, NARIs, universities and locally NGOs, extension and local governments. AHI has been working in pilot benchmark sites to develop and test methods, h and 'models' for scaling up. It promotes the combination of formal and action research, develops capacity in research for development including developing research and development methods, and solicits participation of communities and development partners at all R&D stages. . Cross-site and/or regional analyses and synthesis provides regional learning that led towards developing international public goods that are generalizable. It has also built a cadre of R&D practitioners and managers who are able to advocate for functional approaches. Although AHI is focused on solving issues and addressing opportunities in the highlands, many of its products and methods are generic and can be used in any ecology.

Currently, AHI has two major thrusts, INRM approach development and INRM institutionalization, with 4 main strategic results areas:

1. INRM innovations developed and utilized to advance community-based participation in watersheds;
2. Development strategies, policies, and practices for INRM are facilitated;
3. Supportive institutions and institutional arrangements for INRM are piloted;
4. INRM information that enhances knowledge base of R&D actors is provided.

In 2004, a group of ASARECA NRM Networks and Programs - Trees on Farm (TOFNET), Soil and Water Management (SWMNET), Animal Agriculture (A-AARNET), Genetic Resources Management (EAPGREN), and AHI – developed an NRM strategy for ASARECA. This is part of the overall regional strategy for the next 5 years and helps to create the focus for implementation of the ASARECA Conceptual Framework. It also serves to focus the strategies and priorities of each NRM network or program using its own comparative advantage. An overview of the NRM strategy and results are presented in Part B, Annex 3.

Review of the Research Domain

A summary and conclusion of the situation analysis (Part A) is provided here and leads to the description of the research thrusts in the following section.

OVERVIEW

Populations living in the highland areas of Eastern and Central Africa face growing threats from a declining natural resource base which they rely upon to sustain their livelihoods. This ecoregion is characterized by high population densities usually having smallholdings and house relatively large percentages of the population within their respective countries (e.g. about 75% in Ethiopia).

The ECA highlands and its populace are challenged with the following realities:

- Small land holdings with high incidence of fragmentation and untenable land tenancy regimes limits intensification;
- Poorly intensified feed systems, poor links to markets and break down of traditional management systems is leading to declining ability of livestock to contribute to systems maintenance, degradation of grazing lands, and to increasing numbers of conflicts;
- Agricultural expansion into marginal, hilly areas and limited investment in conservation measures and land cover is leading to greater soil and water losses and associated off-site effects;
- People's inability to replenish nutrients and control pests and diseases associated with soil productivity decline is leading to lower cash and food crop yields and nutrient mining;
- Destruction of unique habitats due to encroachment on wetlands, forested and protected areas, through burning, and through elimination of micro-habitats within agricultural lands is leading to a downward trend in biodiversity;
- Depleted highland forests, limited diversity and tree planting in agroforestry systems, community forests, and natural forests coupled with weak protection and land tenure policies in leading to limited numbers of trees and diversity;
- Poor water management, climate variability and need for better agreements over water sharing are all exacerbating scarcity and inefficient use of water particularly when there are competing interests for agriculture, livestock and other uses within the mountains themselves and along mountain to lowland gradients;
- Poor public services and infrastructure seriously limit access to inputs, credit, and markets;
- A number of socio-political issues, such as inequitable gender relations, labour deficits due to out migration and HIV/AIDS, various cultural patterns, limited collective action, poor local wage rates, landlessness, governance and policy issues, among others, interface with NRM negatively;
- Health and nutrition issues and their ensuing impacts (malaria, HIV/AIDS, poor nutrition);
- Limited knowledge sharing and information management results in lower capacities and limits analysis and decision making for NRM and enterprise management
- Reductionist approaches to R&D from 'experts' result in poor adoption of NRM innovations, limit the use of local knowledge and inhibit innovation processes;

The interplay of these conditions limits people's ability to cope, is leading to increased marginalization of some groups, and is exacerbating poverty in the highlands. The economic conditions and policy environment have not provided the necessary incentives to highlanders to make long-term investments in NRM.

POPULATION PRESSURE AND CARRYING CAPACITY

The highlands² of ECA occupy 23% of the total area of ECA, experience relatively high annual rainfall, and generally boast productive soils relative to the adjacent marginal lowlands (ICRAF, 1994). Given this endowment, the highlands have been a major source of food and nutritional security for countries having significant highland areas producing more than 50% of staple foods (maize, beans, bananas, wheat, barley, teff, rice and dairy products). These areas also produce important export crops mainly tea, coffee, and

² Highlands are defined here as being $\geq 1200\text{m}$ and having characteristic steep slopes, valleys and generally undulating topography.

horticulture that contribute to foreign exchange (ICRAF, 1996). These highlands have the highest concentration of human population and settlement in the ECA accounting for nearly 53% of the population, 70-90% of which are involved in farming (ICRAF, 1998).

Table 1: Land and population statistics for countries having significant area in humid highlands

Country	Total area in highlands ¹ (km ²)	% area in highlands	Total population in highlands ('000)	% total population living in highlands
Burundi	-	80	4,409	73%
Kenya	34,625	30	12,782	50
Madagascar	16,825	11	4,809	-
Tanzania	4,870	5	3,555	13
Rwanda	-	80	6,984	88
Ethiopia	107,584	60	38,607	73
Uganda	10,459	2	2,207	12
DRC		2	2,238	5

¹ 1200 – 3300m

Source: Deichmann (1994); Refs: AHI (1994); Alumira & Owiti (2000)

Population densities are high averaging between 200-400 persons/km² although densities above 600 persons / km² are not uncommon (Hoekstra, 1988).

Average farm size in the highland regions of ECA are small ranging from 0.5 to 1.4 ha per household and given household sizes of 6-8 persons, the amount of land per person is very small (0.07 – 0.23ha) (ref tables 2 and 3). Locations having only one season are more constrained. Current livestock and human population densities on these land holding sizes given their production potential raises the issue as to whether or not these farms are going to be viable or not in future and what further diversification and intensification and livelihood strategies might be required to keep people out of poverty in future. Increasing returns to land and labour through higher value crops and / or added value to commodities is an obvious strategy, among others. Given the population densities and farm sizes per household, there are increasing challenges to meet all needs as well as the escalating strain on natural resources.

Table 2: Average Household Sizes in AHI Benchmark Locations

Pilot location	Area (km ²)	Number of households	Household size (average)	Total population	Population Density (Persons/km ²)
Rubaya (Kabale)	114	6,685	7	46,800	410
Emuhaya (Vihiga)	9	1,000	8	8,000	889
Gununo PA (Areka)	14	700	7	4,900	339
Galessa PA Ginchi	14	446	5	2,003	144
Sahasoa	15	220	6	1,320	220
(Fianarantsoa)					
Kwalei (Lushoto)	40	515	8	4,120	102
Ambohibary	37	700	6	4,200	114
(Antsirabe)					
Kianjuki (Embu)	1.2	100	7	700	583

Source: Participatory Rural Appraisal reports for the respective pilot locations (1997-98); David (2003)

Table 3: Average Farm Size in AHI Benchmark Locations

Pilot Location	Average Farm Size (ha)	Farm land (ha) per person	Number seasons per year
Gununo PA (Areka)	0.5	0.07	1-2
Kashambya (Kabale)	1.1	0.16	2
Galessa PA (Ginchi)	2.9 ¹	0.58	1
Sahasoa (Fianarantsoa)	1.4	0.23	1
Kwalei (Lushoto)	1.3	0.16	2
Kianjuki (Embu)	1.2	0.17	2
Emuhaya (Vihiga)	1.0	0.125	2

Source: Participatory Rural Appraisal reports for the respective pilot locations (1997-98)

¹Inclusive of grazing area 0.9ha holding for 2 cattle, 1 donkey, 8 shoats

Table 4 shows that the highest cattle densities, falling in the range of 103-113 head of cattle/km², tend to occur where there are high densities of people who are used to keeping livestock as well as where there are less intensive systems; for example, in Areka, and Vihiga districts. As systems intensify with markets for dairy and where hoe culture tends to dominate in perennial crop systems, where the terrain is hilly or where land size is small, the zebu becomes less dominant. An important aspect to note is that under current management conditions stocking rates are usually kept above the carrying capacity. This management strategy is used to spread risk and to satisfy various needs / roles that livestock provide, rather than to optimize productivity per animal. If a market economy gained importance, then management strategies might change resulting in lower stocking rates. High numbers of livestock compete with people for what the land provides and space available.

Table 4: Cattle Densities in Relation to Human Population by Benchmark Location

District (country)	Human population density	Cattle population density (# cattle/Km ²)	# Cattle per capita
Dendi (Ginchi, Ethiopia)	111 (low)	80	0.7 (high)
Bolosso Sore (Areka, Ethiopia)	339 (medium)	103	0.3 (medium)
Vihiga (West Kenya)	922 (high)	113	0.14 (low)
Embu (Central Kenya)	730 (high)	28	0.04 (low)
Kabale (SW Uganda)	271 (medium)	25	0.09 (low)
Lushoto (Tanzania)	102 (low)	33	0.32 (medium)
Antsirabe (Madagascar)	201 (low)	18	0.08 (low)
Fianarantsoa (Madagascar)	94 (low)	-	-

Source: Derived from Corbett *et al*, 1997/ (ICRAF GIS Lab., 2000)

The level of intensification linked to land pressure heightens the challenge to better integrate livestock and crop production in a manner that benefits both enterprises and NRM practices in the different scenarios and farming systems. Thus, land use and productivity solutions need to integrate and take cognizance of ecology (species suitability), systems fit including farm size and location (location and niches for feed), culture (how livestock are used and kept), labour availability (level of intensification possible), institutional arrangements (collective management of feed resources in some cases), markets (possibility of sales of products), infrastructure (accessibility of inputs, services and markets), R&D support, and policy (for example land tenure issues).

A major issue arising in highlands is the interplay between rising population density, shrinking land holding size and livestock numbers, which are not yet declining in relation to the shrinking resource base. Livelihood strategies and asset management are changing or need to change as families repeatedly face food deficits, livestock deaths, and degradation. From the sheer numbers of humans and livestock trying to eek a living from the area available, productivity increases of traditional cereal crops alone will not solve food, feed and cash needs. The carrying capacity (ability to provide kcal needed to support the human and livestock units) is not sufficient. This has implications for R&D strategies undertaken to alleviate poverty, hunger and degradation.

In summary, one of the main reasons for working in the intensively cultivated highlands is because of the extreme and rising population densities that are based on small farms. Each generation available land dwindles, resulting in increased intensification of farming and increased problems to rotate crops and maintain soil fertility resulting in nutrient mining and build up of pests and diseases. In many areas, there simply is not enough land for the population resulting in landlessness. Moreover, adequate integration of livestock in farming systems and often decline of livestock units has yet to be achieved limiting NRM and livelihood strategies. The demographic situation is precarious, requiring creative innovations from all sectors to thwarting a prospective human catastrophe.

AGRO-ECOSYSTEMS AND ASSOCIATED NATURAL RESOURCE BASE IN MOUNTAIN AREAS

Highland areas of ECA are very diverse given a number of ecologies, histories, levels of development, and socio-economic factors. There are 17 highland agro-ecologies within two major classifications, as classified by IGAD/FAO through integrating length of growing periods and onset, temperature, soil fertility and water holding capacity, topography, crops, and livestock. FAO's two classifications of highlands are: marginally productive which are dry semi-arid and currently not worked in by AHI, and productive, which has a number of determining variables (where AHI is working). The heterogeneity of mountain areas is both challenging and offer opportunities. Altitude-climate gradients provide a wide range of ecologies for the production of temperate fruits, dairy, coffee and tea as well as agroforestry systems and biodiversity. The hilly landscape also forms important watersheds, which provide water for large areas of the lowlands (Gichuki, 2002).

By grouping highland areas and their farming systems into the following broader scenarios (which are not exclusive of each other) related to their endowments and other characteristics (market access, nearness to conservation areas, etc), potential issues and opportunities emerge (Table 5). Some conditions require greater policy interventions and greater investment support (higher poverty, less natural resource endowment, crisis affected, more distant from markets); may require tailored enterprise development to be competitive (distance from markets); could benefit from diversification; etc.

Both zebu and exotic breeds of cattle, as well as goats, sheep, pigs and poultry are kept throughout the highland eco-region. Production objectives are similar across the area: food security; cash income; draught power; transportation; risk aversion and savings bank; manure production for enhancement of soil fertility; and as a social good. Feed sources function as soil and water conservation barriers, provide organic matter, and can assist in improving soil fertility. Thus, the integration of livestock is exceedingly important. In Kenya, Tanzania, Uganda, Ethiopia and Madagascar, farmers consider ownership of livestock as a 'wealth indicator' (AHI 1998). Poor farmers own no cattle or have limited access to livestock. In the intensive enset farm systems of Ethiopia (upon which 13 million people rely), grazing areas are kept by non-livestock owners so they can trade feed for services provided by owners, even though crop production areas are constraining. Farmers here say that if grazing area size decreases, it would signify the end of their life as farmers. Under current management conditions among rural poor households, animal feed is almost always in short supply. Domestic animals are almost always underfed. By implication, load or stocking rates are higher than the carrying capacity particularly if your goal is to maximize productivity per animal.

There are various livestock keeping systems used in the highlands. They are usually determined by the 'space' available for livestock and customs; thus, systems vary in terms of the extensiveness or intensiveness of the system ranging from extensive grazing (highlands of Ethiopia), to tethering and seasonal grazing on non-cropped areas (more populated areas in Ethiopia, Uganda, Madagascar), to stall feeding or zero grazing (Kenyan highlands).

Table 5. Highland Scenarios determined by ecology, access to markets, and natural resource endowment with associated constraints and opportunities

Type of Highland Zone	Locations (examples)	Constraints and Issues	Opportunities and Potential Solutions
Buffer zones of national parks and conservation areas	<ul style="list-style-type: none"> • Eastern Arc Mountains • Rwenzories • Bwindi Impenetrable Forest, • Mt Elgon national park • Areas in Madagascar • E DRC • NW Rwanda 	<ul style="list-style-type: none"> • Conflicts between livelihood & conservation objectives • Indigenous forest people & their issues; • Exploitation of biodiversity • Limited livelihood options for those depending on the conservation area 	<ul style="list-style-type: none"> • Ecotourism • Joint forest management • Enterprises using unique biodiversity • Tree crops • Compensation arrangements for conservation
‘Water towers’, highlands surrounding lake basins & their surrounding lowlands	<ul style="list-style-type: none"> • Mt Elgon • Rwenzories • Rwengueries • Mt Kilimanjaro • Usambara & Pare Mtns • Ulugurus • Lake Tana highlands & basin • Lake Victoria highlands & basin • Lake Tanganika highlands & basin 	<ul style="list-style-type: none"> • Degraded sloping land & siltation of lowlands & basins • Conflicts over water rights • High costs of conservation for highlanders 	<ul style="list-style-type: none"> • Water sales • ES payments / compensation • Cross border trade • Settlement in lowlands • Improved integrated watershed management • Improve management of communal lands
Intensive & highly diversified systems with steep slopes, relatively <i>good</i> soils/rainfall but <i>distant</i> from major markets	<ul style="list-style-type: none"> • S, W and N Ethiopia • S, N Madagascar • Parts of Usambaras & Ulugurus • Rwenzories • NE DRC 	<ul style="list-style-type: none"> • Productivity issues • Nutrient mining and erosion • Marketing • Limited livelihood options • Limited ways to add value to products • Input supply problems / costs 	<ul style="list-style-type: none"> • Non-perishable / easy to transport products for distant markets • Multiple/diversified products for local markets • NRM solutions • Productivity increases • Improve integration of livestock
Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils/rainfall and <i>close</i> to major markets / population centres	<ul style="list-style-type: none"> • SW Uganda • Mt Kenya • Parts of Mt Elgon • Parts of Mt Kilimanjaro • Most of Rwanda • Eastern DRC • C Madagascar • Parts of Usambaras & Ulugurus 	<ul style="list-style-type: none"> • Productivity issues • Nutrient mining and erosion • Marketing • Limited ways to add value to products • Competition for labour 	<ul style="list-style-type: none"> • Multiple/diversified products for diversified markets • NRM solutions • Productivity increases • Pursue alternative livelihood options like trading • Cheaper inputs • More efficient marketing • More opportunities to add value to products • Improve integration of livestock
Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils/rainfall and <i>close</i> to major markets / population centres	<ul style="list-style-type: none"> • Highlands in Madagascar • Degraded, poor nutrient soil areas in S Ethiopia • part of Ulugurus • Usambaras & Pares • N Ethiopia • Eritrea 	<ul style="list-style-type: none"> • Productivity issues • Nutrient mining and erosion • Marketing • Limited ways to add value to products • Burning & extreme degradation of upper slopes • Periodic drought / water shortage • Greater investments needed to increase production • Competition for labour 	<ul style="list-style-type: none"> • Investment & restoration of degraded areas • Augment nutrients with subsidized/ improved input supplies • Multiple/diversified products that can grow in less than optimum conditions or in niches for diversified markets • Water harvesting & improved management of run off • By laws that limit burning & improve collective action • Improve integration of livestock

Type of Highland Zone	Locations (examples)	Constraints and Issues	Opportunities and Potential Solutions
Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils/rainfall and <i>distant</i> from major markets	<ul style="list-style-type: none"> • Parts of Madagascar highlands • Parts of Burundi • Parts of Rwanda • Parts of Eritrea • Parts of C & N Ethiopian highlands 	<ul style="list-style-type: none"> • Productivity issues • Nutrient mining and erosion • Marketing • Limited ways to add value to products • Burning & extreme degradation of upper slopes • Periodic drought / water shortage • Greater investments needed to increase production 	<ul style="list-style-type: none"> • Investment & restoration of degraded areas • Augment nutrients with subsidized/ improved input supplies • Multiple/diversified products that can grow in less than optimum conditions or in niches for local markets • Water harvesting & improved management of run off • By laws that limit burning & improve collective action • Improve integration of livestock • Lobby for policy support given limited options
<i>Extensive</i> less diversified systems with moderate to steep slopes, relatively <i>poor</i> soils, <i>one</i> growing season & frost hazard, <i>distant</i> from major markets	<ul style="list-style-type: none"> • C & N highlands of Ethiopia • Eritrea • Southern Madagascar highlands 	<ul style="list-style-type: none"> • Limited enterprise diversification given harsh conditions • Limited livelihood options • Limited storage heightens risk & cost • Nutrient mining & erosion • Over grazing • Productivity issues • Limited fuel wood • High transaction costs to markets 	<ul style="list-style-type: none"> • Diversify enterprise options • Intensify valleys and niches • NRM solutions • Productivity increases • Improve storage facilities • Intensify livestock feeding & management systems • Integrated watershed management • Identify niche markets & labelling • Lobby for policy support given limited options • Strengthen collective action & communal property management • Improve land tenure arrangements • Policy incentives and support • Greater investment in infrastructure & market outlets
Peri-urban and nearby highland areas greatly influenced by urban centres	<ul style="list-style-type: none"> • Addis • Nairobi • Antsirabe & Tana • Kigali 	<ul style="list-style-type: none"> • Drain of labour • Nutrient mining • Intensification • Value adding possibilities limited • Small areas of land • Competition 	<ul style="list-style-type: none"> • Markets • Diversify crop & livestock enterprises • Improve quality & seasonal production of strategic products • Processing opportunities • Pursue alternative livelihood options • Inputs supply better
Vulnerable areas & groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition	<ul style="list-style-type: none"> • W DRC • Rwanda • N Ethiopia • Eritrea • Burundi • W Kenya 	<ul style="list-style-type: none"> • Cereal production & NRM mined soils • Insecurity • Dependency syndrome • Increased HIV and other health problems • Traditional coping strategies eroding • Conflicts over land and valuable resources • Exploitation of forests, water, land • Landlessness • Low wage or compensation rates • High % female headed households with limited labour 	<ul style="list-style-type: none"> • High value enterprises as alternative livelihoods to war • Renewed coping strategies • Improved development / aid strategies to limit dependency • Policy support & strategic subsidies • Lobbying for better and cheaper health care • Labour saving NRM technologies • High value, low labour enterprises • Increased fuel sources • Improved integration of livestock feeding & management systems • Conflict resolution & negotiation mechanisms & ability • Improve collective action & social support systems • More accountable systems for managing resources & decreasing theft • Better governance • Alternative livelihoods for landless people

Farmers in all highland areas use the catena and special niches to their advantage and as a strategy to spread risk, capture off-season markets, and optimize returns. Given that farm size is so small, use of niches to the optimum is very important. These are ‘opportunity’ spots that can be targeted for improvements and interventions, including policy interventions. Some examples include:

- Use of valley bottomland for rice (Madagascar) and off-season high value crops. This can be an opportunity for intensification (Ethiopia);
- Different crops are allocated to different parts of the landscape; e.g. use of outfields for cereal and root crop production (Ethiopia), bananas on sloping lands (Lushoto), etc.;
- Use mountain hill slopes facing different directions for different crops; e.g. using rainfall and temperature variability strategically. They will have plots facing different directions in different catchments, so as to spread risk;
- Areas close to the homestead are more fertile and used as home gardens, for higher value crops like vegetables and coffee, important risk/famine avoiding crops like enset;
- In Madagascar land use is distinctly related to its capability to produce and to water availability. The landscape has three types of land: (i) *bas fonts* (rice valley land); (ii) *tanet* (land adjacent but upland from the rice) which grows some cereal and root crops; and (iii) the upland which is basically unsuitable for cultivation so is used for tree planting or grazing and is often burned to bring nutrients into the rice;
- Luvocs, which are small valleys or gullies (Madagascar), are special niches or drainage ways where water is more plentiful and can be used fruit and vegetable production. The amount of rice valley land and the type of water available (e.g. rainfed, perennial or season stream fed, etc) basically determines the overall well being of the area – the larger the area and the more stable the water supply the better the well being.

A large diversity of crops are grown in highland regions compared to other ecologies, given its rich micro-ecosystems that can provide sources of resistance and diversity. Farmers in highland regions often leave wild varieties in their farms, encouraging cross-fertilization for new potential varieties. (Fleury, 1999). “It is estimated that it takes only three to five centuries for a new center of diversification to come into being.” More than sixty different types of East African highland bananas are endemic to the Great Lakes Region of East Africa, after having been transported from India more than 1500 years ago. As a result, this diversification of banana varieties from exotic to endemic has made Uganda, Western Kenya and the Kagera region of Tanzania the world’s second epicenter of banana production (INIBAP 2003). Other crops with some indigenous genotypes to the highlands of Ethiopia include durum wheat, highland sorghums, finger millet, niger seed (noug), teff, oats, coffee, enset, and beans in ECA as a secondary center of diversity. People living in temperate climates owe a debt to those who live in tropical highlands (Fleury, 1999).

ECA mountain ecosystems are very diverse supporting a wide array of natural flora and fauna biodiversity which is threatened due to population encroaching from adjacent agricultural areas, corrupt governments and poor controls on over-harvesting and exploitation of forests, and the subsequent consequences of poor NRM. However, tiny pockets of natural biodiversity still exist. One such example is Bwindi Impenetrable Forest where there are more than 214 different species of forest birds out of 336 in total. Bwindi exemplifies and represents the natural biodiversity that was once in ECA highlands. Unless sustainable integrated natural resource management can be achieved, these last pockets of natural biodiversity are threatened with extinction. Other important conservation areas and sources of biodiversity include: Semliki Reserve, Rwenzories National Park, forested areas on top of Mt Elgon, Mt Kenya, Mt Meru, Mt Kilimanjaro, the Ruwengires, the Usambaras and other parts of the Eastern Arc Mountain chain, and Ulugurus.

The ECA highlands are composed of unique diverse ecosystems to which populations have adapted their farming systems. As a result, the livelihood vulnerabilities, strategies and needs differ. These regions arguably harbour the greatest density of biodiversity worldwide. Agricultural systems have shaped the regions biodiversity significantly, though some changes have consequently endangered the natural biodiversity. A mere fraction of the natural forests remain. The presence of valuable genetic resources have been utilised by farmers as livelihood strategies against pests and diseases. They also have natural ‘water towers’ supplying vast areas including the lowlands. However, livelihoods are threatened by the continued decline of productivity in the natural resource base due to unsustainable agricultural production. The diverse local

realities in highland regions including their unique characteristics need to be taken into account in order for positive change to occur.

POVERTY AND HUNGER HOTSPOTS

According to the Centre for International Earth Science Information Network (CIESIN), based upon their assessment for the Hunger Task Force of the UN Millennium Development Goals program, there are eight major hunger and poverty Hot Spots in Africa. Of the eight, four are located within the ECA highland regions, namely: the Ethiopian highlands, southwestern Uganda, Rwanda and Burundi, certain regions of Tanzania as well as Madagascar. However, in addition to these large generalized areas, there are many other regions that also fall into the same distinction of being a poverty or hunger hotspot. Substantial evidence demonstrates that poverty and hunger occur in tandem, each increasing the other. Moreover, these hunger and poverty hotspots are also the regions of ECA possessing the highest population densities.

ECA regional poverty hot spots have different farming systems possessing diverse constraints, and have different geo-political backgrounds and histories. More than 16 million children suffering from malnutrition live in five different farming systems in ECA: the cereal/root crop based, maize mixed (Tanzania), highland temperate mixed (Ethiopia), agro-pastoral sorghum/millet based and the root-crop based. Regions with the highest population densities correspond with high densities of child malnutrition – hence, the highlands (IAC 2004). The Ethiopian highland region is characterized by highland temperate mixed farming systems where risks of early late frosts at high altitudes can severely reduce yields. In Burundi, Rwanda and in the southwestern Ugandan highlands, farmers are able to grow more diversified perennial and annual crops, such as banana, plantain, sweet potato, beans, coffee and cereals but with limited livestock. Usually, they are blessed with 2 harvests annually; however, population pressure and decreasing landholding sizes is severe; more than 50% have less than 0.5ha. In Tanzania, the majority uses a maize-mixed system. Like Ethiopia, livestock are used more extensively than in highland perennial systems. Vulnerabilities include genetic erosion from the lack of diversity in planted crops, drought, market volatility and socio-economic differentiation due to migration. In Madagascar, a rice system dominates and is augmented by some banana and coffee production, but mainly cassava, legumes, and maize. Population pressure and decreasing landholding sizes are major threats to production and livelihoods in this system. Risk is heightened by climatically driven uncertainties, armed conflicts or other crises, poor storage, limited infrastructure, and imperfect markets.

Poverty is often measured in inadequate terms. The World Bank established their poverty identification level at a daily income of 1\$ US dollar /day. Current evidence clearly demonstrates that poverty cannot be measured simply with a single universal equivalent. AHI, through participatory methods, consulted farmer's perspectives on resource endowment indicators and their own economic conditions, integrating the value of farmer's input in identifying constraints to prosperity.

Socio-cultural components of society play major roles in agricultural development, creating a web of interrelationships. For example, a woman as a single mother suffering HIV/AIDS will not be able to take care of the sick within her own household due to her own condition. Since she cannot care for the sick, increased illness risk amongst her children ensues. Moreover, her own labour input into the farm is nullified due to her HIV/AIDS condition. This compounds when her children are forced to provide the labour necessary to grow enough crops for the family to eat. They will thus not likely have a chance to attend school and acquire an education. Production will decline and malnutrition will further degrade the situation. Coupled with this will be the limited transfer of knowledge from mother to child due to her illness, rendering the children less knowledgeable in farm management. A husband's 'right' to drink and at his whim engage in extra-marital affairs might have been the catalyst. Gender relations have multiple impacts and each in turn has implications. Social issues must be confronted, and those dealing with these in action research for development must be prepared to wade through the quagmire. This is a strong rationale for using an INRM approach to improve livelihoods and environment because non-integrated and non-holistic approaches to social problems rarely produce positive results.

Table 6. Resource endowment indicators used by farmers to describe their conditions (1997-98)

INDICATORS	“POVERTY” MEASURE	BML PILOT SITES USING INDICATOR ¹
Farm size	Small & few parcels; land types are less diversified; if work for others may not farm own land; not able to rent or trade	All
Income sources	Few & not diversified	All
Family size	Larger	All
Labor	Limited & work for others; not able to purchase; sometimes trade	All
Access to health care & education	Less	Areka, W Kenya, Fianarantsoa
Cash crop	None, limited area and/or not diversified	W Kenya, Areka
Crop diversity	Limited	Ginchi, W Kenya,
Livestock numbers / type	Fewer numbers & types	All
Livestock feed system	Less intensive & diverse	All
Access to inputs	None	All
Soil fertility management	Unable to purchase inputs; limited labor & materials	All
House type	Small, poorer materials, not permanent	W Kenya, Areka
Fuel / wood availability	None to limited	Ginchi, Areka, W Kenya

¹ Resource endowment ranking by: Areka, Ginchi, Kabale, W Kenya, Embu, Fianarantsoa AHI sites
Source: AHI (1998)

Evaluation of Past Research

The ASRECA NRM Strategy thoroughly reviews past research efforts for NRM. However, AHI is targeting integrated approach and methods development to tackle the conundrum of technical, socio-cultural, policy, economic and institutional constraints. AHI has reasoned that limited adoption of technologies is by and large due to a variety of reasons. Therefore, concentration on approach development and current research methodologies and mind sets are reviewed here.

REASONS FOR LIMITED ADOPTION OF NRM TECHNOLOGIES AND PRACTICES

Although various independent research efforts have generated successful technologies to improve soil fertility, conservation, pest control and other system constraints there has been limited adoption and impact. Reasons listed here have led to the development of an alternative more integrated NRM approach that is meant to correct for these deficiencies, even though factor research is still required in gap areas:

Limited use of a more holistic, systems approach that integrates biophysical and socio-economic concerns:

- Failure to integrate conservation and other NRM technologies with each other and with solutions to farm and livestock production related constraints.
- The “reductionist” R&D approach has failed to integrate biophysical and socio-economic concerns;
- There is limited understanding of the ‘whole picture’ given the technological mindset. Important areas are left ‘unattended’ such as: local collective management arrangements, customary resource management, local power and gender relationships, government versus traditional rules, among others, that consequently affect NRM;
- Limited recognition of trade-offs inherent in applying NRM solutions: long term versus short term; costs and benefits to various stakeholders; collective versus individual gains; among others;
- Limited attention to scales and levels of decision making, with most concentration of plot scale and farmer level, and limited on farm systems, watersheds, etc. and non-inclusion of other stakeholders, such as community interest groups, district and national governments, etc.

Factoring in of important externalities early on has been ignored:

- Limited access to market, credit and input supplies act as disincentives for farmers to take up new technologies. Short-term needs but long-term payoffs have not encouraged farmers to adopt;
- Failure to take account of policy dimensions related to definition and enforcement of local by-laws, communal management and public investments;
- Limited attention to scaling up barriers and institutional arrangements;
- Limited use of an ‘innovation systems’ approach which recognizes that there are a number of actors and factors involved that need facilitating so as to optimally contribute towards solving a problem or addressing an opportunity.

Technology development process has not encouraged adaptation and innovation by users:

- Researchers are seen as the main ‘innovators’ which limits use of indigenous knowledge, that occur as part of an innovation ‘process’ which is not linear nor set;
- Limited training / knowledge of extension workers in the nuances of application and adaptation NRM technologies has resulted in limited adoption;
- NRM technologies are knowledge intensive. They require management decisions based upon site and socio-economic circumstances for adaptation and application;
- Limited use of participatory research methods that include building of farmers’ own experimental and adaptive capacity limits development and application;
- For the most part, technologies have been developed by researchers alone with limited input from farmers, so do not fit farmers’ circumstances;

PAST APPROACHES AND LIMITATIONS

Approaches to research over the last twenty years have focused heavily on technical solutions related to production. Each commodity and its production issues (pests and diseases, agronomy, NRM, etc.) are also handled separately. NRM has been handled as a separate section in research systems so there has been limited integration even of NRM components. This is often referred to as a 'reductionist' approach or method which has resulted in 'reductionist' thinking, and is seen as an 'accurate' way to apply the scientific method to agricultural production issues rather than being impact oriented.

On NRM issues, more research has been done on soil fertility issues (on plots) than land management, which has typically been handled as a development issue by extension services. Economics is yet in another section though rarely integrated and has very limited personnel. With farming systems research (FSR), there was the inclusion of an economic perspective; yet, it was still obvious that many other components and their interactions had not been identified or worked upon. The systems perspective came into FSR diagnostics but most research was reduced to components that were checked for feasibility within the systems context. Sociologists and anthropologists in the NARIs are non-existent and in IARCs, extremely few.

Most research has been conducted on the research station and/or under the control of researchers on farmers' fields using small experimental, replicated plots to control variation and non-experimental variables. Although scientific, these research procedures were not able to capture multiple variables, systems factors and adaptations needed by farmers to make them work, nor were they useful to explore larger scale landscape issues, temporal factors or social aspects required in NRM. Research techniques were also not adequate to work with more 'messy' human and institutional factors. Social problems require a social component in solutions. Modeling and GIS came in, but lacked participatory elements so results were often academic or inaccurate. Participatory research brought in an important philosophy that has slowly been adopted and institutionalized, though still with skepticism as it was felt to lack scientific rigor. Results, even though less 'scientific,' are producing greater impact and influencing research and this success has kept it from dying out. Action research is now being adapted from NGOs and other sectors (health and education) that have been using it to address issues that are highly context specific and are affected by sociological and institutional factors. (see section on INRM for its application in R4D). Though spoken of in the past tense, this adherence to traditionally scientific models in research continues to exist in many institutions.

Research and development have, by-and-large, been separate activities conducted by separate actors. Research has typically been setting priorities without wide consultation, although this is changing, mainly bringing in farmers but not yet the private sector or development supporters, strategy shapers and policy makers. The new research for development (R4D) thrust has come up in the last 1-2 years. There has been very limited work on social, economic and policy dimensions that are major constraining factors inherent in development and NRM problems. Basically, R&D actors failed to provide an integrated front to solve land degradation and related poverty issues.

This dearth of success has precipitated renewed analysis of the situation and testing on pilot scales of various community-based NRM approaches mainly by development projects. Research has had little input into these and impact is anecdotal but promising. Approach development for both research and development has made considerable strides conceptually, but has had less success in uptake and application by NARIs and IARCs (reasons discussed below).³

There has been considerable work by agricultural research, development and conservation organizations around the world on approaches, methods and tools that are aimed at improving the effectiveness and outcomes of improved NRM from the perspectives of the managers themselves, as well as those that are providing services and information on NRM. Four main approach and method areas that have each added value include: (i) those that enhance user participation in the technology generation and promote better NRM at farm and landscape scales, such as participatory technology development, community-based NRM,

³ For a full review of approaches refer to: Stroud A and R Khandelwal, 2004, In Search of Substance: 'State of the Art' of Approaches, Strategies and Methods for Improving Natural Resource Management and Livelihoods: Indications for Future Directions, AHI, Kampala, Uganda

integrated watershed management, etc; (ii) those that include the livelihood concepts including human, social and other assets, risks and vulnerability factors; (iii) those that recognize hierarchies and levels that are interlinked and integrated (plots, farms, watersheds) such as the agro-ecosystem management approach; and (iv) those that recognize and incorporate diversity in the stakeholders themselves and their stakes such as in gender and multiple stakeholder analyses (Stroud and Khandelwal 2003).

Tools have been developed aimed at improving participation and awareness building; bio-economic models that help researchers to understand systems and management trade-offs; geographic information systems that improve spatial understanding; means to influence policy makers and decision makers, among others. The new approach “Integrated Natural Resources Management” (INRM) incorporates these 4 main areas: sustainably building and optimizing social, physical, human, natural and financial assets; participation of stakeholders having a ‘stake’ in the resources, their activities in this respect, and their relationships linking across various scales (farm-landscape-watershed) and levels of decision making (households-community-district-national) depending upon commonly agreed need-based issues; values and incorporates perspectives and expertise from various quarters, e.g. research disciplines, government decision makers, community members and leadership, and from the development actors including extension, NGOs, and CBOs. INRM promotes research for development (Campbell et al, 2005, in press).

Recently, it has become more evident to many R&D practitioners that resource management strategies result from interaction between social, cultural, historic, economic and physical elements. Social, cultural and historic elements include institutions, governance, power relationships, information access and accuracy, both on macro and micro levels, especially where natural resources managers exist, all within a diachronic context. History plays a tremendous role in the ‘hardness’ of existing socio-cultural elements. Thus, the Integrated Natural Resources Management (INRM) approach is now being developed and tested by AHI, other IARCs and partners around the world (see subsequent section). This approach, which evolved from earlier approaches, was largely borne out of analysis, practical need, and desire to make an impact on NRM where it had not been possible before. The INRM approach has many similar characteristics to the more generic IAR4D approach that is also under development.

REASONS FOR RESEARCH’S FAILURE TO USE ALTERNATIVE APPROACHES

Regardless of all of the various approaches developed to improve R&D impact, there has been limited uptake and institutionalization in research organizations for various reasons:

Science tradition and organizational culture:

- Barriers of acceptance of new approaches by more conventionally trained researchers who were used to a reductionist approach;
- Skepticism on science in participatory methods due to professional traditions and biases but also due to lack of statistical tools;
- Organizational culture and relatively top-down management styles may limit partnerships;
- Largely ignoring inputs from TEK because seeing as ‘non-scientific.’

Capacity deficits and limited attention to ‘experiential learning’:

- Approaches had good philosophical underpinnings but methods and ‘know-how’ lagged behind;
- Difficulty in understanding and applying new concepts and tools;
- Limited use of organized experiential learning and systematic reflection;
- Limited involvement of a broader range of disciplines, e.g. social scientists, economists, systems modelers, ecologists, etc.;
- Those using approaches often remained in project-funded enclaves and were not fully integrated.

Non-supportive organizational management and structure:

- Limited or over-concentration on mandates which limited ability to take a more holistic approach towards finding solutions;

- Lack of a strategy with support and expertise to move from small, modular pilot teams to wide use of the approach within organizations;
- Implementation problems due to monitoring and reward structures do not favor integrated team work;
- Limited resources to move out to farmers and hold stakeholder consultations frequently enough;
- The way in which research organizations are structured along commodity/factor lines limits team work and prevents integration;
- Limited empowerment from management to make and sustain partnerships;
- Separation of research, training and extension into different organizations makes necessary linkages more problematic, limits experiential learning and limits managers/trainers time in the field where closer to development (or lack of) outcomes.

Therefore, new ways of generating and adapting NRM innovations and new modes of knowledge sharing are needed (section 3.4). Concentration on technology components needs to be done in an innovation systems context where multiple sources of innovation are facilitated and more concentrated research effort is required on generating NRM principles, that is, understanding the context and circumstances where NRM interventions can work best and trade-offs that need to be considered. Farmer experimentation using these principles can help them to apply NRM interventions to site and client specific situations. Greater consideration by researchers of systems and landscapes management perspectives and action should be enhanced in the research and development work (Stroud 2002).

DEFICITS IN CURRENT KNOWLEDGE MANAGEMENT SYSTEMS LIMITS IMPACT

Current deficits of KMS and impacts on various stakeholders of limited knowledge management and learning culture are provided in these examples:

- Policy and decision-makers lack the required knowledge necessary in understanding the complex socio-cultural, political, economic and environmental problems of natural resource degradation, its causes and methods of reversing these trends; they cannot be apart of the remedial process.
- Without adequate knowledge of NRM, policy and decision-makers can easily forge policies and make decisions that have further detrimental effects upon the natural resource base.
- Researchers and research institutions have limited access, understanding and therefore limited use of 'local agro-ecological knowledge' or 'traditional ecological knowledge.' This results in 'expert' perspectives and 'top-down' approaches which limits innovation, facilitating the erosion of the former knowledge system, which contributes to poor NRM.
- Extension actors need adequate knowledge regarding the technological innovations coming from research, current policy and political institutions, as well as an appreciation and understanding of stakeholders knowledge of NRM, socio-cultural structures and relationships.
- Connected to the 'top down' reductionist approach used by most 'experts' is that stakeholders have been seen in the past as powerless actors bereft of equitable knowledge to scientific research and thus sidelined from the technology implementation; so stakeholders remain marginalized in the NRM R&D process at the start.
- Farmers can rarely access valuable research findings, market information and the like. As a result, uptake and adoption rates in the past have been poor.
- Stakeholders possess vast knowledge of NRM and that knowledge plays a key role in identifying the most effective methods of implementing NRM technologies; hence the development and necessity of participatory methods. Knowledge sharing between all parties serves to enhance the positive impact potential of technology implementation initiatives (Ritho 2003).

In summary, agricultural research has been conducted using a reductionist approach, making it difficult to work with the complexity of NRM, and limiting progress towards solving NRM issues. Moreover, expertise and funding to NRM has been limiting. Institutions are not organized to promote integrated research. Traditional science has resulted in 'top-down' expert-initiated experimentation with little participation from stakeholders. Other factors limiting success in tackling NRM issues is limited work on weak policy structures, limited incorporation of stakeholders' knowledge and input, failure to address socio-economic and cultural issues linked to NRM, and the fact that NRM innovations are labour and time intensive, leading to farmer's reluctance to adopt.

Solutions to 'failed' past NRM approaches are affected by inadequate inclusion of social sciences, institutional learning and change (ILAC), and tackling the human causality factor. This has resulted in demand for increased participation from stakeholders in research, development, implementation, monitoring and governance, from national to local levels, and in the appreciation of TEK and its fundamental role in NRM. Capacity building within research and extension institutions and of development and government partners is required along with improved communication and knowledge sharing between all actors. There is need to adopt a holistic systems approach to augment classical reductionism currently used that is manifested in the concept of Integrated Natural Resource Management (INRM) which AHI is currently developing and operationalizing.

Constraints and Opportunity Analysis

ECONOMIC AND PRODUCTION ISSUES

Food and Income Shortages Resulting from Production Constraints

Some factors reducing production are directly linked to the natural resource base while many others are human and socially induced. Many constraints emerge from combination of these three. However, there are many interlinked factors that negatively impact production, further justifying an integrated approach to NRM. Separately, these factors include:

Natural resource based constraints⁴:

- Soil erosion from natural causes
- Decreasing soil organic matter content
- Poor water infiltration rates and increased water run-off
- Absence of organic matter and manure
- Ecological shifts, for example, decreasing biodiversity in vegetative cover
- Infestation of pests and diseases
- Climatic changes (periodic water shortages or floods)

Human induced production constraints:

- Continuous cultivation of steep slopes or leaving highly erosive soils bare at the onset of heavy rains leading to erosion
- Continuous grazing of livestock
- Continuous cropping without rotation, particularly of cereals
- Non-replacement of trees used for fuel and building materials
- Bush and grass burning
- Poor nutrient recycling and limited transfer of nutrients from nutrient rich to poor areas and limited use of legumes to improve nutrient balance and soil cover
- Decreased use of fallows
- Poor animal husbandry
- Undermining or limited upkeep of soil conservation structures
- Tree planting practices or species which limit undergrowth and soil cover
- Pathways that create water runways or channels and increase erosion
- Over harvesting of natural products without replenishment

Socially and institutionally induced production constraints:

- Progressive land fragmentation (ancestral traditions) of family holdings and a continuous multiplicity of complicated land-use systems
- Low levels of soil conservation technologies, compost making and application, etc (knowledge)
- Loss of or under-valuation of traditional knowledge and norms / practices
- High costs of land and labour
- Transportation constraints (transporting manure to distant plots)
- Land and tree tenure insecurity (policy and infrastructure)
- Poor dissemination of information approaches which are often non-participatory
- Unequal gender relations (for example: drunk men and overburdened women)
- Various types of conflicts with limited reconciliation mechanisms: grazing, land use, theft, boundary
- Break down or weak collective action and application of by-laws
- HIV/AIDS, malaria, and other diseases (decrease in labour from sickness and death)
- Religious holidays and beliefs that interfere with farm work
- Government rules and regulations contradict traditional mechanisms

⁴ NR induced constraint include those related to: soils and soil fertility, water, biodiversity and livestock

Input and Output Market and Credit Constraints

- Lack of public investment in roads, railways and telecommunications;
- Lack of marketing information which raises transaction costs while searching for buyers and sellers, enforcing contracts and resulting in lower bargaining power;
- Limited storage capacity resulting in inability to speculate on the market;
- Long-term investment by private traders in transport and/or storage;
- Poor formal financing and pricing mechanisms – prices fluctuate dramatically resulting in more risky, personalized, cash-based agricultural trade
- Lack of grades and standards for quality;
- Low level market transparency;
- Frail legal environments governing property rights and contract enforcement.
- Local markets are often glutted just after harvest so prices are low. Low local prices and wage rates limit buying power. (Gabre-Madhin, 2001; Hatibu et al 2004)

Some of the economic opportunities available for mountain areas are:

- Niche markets of specialized commodities given unique growing conditions, agro-ecologies and biodiversity potential. This would lead to further exploitation of high value market products, such as herbs, medicinals, plants having cosmetic value
- Staggering commodity supplies to markets given varying rainfall and growing patterns
- Better water management and intensification of niches so as to optimize or extend seasons to intensify
- Develop businesses in ecotourism and spiritual spots
- Enhance organic marketing and production techniques to increase returns to commodities
- Sale/payments for environmental services (ES) (carbon and water credit systems)
- Improved productivity with better NRM resulting in higher yields and lower pests / diseases

In summary, farmers face challenges such as: inadequate access to markets, yield deficits, lack of and access to market information (e.g. current product prices), low value products and limited possibility to add value, inadequate resources to buy farm inputs and simple labour-saving tools, limited local supply of inputs, inadequate public investment in transportation and telecommunications and limited investment from the private sector, risky personalized cash-based transactions, limited storage capacity, lack of or inadequate access to credit, volatile fluctuation in prices, lack of quality grading and standardization, and inadequate legal enforcement protecting farmer's rights. These constraints force farmers to adopt livelihood strategies that compound the degradation of the natural resource base. It is hypothesized that more income would mean greater investments into NRM. However, experience shows that this is not usually the case. Thus, the danger is that improved production levels will increase the mining of natural resources, resulting in short term gains but negative effects for long-term sustainability. Therefore, there must be mitigation or incentive strategies put into place to ensure sustainability.

SOCIAL WELFARE

Education and Development of Human Capital

The rural poor are affected by poor education, which exacerbates their position as rural poor and limits their options to rise out of poverty. Highland areas tend to be less accessible thus more limited in terms of social services. Women, in particular, are affected by limited education opportunities resulting in high illiteracy rates (see gender issues). This negatively influences participation in collective action, groups and other development activities. Several perspectives argue that education is the primary capacity tool necessary for sustainable development. Literacy rates for women in highland areas are extremely low. Rural areas have seen inadequate development of schools required accommodating the population. In the ECA highlands, extreme population densities aggravate the problem. Another major problem is a lack of qualified teachers necessary to fill schools coupled with extremely low wages forcing teachers to turn to other sources of livelihood income. School fees remain high for rural farmers marginalizing large portions of highland populations. In addition, school curriculums in operating schools and classes are not pertinent to local livelihoods as they are based off western models. Therefore, children's education has become secondary to farming. Furthermore,

poverty stricken farmers (the majority women) simply do not have enough labour necessary to achieve all necessary livelihood strategies. Therefore, children play an essential role in domestic and production activities. New livelihood strategies include keeping children, particularly girls, away from school, even when resources permit. Yet, clearly a locally pertinent education curriculum properly functioning, administered and accessible to all would permit the transmission of knowledge to children, rendering entire generations more learned, thus enhancing capacity for future INRM.

Prospective solutions to solving education issues include (these solutions are generic, not only particular to ECA highlands):

- Enhanced policy at national and local levels permitting the creation of locally derived curriculums pertinent to livelihood needs in highland areas – in this case, integrated NRM;
- Alternative forms of tuition payment (crop exchange, labour service);
- Extra-curricular activities including community on-farm labour service, teaching children differing strategies and their subsequent impacts while filling in a labour gap (knowledge sharing and transmission enhanced).
- Detailed courses on biodiversity elements, their importance, role and characteristics;
- Programs developed teaching traditional ecological knowledge (TEK);
- Tree planting activities governed by both schools and local authorities;
- Government's facilitation in providing school materials (pens, paper, etc);
- Educational activities (drama, sports, music, etc) thematically tackling awareness of NRM issues;
- Strengthening teacher training programs and enrollment;
- Solidifying policy (both local and national) orientated mechanisms of supporting teacher's livelihoods to ensure continued education.

These solutions would help provide a long-term solution to NRM. Education remains a fundamental key to insuring proper NRM from local actors, thereby achieving sustainable agricultural production, creating specialized scholars versed in both scientific and TEK approaches resulting in a future generation with capacity through their knowledge of all INRM issues to ensure that external development forces are no longer required.

HIV/AIDS Impact Upon Agricultural Production in the Highlands

UNAIDS estimated in 2002 that 28.5 million adults and children lived with HIV/AIDS in Africa. In 2001, 2.2 million died alone from the epidemic, surpassing any other cause of death continent-wide. In sub-Saharan Africa, the average life expectancy for those afflicted by the virus drops to 20-25 years, sometimes even below this for children. Evidence now suggests that HIV/AIDS is having a disproportionately high impact in agrarian sectors. The HIV/AIDS epidemic must be understood holistically and the impacts it produces analyzed thoroughly in any INRM approach to action-oriented R&D within the ECA highland regions, where there is a high population density that is sure to be affected (UNAIDS, 2002 in Waal and Tumushabe 2003).

In the agricultural sector, people are less capable of absorbing the negative impacts derived from human resource loss due to HIV/AIDS. The highland regions lay upon the threshold of disaster as they produce over 50% of their respective countries agricultural production! HIV/AIDS intensifies labour shortages, increases malnutrition, becomes a barrier to traditional mechanisms of support during calamity, and puts incredible stress on rural women, already struggling under patriarchal societies that still cling tenaciously to inequitable gender rights. Examples of such are division of labour, land and resource rights and access and intensifying macro-economic crises due to agricultural export reduction to name a few. Recent surveys in the Kenyan highlands have produced evidence of how the cost of HIV treatment puts families back into the poverty trap with permanent loss of land, livestock and other key assets (Russell et al 2003).

R&D models for income generation, food security and NRM require a dramatic revision based upon the changing dynamics in agrarian societies due to the impact of HIV/AIDS. The basic assumptions built into economic and development analysis, farming systems research, livelihoods studies, and coping strategies research, e.g. that a household can command basic food entitlements in 'normal' times, should be questioned.

Equilibrium models in economics, demography and other branches of social and economic science, may no longer be valid.

Gender Inequity

Gender inequity impacts agricultural production from macro to micro levels. Women play a vital role in production activities in all farming systems in ECA at local levels. Men usually control the assets (land, trees, livestock) and make decisions in this regard. As a consequence, gender relations have fundamental impacts upon natural resource base management and subsequently, its degradation. Most highland areas are characterized by patriarchal social structures where men collectively (through a socio-historic process) have formed the boundaries of women's roles in reproduction and production. Moreover, due to these governing structures, women have found themselves marginalized especially regarding equal rights to resource access and resource use and in decision making, at household, community and higher levels. (Kigankomo 2002, 2004)

Over the last forty years, women have had to face an increase in demands upon their time and labour. With changing labour structures and livelihood strategies for men resulting from macro and micro influences have resulted in a drain of labour force of men to urban centres, rising levels of alcoholism, the impact of HIV/AIDS and other illnesses and perhaps most importantly, the perception by many men that married women have found themselves to be responsible for not only the tasks of reproduction, but production. Current trends in the highlands demonstrate that female-headed households (for example, 33-51% in Kabale Uganda) are increasing.

Demands upon women's time are forcing them to adopt new strategies for coping against livelihood threats. Often, this results in strategic selection of tasks that are reprioritized in favor of others. Marginalized women suffer from extreme time stress loads, reducing their physical and mental health, causing poor nutrition, increased illness (which further draws labour away from farming) and thus the capacity of the farm to produce for the family. Moreover, such stressed women can barely afford to integrate labour intensive practices in NRM.

Participation in R&D groups by women has been relatively high. Women tend to stay engaged for long periods and are more responsible in managing group assets than men (Sanginga and Stroud 2001; CEED 2004). This is encouraging; however, some situations limit the participation of women – illiteracy, limited assets so contributions groups demand cannot be met, and the time factor mentioned above. Women tend to contribute less in mixed groups, given cultural norms and gender power relations. There are relatively few women involved in R&D work or in local government, thus, female-to-female links and outlets are few. Some specific issues concerning women cannot be discussed with men, and in some cultures, male R&D workers are not allowed to talk to women. Specific strategies are needed to overcome these difficulties.

Research and development strategies need to be re-evaluated given these challenges. Currently, emphasis is being given to propelling economic growth, but ultimately, there are no 'silver bullets' and a more holistic approach needs to be taken to include social parameters. Within a better R&D framework, methods and strategies are needed to improve inclusion and to truly engage poor people, women, youth and other marginalized categories. Although often left to the NGO sector, it is extremely important that public sector R&D organizations wholeheartedly take on poverty, gender and HIV dimensions by developing explicit strategies and options to help poor people. This includes integration of local capacity building into research work, tackling issues that are important to diverse groups farmers, and finding solutions that will suite those that are disenfranchised. Research can contribute towards understanding the dynamics, sorting out the social quagmire, providing more holistic development strategies and policies, and introducing better monitoring systems. Research must pay more attention to social differences, gender and power relations, nutrition and food security and other livelihood dimensions, and work on methods, approaches and strategies that can better address and work in differentiated socio-cultural contexts.

POLICY ISSUES

The impact of policy on NRM sustainability cannot be underestimated nor sidelined and it is entwined with developing social capital. Successful decentralization led by government needs to be coupled to true devolution of power and decision making, empowerment to take on responsibilities, and capacity and funds to do the work. The result of traditional policy erosion leading to fragile social capital manifests in mistrust, individualism in collective issues, refusal to invest in NRM, and continuing degradation of the natural resource base culminating in lower production, spiraling poverty and human suffering. Policy development and proper implementation must occur at all levels, from government to local authorities, research and research institutes and extension. Policy also needs to address the communication channels between all levels, insuring active participation and knowledge sharing from all involved actors. Currently, weak policy and governance fails to facilitate and monitor local NRM while in some cases it actually hinders positive innovation adoption amongst stakeholders.

More than 10 million people are displaced due to a myriad of reasons including war and conflict, natural disasters, the construction of hydroelectric dams, desertification and more. Eastern Africa is no exception; high population density areas such (Rwanda, SW Uganda, W Tanzania, E DRC) have faced some of the most unimaginable scenarios of population displacement due to war (civil and international), genocide and ethnocide⁵, political instability, food insecurity and cultural (ethnic) discrimination. Secondary effects from refugee camps formed by the displaced harm the environment, stripping its resources bare, spoiling water sources, and damaging ecosystems severely. Moreover, vulnerability for these people is at its highest. Political instability renders collective action and social capital within the region impotent. Unless governments work towards creating good will, and international collective action and 'international' social capital, this conflict will only continue to escalate and perpetuate.

Issues involving policy include land tenure, ownership and access to communal natural resources. Moreover, local policy needs to insure that private stakeholder property is protected. Policy over natural resources must become trans-boundary as well as local to reduce conflicts over natural resources. Governance, monitoring, accountability and policy enforcement remains weak at best and must change for INRM to have positive results. This strengthening of policy takes precedence in all levels, local to national. Corruption must be thwarted to assist in good governance thus protecting natural resources commonly used. Often, general policy is created without consideration or consultation of local realities. Traditional governance has eroded due to acculturation processes initiated by the advent of the colonial era leaving stakeholders ignorant of current policy while local authorities remain impotent.

Governmental policy must also address markets, market information, supply of farm inputs, and other associated economic issues facilitating stakeholders' livelihood strategies. It must strengthen infrastructural development assisting farmer's to access markets through road and rail construction and therefore, farm inputs, seeds, and requisite tools. Research institutions and extension need to generate, research, implement, monitor and govern policy conducive to the use of participatory methods and promotion of inter-institutional knowledge management and sharing. Implementation, monitoring and governance of conducive policy towards INRM must be participatory, involving all levels and utilizing local knowledge and expertise regarding local problems derived from formerly poor policy. Moreover, general policy must facilitate the governance and generation of policy at local levels, empowering local populations to monitor, develop, implement and govern policies specific to their realities. Unless these complex policy issues are dealt with accordingly, INRM innovations will continue to face poor adoption rates. AHI offers action-orientated participatory policy research, which can help bridge decision-makers with stakeholders, subtly enhancing capacity (understanding livelihood challenges as well as rights, rules and social obligations) while mediating conflict.

⁵ Ethnocide: The systematic pre-meditated destruction of a specific culture by another.

The following are the fundamental NRM concerns in ECA requiring collective action and conflict resolution include:

- Cross-border issues such as soil and water management between highlanders and lowlanders, logging, nations and ethnic groups, trade agreements affecting the marketing of NR products, transfer of livestock and crop diseases;
- Disagreements between stakeholders with different interests and livelihoods (those protecting forests and those deriving livelihoods from the same resource base, conflicts between pastoralists and cultivators);
- Between neighbours over management of water and soil, theft of water or other assets, arguments over land access rights, and conflicts over livestock grazing crops;
- The illegal removal of NR products and implementation of unsustainable bio-prospecting.

Among the generic incentives and good practices requiring research on their adaptability to local situations are:

- Economic incentives (eco-labeling and product certification, improvement of markets for NR products, determination of property rights, payment for incremental costs of NRM);
- Environmental funds (fees, charges, fiscal incentives, payment for environmental services);
- Social and cultural incentives (acknowledgment of indigenous knowledge, recognition of community intellectual property rights, exclusive rights for communities to exploit NR);
- Policy and legislative frameworks (regulations and access to NR, technology transfer, benefit sharing agreements)
- Assess the impact of regulations, penalties, and fines that affect the direction of investment (Hatibu et al 2004).

Any initiative tackling the challenge of NRM in highland regions requires a comprehensive emic approach to conflict resolution, consultation, and social capital generation and collective action promoting positive social relationships both horizontally and vertically. Such conflicts require the combined effort of stakeholders, governmental institutions and authorities, research institutions and properly implemented action through well-networked extension.

The following are some of the outstanding researchable issues:

- Improve information and data for decision-making processes;
- Build capacity of policy makers on understanding the implications of international conventions and local concerns;
- Develop tools for mainstreaming NRM into planning and decision-making processes;
- Improve understanding of benefits and cost sharing mechanisms;
- Facilitate institutional structures and arrangements for the implementation of incentive measures.
- Research on best practices, approaches and methods can make a major contribution to handling groups and fostering collective action.
- Identify the relevant costs and benefits and advice in policy formulation to ensure their fair division among all parties.
- Regional intervention through institutional collective action (including governmental agencies and authorities), prudently considering regional particularities and socially constructed realities, must strengthen in order to forge stronger vertical linkages in policy consultation and implementation.
- Qualitatively assesses the socio-cultural, historic, religious/spiritual constructions and structures through which stakeholders perceive their reality, and thus their challenges.
- Participatory policy formulation is required at right levels. Instruments for measuring costs and benefits may be applied to negotiations over cost-sharing for remedial purposes or benefit sharing of natural resources.
- NRM R&D can facilitate and support participatory diagnosis, analysis and policy formulation on a wide range of NR issues cutting across various decision-making levels.

Thrusts that address this theme include: 1) enhance the capacity of communities to undertake land-use planning and enforce regulations, 2) empower women as primary NR managers, 3) inform decision making on implementation of global conventions at the local level, 4) institutions for participation at all levels of the policy-making hierarchy, 5) develop and establish stable networks to improve information flow through all levels of decision-making. It is essential that national decision-makers become a part of the process, creating the necessary channels to facilitate local NRM policy creation, development, implementation, governance, information and knowledge sharing. Furthermore, they must also facilitate the possibility of trans-boundary consultation in conflict resolution.

INSTITUTIONAL ISSUES

The current condition and subsequent impacts of institutions (research, development and community-based) involved in NRM is unsatisfactory. Primarily, institutions need to reform their present approach to forming linkages between research and all other stakeholders. Increased partnership and network management needs to be facilitated due to cumbersome costs and old administrative models and policies hindering knowledge sharing and collaborative action. Research institutions also need to network together more strongly operating 'with one voice,' rather than remaining fragmented and disassociated.

Many institutions require internal change in order to adequately contribute to NRM. Community institutions/groups need to improve NRM efficiency through collective action, promoting equitable benefits and cost sharing, conflict resolution, monitoring progress, and ensuring their sustainability. Development and research institutions involved in NRM require fundamental changes from within removing hindering policy structures to facilitate proper participatory method implementation, information sharing and knowledge management in order to create a 'learning culture.' NRM demands a broader contribution from disciplines resulting in increased institutional capacity. Moreover, where local community groups remain weak due to weak social capital and thus collective action, R&D institutions must learn the appropriate tools and methods necessary for strengthening capacity building at local levels. Institutions must become involved in frequent self-evaluation and reflection, removing hindering policy and structures impeding their capacity to learn and change. They must improve documentation of research methods, results, and participatory M&E, amongst others, potentially decreasing knowledge acquirement time, which, currently, is slow.

Knowledge sharing and management in institutions must be facilitated. Too often, access to information and research results is restricted due to policy or insufficient resources and/or means for its acquisition. Increased knowledge management and sharing would result in overall capacity development for NRM. Embedded in this knowledge management and sharing is the importance of Traditional Ecological Knowledge (TEK). The local pertinence of such knowledge systems cannot be underestimated and research institutions need to adopt a different ontology, thereby valuing and appreciating local knowledge systems' contribution to NRM. Without these institutional changes, positive results from NRM work will remain limited.

The INRM approach development that AHI is undertaking addresses a number of the institutional shortcomings through these premises that are backed by methods, new skills and expertise:

- Use and facilitate new models for institutional arrangements and partnerships;
- Explicitly empower and build the capacity of resource managers and users recognizing that change and development require specific adaptations;
- Increase the level of dialogue and deliberation among stakeholders, improving interactions between research and 'clients';
- Incorporate and facilitate social learning processes for community, research entities and others;
- Facilitate trade-off analyses, exchange and negotiation among stakeholders having different stakes / perspectives to resolve conflicting interests and promote benefit sharing;
- Integrate systems and multiple level perspectives through scenario analyses and use of other participatory, analytical tools to improve decision making and selection of options;
- Generate and integrate complementary policy, technological and institutional alternatives that have a direct bearing on the problem or opportunity;

- Empower relevant and diverse stakeholders, applying organizational development and change principles, to strengthen collective and individual decision making, analysis, planning and implementation, lobbying, negotiation and conflict management;
- Recognize and take into account that activities, actors and their relationships link across various scales (farm-landscape-watershed) and levels (households-community-district-national).

Situational Analysis Conclusion

The current situation in the highlands of the East and Central African ecoregion is deteriorating. Already, the natural resource base degradation has contributed to widespread poverty and human suffering. Unless immediate calculated strategic action from all involved in NRM development (including stakeholders) begins to reverse this perilous situation, current human suffering and poverty will be but a prelude to a major world tragedy.

Natural resource management requires an integrated approach that utilizes from an integration of traditional knowledge, technological innovations and socio-economic dimensions to find and implement solutions. Policies established by decision-makers in government need to reflect the interests of stakeholders at all levels. They need to facilitate local empowerment of farmers, communities and their institutions. Knowledge sharing must enhance to permit capacity building in governmental and non-governmental institutions that are involved in R&D continuum. Social capital and collective action need to drive change in NRM practice. Education must take its fundamental role, building the capacity of future generations to manage their environment and thus livelihoods. Gender inequality continues to hamper progress as an anchor, draining the strength from any potential derived. HIV plagues millions, reducing production capacity.

The constraints are many and diverse. They are interwoven forming unique interrelationships and creating a quagmire of biophysical, economic, social, cultural and political threats that continue to hound and render livelihoods vulnerable.

INRM RESEARCH STRATEGY – A WAY FORWARD

A variety of strategic research thrusts have emerged from the AHI Priority Setting Exercise, which are going to catalyze a directional focus in AHI's work particularly in the area of Policy, Technological Innovation, and Institutional evolution.

AHI's new strategic document recognizes that there is a link between INRM research strategies focusing on Institutions that have direct implications in policy and innovations. Good policies cannot be realised unless institutions creating them are sound and effective. Likewise, institutional cohesiveness and capacity is dependant on equitable and efficiently governed policy. Nevertheless, the latter inter-dependencies between Policy and Institutions requires relative flexibility in establishing an environment for INRM initiative in order to tackle the challenges and provide solutions of specific problems. The diversity of stakeholders and their localized livelihood threats require uniquely tailored solutions if any positive impact is to be achieved. This equires standardized and universal application of INRM research principles to be established for equitable and progressive change. A balance must be found between INRM universalisms and relativisms in all future approaches.

Technological Innovation, derived from the knowledge-born capacity of stakeholders, permeates INRM policy and institutions. Technology is the manifestation of knowledge or knowledge action. Technology Innovation is precisely the localized perpetual and sustainable development of cognitive tools required for positive change through INRM. Communities should be assisted to generate their own solutions; they must innovate and produce new technology from their own knowledge base while using available technology, endemic or foreign, as a secondary resource. Technological Innovation transcends empirical understandings. Although traditional and biophysical in origin. (such as soil and water conservation technologies), the focus of technological innovation must not shift or divert, but expand. Biophysical technology innovations should how ever integrate local socio-cultural technology innovation.

AHI's strategy in INRM addresses the systemic web of relationships impacting environmental degradation and consequently, on poverty sufferance. Reflectively, technology innovation, policy and institutions must address the maelstrom of related influences including INRM initiatives. Reversing environmental degradation trends and restoring environmental quality will take time; therefore, INRM is not a priority when key stakeholders are more concerned about starvation, landlessness and destitution. A good research strategy must therefore underscore conditions of security in order to unlock stakeholder incentives in INRM.

Annex 1: Livelihood Agro-Ecosystem and AHI NRM Research Theme Descriptions

LIVELIHOOD AGRO-ECOSYSTEMS (LAE)

1. Common Property Areas with Important Biodiversity Assets;
2. 'Water towers' – Major mountain features draining into lake basins and lowlands;
3. Intensive and highly diversified systems with steep slopes, relatively *good* soils and rainfall but *distant* from major markets;
4. Intensive and highly diversified systems with steep slopes, relatively *good* soils and rainfall and *close* to major markets / population centres;
5. Intensive and highly diversified systems with steep slopes, relatively *poor* soils and rainfall and *close* to major markets / population centres;
6. Intensive and highly diversified systems with steep slopes, relatively *poor* soils and rainfall and *distant* from major markets;
7. *Extensive* less diversified systems with moderate to steep slopes, relatively *poor* soils, *one* growing season & frost hazard, *distant* from major markets;
8. Peri-urban and nearby highland areas greatly influenced by urban centres;
9. Vulnerable areas & groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition.

AHI RESEARCH THEMES

ASARECA NRM Theme 1: Increased Returns and Investment to NRM from Natural Resource Enterprise Development

- 1.1 More effective participation in resource to consumption chains;
- 1.2 Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services (ES);
- 1.3 Local communities demand and receive better quality services and support systems to ensure successful enterprises;
- 1.4 Better policies and R&D strategies increase investment in product development and in NRM.

ASARECA NRM Theme 2: Reduced Vulnerability by Improved NRM Strategies for Adapting to and Coping with Crises and Shocks

- 2.1 Traditional coping strategies and options bolstered so as to reduce vulnerability and risk;
- 2.2 Improved impact of policies including domestication of international treaties, R&D strategies and approaches used by key development actors to help vulnerable groups;
- 2.3 Improved preparedness, crisis management and governance strengthen transboundary agreements and local structures and assets.

ASARECA NRM Theme 3: Enhanced Productivity from Restored and Improved Ecosystems Integrity

- 3.1 Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders;
- 3.2 Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives.

ASARECA NRM Theme 4: Improved Benefits from Conserved and Valued Environmental Services

- 4.1 Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders;
- 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation.

ASARECA NRM Theme 5: Improved Incentives to Invest in NRM by Primary Users, Governments and Other Stakeholders

- 5.1 Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland Livelihood Agro-ecosystems;
- 5.2 Support to community-action policy and by-law reform improves local NRM;
- 5.3 Improved dialogue between constituents and policy shapers enhances NRM policy support.

ASARECA NRM Theme 6: Strengthened institutions and social capital improve governance and support to NRM

- 6.1 Local residents equitably engage and participate in integrated natural resource management;
- 6.2 Service and support organizations more effectively strengthen the capacity of the rural poor;
- 6.3 Research institutions have improved their support for their staff implementing INRM;
- 6.4 Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development.

ASARECA NRM Theme 7: Strengthened Capacities and Competencies in NRM Research for Development

- 7.1 Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries;
- 7.2 Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions;
- 7.3 Strengthened regional mechanisms for coordination and collaboration to develop and use the INRM approach.

ASARECA NRM Theme 8: Amplified Impact by Effective Knowledge Management, Brokering and Sharing

- 8.1 Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders;
- 8.2 Effective scaling up and out mechanisms improves development practices and strategies.

Annex 2: Livelihood Agro-ecosystem Descriptions with Associated Potential Research Themes

AHI uses an ecoregional framework defined with common geographic, social and human dimensions. In line with this, AHI has defined 9 “Livelihood Agro-ecosystems” (LAE), which are within the ECA highlands dealing with the interaction between agro-ecological zones and their human and social dimensions that create livelihoods for people. They share similar characteristics (e.g. access to markets, level of intensification, resource base and endowment, including rainfall) and as such frame the issues which are the starting point for what needs to be done and what can be done to improve livelihoods and the environment. These serve as the context for choosing the research themes and help to target research interventions. The description of the 9 “Livelihood Agro-ecosystems” (LAE) are described in terms of where they are located, what their main characteristics are and associated issues. Possible R4D strategic options (combinations of research themes) can be put together according to the situation considering the logical ‘entry point’ (which might be a commonly felt need, constraint or a barrier that when removed can help development and other research themes take effect). These are suggested within the description of each LAE and draw upon the NRM research themes (see Executive summary to the list).

Livelihood Agro-ecosystems	Number of People per Area (level of intensification)	Potential for Improving Income (close to markets, type of & enterprise specialization)	Number of Poor People (poverty / hunger hotspots)	Environmental Potential / Services (soil fertility status, topography, rainfall)
Buffer zones near conservation areas	Variable	Medium	Variable	Medium to high
Water towers	High	High	High	High
Intensive, good NR, close to markets	High	High	High	High
Intensive, good NR, far from markets	High	Medium	High	High
Intensive, poor NR, close to markets	High	Medium	High	Medium
Intensive, poor NR, far from markets	High	Low	High	Low
Extensive, poor NR, far from markets	Medium	Low	Medium	Low
Peri-urban	High	High	Medium	Variable
Vulnerable, marginal groups	High	Low	High	Variable

COMMON PROPERTY AREAS WITH IMPORTANT BIODIVERSITY ASSETS

These sorts of areas include: buffer zones adjacent to parks, forest and biodiversity reserves, wetlands, conservation areas and grazing areas that people have historically depended upon for their livelihoods and in some cases where they have lived within the forests and natural areas (such as the Batwa people in Uganda). Moreover, these communally managed natural resource areas may also contain transnational or trans-boundary issues. The tendency has been to continue to ‘exploit’ these areas for livelihoods, sometimes resulting in over-harvesting or ‘illegal’ encroachment even though there are (relatively recent) rules and regulations against this behavior. Some of the driving forces (causes) in the ECA region and in the highlands are: (i) Population growth has been considerable and intensifies carrying capacity stress and leads to degradation through land pressure. For example, people looking for land to encroach on: forests resulting in deforestation, wetlands through drainage and habitat changes, etc. They do this to meet livelihood objectives and counter livelihood vulnerabilities, at least in the short term. (ii) War related conflicts or political changes

in government, where government is no longer able to control exploitation or the removal of trees and other resources. (iii) Lack of rules / regulations, poor implementation of rules, and/or corruption which allows for the breaking the rules. (iv) Negative interactions between wildlife and livestock, and/or human/wildlife, causing disease and pest vector impacts. (v) Break down or changes due to government structures in local / traditional rules, jurisdiction, collective action and social capital; thus, negatively changing sustainable management regimes.

A major issue in this ‘Livelihood Agro-ecosystem’ is conflicting livelihood and conservation objectives, which sometimes pit national or global interests against local interests and survival. Secondly, there is the issue of exploitation, where some are making large amounts of money harvesting trees and other valuable products illegally and at the expense of society and broader local trans-generational interests. One of the largest impacts is loss of biodiversity and habitat integrity– resulting in future generations’ inability to draw upon biodiversity assets for numerous benefits they can provide.

The highland locations having these or similar issues might include: the Eastern Arc Mountains including the Usambaras in Tanzania, the Rwenzories and Bwindi Impenetrable Forest, the Virunga mountains, the Rwengueries including parts of the Uganda, DRC and Rwanda; the Aberdares, Mt. Elgon and Mt. Kenya forest areas and national parks in Kenya and Uganda; and areas in Madagascar. A number of wetland, forest and grazing areas are not included in the conservation and national park classification but are included as part of the highland landscape.

There are opportunities and solutions that can be brought to bear on either changing the course of the driving forces, their mitigation or providing alternative livelihood options. This is where various research themes can be brought in and trans-disciplinary action is required.

- a. Alternative livelihood options for buffer zones might feature non-agricultural enterprises such as ecotourism, getting compensation for environmental services, or development of unique or high value enterprises using unique biodiversity. This brings in potential research themes associated with **Themes 8 and 4**. And, where watershed and restoration issues are present **Theme 3** can help to tackle these issues. A potential constraint might be that conservation and buffer zone areas may be distant from main markets. This means that government investment will be needed for infrastructure development or provide some form of subsidies (**Theme 5**).
- b. In some countries, joint or co-management of conservation / forest areas is a potential solution. Another is to support more concerted work on conflict management and resolution to come up with ways to bring diverse peoples’ livelihoods and conservation interests together. New rules and regulations may need to be co-developed and agreed upon to allow for benefits to accrue to both sides. Therefore, there should be an important contribution from **Theme 6**.
- c. Another solution deals with stronger policies and their implementation to counteract exploitation due to various causes as well as to improve dialogue among all NRM stakeholders who have different interests (**Theme 4**).

‘Water towers’ – Major mountain features draining into lake basins and lowlands

The ECA region has a number of important high mountains that can be referred to as ‘water towers’ because they are the source of water for large areas and for many people. Many of these cover significant area, have diverse ecologies and agro-ecologies, and in some cases straddle national borders. These include Mt. Elgon, the Rwengueries including the Virungas, the Rwenzories and Mt. Kilimanjaro. There are also water towers that exist within national boundaries which include: the Usambara, Pare and Uluguru mountain chains in Tanzania, and Mt. Kenya and the Aberdares in Kenya. Other important mountain areas that have lower population densities include the Simian and Bale mountains in Ethiopia and other mountain areas in Eritrea. The importance of Eastern and Central African highland water towers cannot be under-estimated as they directly feed the source of the Nile. In addition to these major geo-political features, the ECA region has highland watersheds that drain into important basins and lakes, which are sources of water for large lowland areas and millions who depend upon them including Lakes Tana, Victoria, Edward, Albert, Kyoga and

Tanganika, among others. Another case in point is the Gizira Scheme in Sudan, which has its source in the Ethiopian Highlands.

The main issue here is that upland management of watersheds improves the water supplies and quality for both highlanders and lowlanders. There are soil and water conservation issues which, if not taken care of by the highlanders, will result in degrading slopes, siltation, conflicts over water rights, and generally poor water management that will influence and cause higher levels of vulnerability and lower levels of productivity for many people. Moreover, conflict resolution and all its associate elements are also inherent in sustainable water tower management.

The causes of the issues found here are: (i) Highland areas are more prone to natural disasters that can have both macro and micro effects – some of which are volcanic activity and earthquakes (DRC) floods resulting in land and mud slides, among others. It is important to remember that the entire Rift Valley area (linked to most of the ECA highlands) is geologically active. (ii) Population pressure is resulting in over grazing, removal of highland vegetation and deforestation. These human driven processes also negatively impact water and springs. The exhaustion of springs and the extended time needed to fetch or wait for water is mentioned frequently as an issue that particularly affects women (due to inequitable labor structures) and is getting worse. (iii) Local management of water and land-use decisions requires collective action (thus stronger social capital) and often policy and by-law support; locally, these are breaking down or are non-existent. For example, one of the most common conflict areas currently faced in ECA highlands is the issue of tree planting locations and competition with water, e.g. drying of springs used by people and livestock caused by competition with trees. (iv) High costs of restoration have to be borne by the highlanders often with little help from governments or cost sharing with lowlanders.

Solutions for this Livelihood Agro-ecosystem draw upon the following research themes:

- a. Costs related to conservation, maintenance and restoration need to be shared among highlanders, lowlanders, governments, and development agencies⁶ of the countries affected (source and sink countries). This requires two main actions: from **Theme 4**, improving benefits from valued environmental services (ES) and from **Theme 5**, improved incentives to invest. Water sales/payments or other compensations for ES would be an example of this. These would require support from **Theme 1** (enterprise development) and **Theme 6** (improved collective action and conflict resolution).
- b. Improved integrated watershed management and communal lands management would result in overall more applicable, sustainable solutions to land use, resolution of local conflicts and provision of diverse technologies that could improve livelihoods. This would integrate **Theme 3**, which concentrates on farm and watershed improvements, and **Theme 6** which builds local capacity for collective action.
- c. Another strategy might be to improve returns to highlanders by enhancing cross-border trade and enterprise development. Increased returns should improve investment in NRM. This would involve **Theme 5** to improve trade through an enhanced policy environment and **Theme 1** to promote enterprises. It would also include comprehensive knowledge and information management and sharing so that viable enterprise development could be founded on market information identifying local, regional, and national (eventually even transnational) opportunities

Intensive and highly diversified systems with steep slopes, relatively good soils and rainfall but distant from major markets

Areas such as SW and N Ethiopia, S and N Madagascar, parts of the Usambaras and Ulugurus, the Rwenzories and NE DRC fit this Livelihood Agro-ecosystem. These areas have similar constraints to other areas, but a difficult challenge is the distance from major markets. Here, there are production constraints such as nutrient mining and erosion given the steep slopes and limited use of sustainable NRM practices. This is aggravated by labour and gender issues. There is need to increase livelihood options, improve returns to the small, intensive farms, avail cheaper inputs and technological options. The distance from urban centres means that the livelihood

⁶ “Agency:” Development actors’ (from all levels; research, decision-makers, extension, government, stakeholders, even fringe affiliates) movement/mobility, initiative, capacity, and collective action in development identified as a whole – agency.

options are more limited (labour selling, small businesses), that input supplies are more limited and costly, and output markets are limited by inadequate information, limited means of transport, and limited ways of adding value to products. These areas are also hampered by limited access to public services (medical, schools, decision makers, etc). These areas have had few targeted policies that might increase incentives to invest.

Solutions for this Livelihood Agro-ecosystem draw upon the following themes:

- a. Enterprise development and marketing strategies need to target products that can be easily and cheaply transported long distances that are particularly competitive in the market place and / or can be stored and sold when prices are optimum. Multiple and diversified products and market strategies are needed. Alternatively, on-site value addition through post harvest research, technology implementation and capacity building would be another option and would offer alternative employment and stretch the season. Collective action combined with post harvest strategies could possibly alter relations of power in buyer/seller relationships. This would be targeted by **Theme 1**. This should be coupled with better information on market prices, advocacy, and information and knowledge sharing regarding all NRM issues (**Theme 8**).
- b. Another strategy would involve improved farming system integration of livestock and production of enterprises coupled with NRM solutions. The overall aim being to try to intensify and raise productivity, through the most effective sustainable use of current resources (**Theme 3**) as well as watershed management. Women's participation should be targeted as well as collective action (**Theme 6**).
- c. The above options should be accompanied by functional policy and targeted support to this situation so as to improve infrastructure, institutional linkages, and incentives. (**Themes 5, 6, and 8**)

Intensive and highly diversified systems with steep slopes, relatively good soils/rainfall and close to major markets / population centres

This Livelihood Agro-ecosystem has the same issues as (3) but locations are closer to major markets (or has good infrastructure), which increases the chances of meeting livelihood and NRM goals. Locations having this Livelihood Agro-ecosystem include: S.W. Uganda, Mt. Kenya, parts of Mt. Elgon, parts of Mt. Kilimanjaro, the Virungas, most of Rwanda, Eastern DRC (if stable), C Madagascar, and parts of the Usambaras and Ulugurus.

There is more competition for labour (assuming men go to urban centres to get work) and a higher level of female-headed households in this Livelihood Agro-ecosystem. There presumably would be cheaper inputs, more efficient marketing, and perhaps more opportunities to add value to products compared to Livelihood Agro-ecosystem 3. Therefore, the possible themes are similar with a few exceptions:

- a. Enterprise development and marketing strategies can target most high value products that are competitive or can be stored and sold when prices are optimum. Multiple, diversified products and market strategies are needed. Alternatively, on-site value addition through post harvest innovations would be another option and would offer alternative employment and enhance food security during unproductive seasons.. This Livelihood Agro-ecosystem would be targeted by **Theme 1**. This should be coupled with better information on market prices, advocacy, and knowledge and information sharing regarding all NRM issues (**Theme 8**).
- b. Improve farm integration of livestock and production of enterprises coupled with NRM solutions. The overall aim being to try to intensify and raise productivity through the most effective sustainable use of current resources (**Theme 3**). Women's participation should be targeted as well as collective action (**Theme 6**).
- c. Policy and development to target support to this Livelihood Agro-ecosystem so as to improve infrastructure support, institutional linkages, and incentives. (**IR 5, IR 6, IR 8**)

Intensive and highly diversified systems with steep slopes, relatively *poor* soils/rainfall and *close* to major markets / population centres

Here there is a situation similar to Livelihood Agro-ecosystem (3) but the natural resource base is poor and the climate may be limiting (frost, drought, single growing season). This occurs in highlands in Madagascar; degraded, poor nutrient soil areas in S. Ethiopia; parts of the Ulugurus, the Usambaras and Pares in Tanzania; N. Ethiopia and Eritrea are affected by drier conditions.

Although there are similar themes as (3) and (4), the main challenge here is the limiting resource base. However, there is a potential opportunity in that these areas are closer to markets. Therefore, greater investment and better coping strategies are needed along with enterprise development.

Farmers face productivity issues related to limited options and to NRM, where the latter is both inherently poor and/or poor from limited NRM. In these conditions, for example, where phosphorus is limiting, inputs need to be purchased. Biomass is usually an issue because of limited fertility. The effects of nutrient mining and erosion are therefore more devastating. In Madagascar and parts of the Tanzanian highlands, burning can result in extreme mining and degradation of upper slopes. Periodic drought and water shortage also exacerbate the situation.

Some of the options to help these areas include:

- a. Enterprise development and marketing strategies need to target products that are especially competitive in the market place and / or can be stored and sold when prices are optimum. Multiple diversified products and market strategies are needed for these poor NRM conditions and marketed produce that raises income and can be a source of reinvestment in NRM. Alternatively, on-site value added through post harvest innovations would be another option and would offer alternative livelihood strategies and stretch the season. This would be targeted by **Theme 1**. This should be coupled with better information on market prices, advocacy, and knowledge and information sharing regarding all NRM issues (**Theme 8**).
- b. Strategies or policies to increase investment in the resource base, in restoration, and in water conservation structures. This theme might help farmers to invest more in inputs if there is subsidy and/or improvement in input supplies, which requires policy action and implementation. Similar to (3) and (4), improvement of farm integration of livestock and production of enterprises coupled with NRM solutions is also key. The overall aim is to try to intensify and raise productivity (**Theme 3**) as well as watershed management. Women's participation should be targeted as well as collective action (**Themes 6, 2, 3 and 5**).
- c. Boost collective action and strategies to better manage common resources, for example by-laws that limit burning, water and watershed management (**Themes 3 and 6**).

Intensive and highly diversified systems with steep slopes, relatively *poor* soils/rainfall and *distant* from major markets

Areas fitting this Livelihood Agro-ecosystem include: parts of Madagascar highlands, parts of Burundi, Rwanda and Eritrea and parts of C and N Ethiopian highlands. Given the poor resource base and distance from markets, this is probably the worst-case scenario of the highlands. It requires more help from policy and development agencies. Issues outlined for (5) are similar here, but more emphasis should be on coping strategies, and development and policy support for investments.

- a. Strategies or policies to increase investment in sustainably managing the resource base, in restoration, and in water conservation structures. This theme might help farmers to invest more in inputs if there is subsidy and/or improve input supplies. Similar to (3) and (4) improve farm integration of livestock and production of enterprises coupled with NRM solutions. The overall aim is to try to intensify and raise productivity as well as watershed management. Women's participation should be targeted as well as collective action (**Themes 6, 2, 3 and 5**).
- b. Enterprise development and marketing strategies need to target products that are particularly competitive in the market place and / or can be stored and sold when prices are optimum. Multiple, diversified

products and market strategies are needed for poor NRM conditions and marketed produce that raises incomes can be a source of reinvestment in NRM. Alternatively, on-site value addition through post harvest innovations would be another option and would offer alternative employment and stretch the season. This would be targeted by **Theme 1**. This should be coupled with better information on market prices, advocacy, and knowledge and information sharing regarding all NRM issues (**Theme 8**).

- c. Boost collective action and strategies to better manage common resources, for example by-laws that limit burning, water and watershed management (**Themes 3 and 6**).

Extensive less diversified systems with moderate to steep slopes, relatively poor soils, one growing season and frost hazard, distant from major markets

These highland areas, located in much of the C & N highlands of Ethiopia, Eritrea and southern Madagascar are still relatively extensive, but are facing increased livestock and human population pressure in the near future. They are usually somewhat drier and less diversified due to harsher climatic conditions. They are one of the hunger hotspot areas. Intensification and diversification is limited which in turn limits livelihood options. NRM degradation is caused by limited investments in soil and water conservation, over grazing of extensive areas, nutrient mining, deforestation and removal of trees for fuel without replanting as well as the burning of dung to replace unavailable fuel resources. Limited diversification has negative impacts on the nutritional quality of diets. There are high transaction costs in getting produce to markets, so most surplus is sold locally at low prices. Limited storage also heightens risk and costs. There are the usual social capital issues, particularly where aid and food for work has undermined local initiative and created dependency. This is another difficult or worse case scenario in the highlands.

The following possible themes may be enacted:

- a. Intensification and diversification strategies and associated technologies, collective action and policy support. These can be linked to 2) targeted at enterprise development and to watershed and farm level improvement. Intensification of valley bottoms and other niches is needed so as to get more trees into these systems and to improve livestock feeding and management systems, and generally improve NRM. For this, the integrated watershed approach would be employed (**Themes 3, 5 and 8**).
- b. Improved collective action and communal property management for NRM, marketing and storage as well as lobbying for policy support, given limited options, including improving land tenure arrangements and infrastructure and market outlets (for livestock products), including storage and support. (**Themes 4 and 6**)
- c. Enterprise development and marketing strategies need to target products that are particularly competitive in the market place and / or can be stored, sold and easily transported when prices are optimum. There will be a reliance on local markets. It may be a useful strategy to identify niche markets and competitive labelling. Enterprise development needs to target the intensification and diversification strategy in multiple diversified products and market strategies that are needed for poor NRM conditions and marketed produce that raises incomes (which can be a source of reinvestment in NRM). Alternatively, on-site value addition through post-harvest innovations would be another option and would offer alternative employment and stretch the season. This would be targeted by **Theme 1**. This should be coupled with better information on market prices, advocacy, and knowledge and information sharing regarding all NRM issues (**Theme 8**).

Peri-urban and nearby highland areas greatly influenced by urban centres

Currently, this is mainly limited to national capitals and major district towns, such as Addis Ababa, Nairobi, Antsirabe and Tana, Kigali and Kabale, among many others. The constraints in this Livelihood Agro-ecosystem are that urban centers offer employment opportunities which are positive on one hand, but promote a drain on agricultural labour on the other. It may increase the incidence of female-headed households and of health issues, such as HIV/AIDS. Studies have shown that households with other sources of income than agriculture are less prone to poverty. In the rural areas, NRM issues are still present and exacerbated by nutrient mining given potentially more produce leaving the farm for the urban markets, particularly if NRM

investment is not forthcoming. There will be more competition between farmers selling produce, given closeness to markets; therefore, market intelligence, added value to products, and intensification and diversification are important strategies.

Potential strategies and opportunities include:

- a. Sustainable diversification and intensification of crop and livestock enterprises is a promising strategy that should increase income, food and improve NRM. Enhanced nutrient recycling from urban waste to peri-urban production systems will improve rural-urban linkages (**Themes 3 and 4**). Improve the quality and seasonal production of strategically chosen products as well as pursue processing opportunities. In principle, these opportunities may be more common than where distant from urban centres. Therefore the enterprise development theme coupled with NRM should be pursued (**Themes 3 and 1**).
- b. Given the labour situation and the need to pursue other livelihood options outside of agriculture, NRM technologies and collective action should be targeted, particularly to reduce the burden on women. Coping strategies for female-headed households are also necessary. (**IR 3, 4 and 6**).

Vulnerable areas and groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / conditions

Situations that fit this Livelihood Agro-ecosystem include DRC (especially the eastern border), Rwanda and Burundi, N Ethiopia and Eritrea, W Kenya and SW Uganda, for various reasons. These are areas that have been called 'hunger hotspots'; they are high poverty areas, usually densely populated and there may be a relatively high level of landlessness coupled to low local wage or compensation rates. Some areas are extremely eroded from farming practices that have mined soil nutrients or created soil loss, such as in the cereal producing areas of Ethiopian highlands. Some of these areas have been affected by insecurity (political, ethnic, land tenure) and there may be conflicts over land and valuable resources that have led to exploitation of minerals, forest, water and/or land. They might also be drought stricken areas where they are recurrent recipients of food aid. Generally, all peoples are becoming more vulnerable with increased HIV infection and other health problems, such as, malaria (given global warming) typhoid and dysentery to name a few. These areas tend to have dependency syndrome (due to high levels of aid), traditional coping strategies may be eroding and there may be a high percentage of female-headed households with limited labour.

Opportunities for these vulnerable people might include:

- a. Provision of alternative livelihoods after war or famine and for landless people. This requires specific development assistance that is targeted for these situations. Improved development / aid strategies to limit dependency. Enterprises that are higher in value, but require limited labour would be ideal and may need support from policy (**Themes 1 and 6**).
- b. Support to renewed social capital, coping strategies and possibly improve ability and mechanisms for conflict resolution and negotiation. This can be linked to improving governance, helping to attain more accountable systems for managing resources and decreasing theft, and improved collective action and social support systems. People could also lobby for better health care and education. Strategies for inclusion in R&D programs is needed (**Themes 2, 4 and 6**).
- c. Improved integration of NRM and enterprises, for example livestock feeding and management systems would assist. Labour saving NRM technologies and increased fuel sources would help female headed and other types of households that are labour constrained (**Themes 3, 6**).
- d. Strategic policy and development support as well as strategic subsidies are needed to target these vulnerable categories and areas. They need help to be lifted from these social quagmires. (**Theme 6**)

PROPOSED RESEARCH THEMES FOR AHI

The following is a comprehensive list of research themes and their descriptions that relate to constraints and opportunities in the various highland Livelihood Agro-ecosystems that were defined above. The overall focus

of the work will be determined by which of these themes may be combined and integrated within selected Livelihood Agro-ecosystems in order to have an impact. The following descriptions are meant to build an understanding of each research theme as they ‘fit’ under each ASARECA NRM theme. Since AHI is proposing to take an integrated approach, within each ASARECA NRM theme you will find AHI themes related to policy issues, building social capital, and conducting research on institutional arrangements. This is not repetitive, but rather are sub-theme areas needed to contribute towards accomplishing the ASARECA NRM Research Theme; for example, the sub-themes (1.1., 1.2, etc) are contributing towards accomplishing ASARECA NRM Theme 1.

NRM Theme 1: Increased Returns and Investment to NRM from Natural Resource Enterprise Development
NRM Theme 2: Reduced Vulnerability by Improved NRM Strategies for Adapting to and Coping with Crises & Shocks
NRM Theme 3: Enhanced Productivity from Restored and Improved Ecosystems Integrity
NRM Theme 4: Improved Benefits from Conserved and Valued Environmental Services
NRM Theme 5: Improved Incentives to Invest in NRM by Primary Users, Governments and other Stakeholders
NRM Theme 6: Strengthened institutions and social capital improve governance and support to NRM
NRM Theme 7: Strengthened Capacities and Competencies in NRM Research for Development
NRM Theme 8: Amplified Impact by Effective Knowledge Management, Brokering and Sharing

NRM Theme 1: Increased Returns and Investment to NRM from Natural Resource Enterprise Development

This theme is an important component for all the intensively and more extensively cultivated highland areas, particularly where there is a relatively good resource base, access to unique agro- and natural biodiversity and access to markets. Mountain areas endowed with heterogeneous niches and temperate climate can more strategically use them to advantage by producing unique crops in different seasons to other areas to capture off-season and unique markets. In areas more distant to markets, non-perishable and easy to transport commodities may offer some advantage. In all areas it is important to develop strategies to ensure reinvestment back into the resource base and to repair degraded areas where possible. Farming system and client oriented intensification and diversification will be important so as to realize higher returns to labour and land, particularly in areas with very small farms and steep slopes. Given the high density of people and importance of many products produced in the highlands there are well-developed trade corridors that go between countries, thus cross-border trade is important when considering market opportunities. Four areas have been identified through the situation analysis that AHI can contribute which are new research themes for AHI, but upcoming in the watershed work currently pursued.

AHI Theme 1.1: Effective facilitation in resource to consumption chains

The aim is to find methods and ways to make enterprise chains work. Most enterprises are aimed at subsistence and surplus is sold. If cash is needed, farmers sell staples early when prices are low, and later food is bought back at higher prices. Also, farm sizes are very small so production of low value commodities results in low returns to land and labour. Higher value commodities could alleviate hunger periods and income gaps. People are stuck in a poverty trap and cannot invest in NRM. They need better links to markets and competitive enterprises that will meet needs and allow for NRM investment.

In other cases, highland systems are cereal based with limited rotation and diversification, such as the extensive Ethiopian highlands. This practice results in nutrient mining, increases pests and diseases,

degradation, and causes poor nutrition. The situation can be reversed by planting higher value vegetables and legume crops and by intensifying animal feeding and production systems. Links to markets are essential for these enterprises to earn more money, improve the land and nutrition.

The problem is that many resource-to-consumption chains do not work well or are non-existent. Selected types of chains (dealing with environmental services; perishable and non-perishable organic products; high value medicinals; easy to bulk and transport high value vegetables and herbs, etc) for selected Livelihood Agro-ecosystems (near or distant from markets, taking advantage of unique products near buffer zones, for HIV households, to increase income in watersheds for reinvestment in soil & water conservation works, etc) would be researched using an innovation systems and action research approach with the aim to learn how to make chains work better. Market chain 'cases' could be developed, facilitated and studied as pilots to learn across them on various aspects related to overcoming high transaction costs or production, institutional and policy barriers. Some barriers are generic and well known, and for these, methods would be developed to solve them; for example, production techniques that lead to better quality and quantities at the right time; entrepreneur skills; negotiation with traders.

Success factors would be derived from facilitation of selected resource-to-consumption market chains for various types of markets and products to find out 'what makes them work'. Policy, institutional, and other mechanisms can be developed to overcome transaction costs and market chain barriers; such as collective marketing, however these need to be worked upon using an innovation systems approach. This would work would also entail some empirical research to target the choices, to understand transaction costs, tackle production and NRM issues, and to find ways to overcome barriers.

AHI Theme 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services (ES)

The aim is to improve the understanding of markets so as to improve marketing strategies, evolution and management of production-market chains. This is complementary to IR1.1. Stumbling blocks for farmers are that they are not commonly aware of market opportunities, how to analyze them or to use them strategically. Likewise, buyers and traders have limited information about production possibilities, its constraints, inputs and credit issues. Information exchange around markets is limited and analysis unsophisticated. This leaves farmers with low value products and limited diversification, which does not avoid risk nor add income to the majority of households.

Although some methods exist for market identification and analysis, these are not widely tested and developed to respond to various market scenarios nor known by the users. Generic methods that are user friendly can be developed to assist in general, as well as specifically to target marginal cases. In some cases, sophisticated analyses are needed, for example to identify export markets, create contacts, and link the producers with processors.

Market and production strategies need to evolve as markets grow through promotion; so as new demands arise, the supply keeps pace. Added value through labelling, specialized market campaigns and processing techniques need to go hand in hand with market analysis and promotion. Brokering services and methods can assist. Study of product development and marketing cases in the region can help to earmark best practices during market development promotion and to help develop innovative market information systems.

AHI Theme 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises

The objective is to find ways to improve services to entrepreneurs and enterprise development. A recent survey conducted by AHI and partners in Uganda highlighted the dearth of services available to help farmers become successful entrepreneurs. Many NGOs and extension workers are not conversant with market identification, analysis techniques, so cannot help farmers to become more entrepreneurial. Extension services and NGOs are both weak in this area and require better ways of organizing services as well as the content. In addition to limited relevant services, there are problems with reaching the poor and women and in being accountable to clients. At this point in time, there are very few private sector service providers or markets

needing products that are willing to assist the producers. Information support, input and credit systems are weak and not in place (see institutional strengthening of service support). Without these services and support systems when the private sector is still very limited, farmers will not go far in their enterprises. Support service issues are high on farmers' constraints lists, and have been for years.

By using an innovation systems approach and targeted action research on development processes, guidelines, models and methods can be developed that assist these processes, particularly on the capacity issues. The ability to articulate demands is important, particularly as decentralization and stakeholder consultations are increasing the possibility to have a voice. Platforms and governance processes are needed to help equitably amalgamate demand for services and these are still in early stages of development. AHI has been involved in action research in this area to improve decentralization and governance, which is paying off.

AHI Theme 1.4: Better policies and R&D strategies increase investment in product development and in NRM

The aim is to improve policy and R&D strategy support to product development and NRM. Enterprises currently mine the natural resource base due to given short-term perspectives. Policies and strategies are needed that encourage investment in NRM while increasing income through enterprise development. Strategies would be worked upon to come up with ways to improve NRM while managing enterprises in highland watersheds, particularly where nutrient mining and water wastage or shortages are prevalent, and where there are promising markets. Another important target area would be in buffer zones, where joint management of conservation areas and natural forests would benefit livelihoods and NRM.

Strategies would be developed through on-ground testing and studies of various experiences in this regard to produce strategy guidelines for NR users and support organizations. AHI is transferring the principles of Land-care, a movement started in Australia, the Philippines and now moving into Africa, in this regard. Research enhances and communicates information about tradeoffs, barriers and successes of these sorts of strategies to increase the buy-in of policy / decision makers. Development of facilitation methods that enable change processes, better linkages and partnerships, exchanges of information and lobbying would be part of the research.

NRM Theme 2: Reduced Vulnerability by Improved NRM Strategies for Adapting to and Coping with Crises and Shocks

Highland areas, given their large population concentrations, have the largest constituency in the ASARECA sub-region suffering from persistent stresses due to HIV-AIDS, malaria, poverty and effects of natural resource sharing conflicts, theft of assets and resource degradation; and there are also sudden unforeseen crises and disasters such as famine, floods, war, and NR exploitation issues. All influence livelihoods and degradation. In addition, there are the long-term effects of limited development, which constrains livelihood options beyond the farm, and in many highland situations farm sizes are too small to provide solely for livelihoods. These are commonly shared issues all across the ecoregion and AHI would particularly target the more endemic causes vulnerability, e.g. gender, HIV, conflict and poverty issues as relating to degradation and livelihoods. This would be a new but needed area of research for AHI.

AHI Theme 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk

The aim is to develop better methods that help local people to cope with vulnerability issues. Local people have for long had coping strategies and have sought out alternative livelihood options; however, due to dynamic circumstances, they either may be inadequate or may be disappearing altogether. Coping strategies include use of local social welfare groups, seeking employment locally or elsewhere, selling assets, borrowing, employing various production strategies, buying and selling enterprises (market speculation), exchanges in kind, sharing assets with others, among others. Dynamics that are influencing coping strategies include HIV-AIDS and other diseases; security problems due to imposed conflicts; conflicts arising locally resulting in theft and loss of assets; new government policies, rules and regulations; destruction or loss of assets (due to government removal or having to sell off to pay for medical costs) and climate driven disasters.

Even though all can be affected, poorer people and female-headed households are affected more by these dynamics. To date, agricultural research has not targeted its interventions, or worked much on these development issues.

Although there are some studies about poverty traps and the dynamics, more needs to be known about coping strategies, driving forces for change, how they are changing, how people are reacting and the impacts on livelihoods and environment. This information would be used to design methods that do not erode local traditions and coping strategies but help to build upon and strengthen them creating ownership and limiting dependency. Participatory and facilitation techniques are important avenues for this. The problem described here is endemic to the region, thus regional efforts to help improve the situation are needed. Specific target groups and areas would be chosen for the work.

AHI Theme 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups

The main aim is to provide specific types of strategies and design technical and institutional solutions that are better targeted. Poverty reduction strategists and R&D agencies that are providing aid, building social capital or solutions to improve livelihoods and the environment need to be informed about dynamics (mentioned in 2.1). This work is sometimes done by NGOs but given the situation is dynamic and complex, it could be improved with more rigorous research, while at the same time research informs itself and its own strategies. It would also be useful to ‘map’ and describe vulnerability zones and groups, given that there is variation in the causes and the context.

The ECA, including highland areas, have a number of well-known endemic and disaster and crisis hotspots. Indications from the current AHI work over the last 8 years show that even households not facing any major crises are dynamically changing their strategies. In some cases, strategies are becoming more limited, as land shortage is exacerbated by population growth. Development and poverty eradication strategies are being developed every day as governments try to find solutions or magic bullets. Some of these are untested, and require monitoring to see the effects and to understand unforeseen reactions and trade-offs so as to make faster adjustments. Tools and methods would be developed to assist in this. Participatory monitoring techniques can also be developed to help the vulnerable have their own observations.

This research would be aimed at helping aid organizations and policy makers target assistance and solutions more specifically and to increase feedback so as to make faster adjustments to policies. It is only then that appropriate strategies and methods can be designed to help the vulnerable. In order for the findings to have an impact, communication and negotiation processes needed to influence and facilitate policy and strategy change to new approaches and strategies would be developed using action research.

AHI Theme 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets

The aim is two fold: (i) to improve strategies and methods by which local structures and assets are improved; and (ii) to improve preparedness for crises and disasters, so that the effects will be less harsh. When crisis and disasters arise, recovery mechanisms can be driven by local initiative, if possible, but in most cases usually rely on outside assistance. Outside assistance mechanisms can be improved by having a stronger development orientation rather than relief focus, by taking a more systemic approach, and by having a longer time frame perspective, even though the assistance itself may be short lived. Research can assist development of strategies by analyzing success and failure factors for different types of situations of different types of assistance strategies. Similar to 2.2 but in with a different aim, research can look into trade-offs, affects on local social structures and social capital, from the perspective of different stakeholders. AHI’s concentration would be on finding ways and methods using action and empirical research to build social capital and local solutions so as to limit dependency, hasten recovery and adaptation, and be more receptive to aid if needed. This entails governance, conflict resolution mechanisms, local by-laws and social means to help each other in time of need, among others. As in 2.1, understanding the differences across different contexts, stakeholder and trade-off analysis would be part of the research. Strategies to incorporate these new processes and principles into aid and support organizations would assist in scaling up.

NRM Theme 3: Enhanced Productivity from Restored and Improved Ecosystems Integrity

AHI's contribution would be to continue to develop an integrated approach towards better management of different types of farm and watershed systems. Target areas would be important 'water towers' and watersheds draining into important lakes of ECA, many of which cross boundaries. In addition, buffer zones near national parks, conservation areas and biodiversity hotspots would be targeted in highland areas, where many unique areas are located. Other targets would be where both extensive and intensive systems are faced with poor NR base, degraded areas that can be cost effectively recovered and cared for, and/or have substantial problems in carrying capacity (e.g. where livestock and human needs are not being met given land use). Building social capital for collective action and gaining increased investment by government for major works is important in these areas.

AHI Theme 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders

The aim is to blend technical, social, institutional and policy solutions to improve upland watershed management. If successful, then more equitable outcomes should be available for more types of households and endowments and the multiple needs of many stakeholders, on and off site, can be accommodated. This is currently one of the major themes for AHI. Most approaches used in the past or currently are not integrated and take a purely technology approach, leaving out important collective action (social and institutional) dimensions. Many approaches used in the past merely tackle the soil and water conservation elements and often using top down planning and implementation strategies that limit local buy-in and ownership and do often do not result in higher levels of production. Other approaches only look at the productivity side and do not take into account conservation and NRM. Although some research is done using participatory methods, this is often limited to plot level testing of single factor commodity based technologies, and does not look into impacts at a larger scale, for example on water or crop competition, or on the system. Where policy issues are problematic, this dimension is left out.

The main contribution from an integrated research approach would be to develop and test an integrated, participatory systems (INRM) approach⁷ that optimizes resource use and minimizes competing interests so as to sustainably satisfy multiple needs arising from heterogeneous circumstances. To do this a number of new methods and tools need to be developed: for example, stakeholder and scenario tradeoff analyses that accommodate a wide variety of stakeholder interests and improve management decisions; GIS mapping and modeling decision support tools; governance and organizational development methods; methods for joint planning, implementation, reflection sessions and knowledge sharing among interest groups; methods to improve inclusion of women, poor and other marginalized groups; conflict resolution and negotiation methods that can be used locally, and participatory M&E methods. (See IR 6.1 for social capital building)

Another contribution will be new research methods that blend action and more formal research and demonstrate ways to bring disciplinary contributions together that have a bearing on solving complex or multifaceted problems. Research for development, on development and embedded in development are three other research method areas that AHI is working on, in the same regard. AHI has started this work in some typical highland watershed situations across the region (both extensive and intensive and in buffer zones); however, there are still gaps and time needed to complete the work given the dearth of research in this area. This theme can be linked to the enterprise themes that bring in this dimension.

AHI Theme 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives

The aim is to improve upon the way farm level innovations are developed and integrated into the farm system so as to improve the lives, NRM and meet the multiple objectives of the smallholder farmers living in the highlands. This theme would look at both products and environmental services (ES) derived from NRM. Most research is conducted on commodities and factors within commodities, e.g. in a reductionist mode. Although there have been eras of new approaches that look into systems and participatory methods, uptake by

⁷ Integrates technical options, collective action and agreements, policy dimensions, partnerships, economic variables

researchers has been limited, given their strong science orientation and more traditional research organizations. In the meantime, adoption rates continue to be low, particularly for NRM technologies and due to dysfunctional scaling up and institutional arrangements.

To break through this bottleneck, this theme would work further on developing an “innovation systems approach” and principles so as to optimize interactions between actors involved to improve resource productivity on farms related to: improving livestock feeding systems, soil and water conservation and management; incorporation of trees and other multi-purpose enterprises; optimizing enterprise links and interactions; and satisfying multiple needs. The innovation systems would recognize the need to generate new technologies that combine local knowledge and science as well as other sources of innovation particularly with knowledge intensive types of technologies (e.g. in integrated pest and soil fertility management, livestock feed and crop management, and conservation technologies and practices). Development of this approach would also include the development of methods and tools to build capacity of stakeholders better innovate, adapt, and integrate NRM and enterprise technologies.

This theme is linked to scaling up (IR 8), institutions (IR 6) and to the watershed management themes. Decision guides, participatory M&E practices and other techniques would be developed to improve future actions and decision-making as well as scale up the knowledge intensive technologies. It makes sense to have this work nested inside the pilot watershed work, because on farm management influences landscape management and visa versa.

NRM Theme 4: Improved Benefits from Conserved and Valued Environmental Services

In the highland ecoregion, this R&D work would be relevant to conservation efforts of the unique biodiversity niches and watershed functions provided by highlands. It also would be relevant to the buffer zone areas around national parks and conservation areas. It may be particularly relevant to highlanders who are otherwise far from product markets, as ES compensation or payments may become an input to livelihoods. This is a highly speculative and new area of work, with some examples of success elsewhere. Therefore, it is of strategic nature to the region, and of particular importance to highland Agro-ecosystems. Work would design and test valuation and remunerative mechanisms and improving negotiations and agreements between different interests.

AHI Theme 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders

The aim is to find management mechanisms and practices that pay to improve ES and biodiversity conservation. Water sources originate largely in the highlands and supply huge lowland areas and residents with water. In addition, a number of these geographic features and basins straddle boundaries covering a number of countries. The Nile Basin covers about 80% of the ECA region, where upland watershed management is very important. Usually the residents at the source end up bearing the brunt of the cost to put in conservation and water harvesting structures, and given poverty and limited development funds for this, the investments are not made. This then negatively affects the quality and quantity of water going downstream. Therefore, it should be of strategic importance to a large number of stakeholders that water sources are better managed.

Another valuable resource in highlands is agro and natural biodiversity. Given short-term perspectives on procuring livelihoods and encroachment on conservation areas, forests, wetlands and other niches the densely populated highland areas have been particularly prone to exploitation of niches housing biodiversity. Most biodiversity work is related to inventorying and collecting for conservation purposed for later utilization. Importantly, however is to better understand the driving forces that are diminishing agro and natural biodiversity; such as, pests and diseases, new varieties, markets that favour certain commodities or varieties, population pressure, and limited livelihood options around conservation areas. This understanding can lead to solutions that may be joint management of resources; compensation schemes; changed R&D strategies; new policies; and monitoring schemes.

Therefore what research can do more specifically in both these scenarios is to develop methods and tools that help to monitor and better understand the dynamics and implications of changes taking place. Then, work on designing and testing better strategies to deal with multiple stakeholder interests (conservationist and forest dwellers; highlanders and lowlanders; water supplying and water demanding countries), winners and losers, and forces / perspectives driving management in relation to ES. From this, various mechanisms, schemes and methods could be designed to entice strategic public and private investments in ES, into more equitable cost and benefit sharing schemes; and sustainable harvesting methods. Promising but costly technologies might be applied with support from governments or shared costs among all beneficiaries. Where sharing agreements have broken down, then negotiation and conflict resolution methods need to be developed and capacity built to use them. This theme would be a new area for AHI and should be implemented together with those involved in the management of these specific resources. Focal areas for this work would be biodiversity hotspots; water towers that straddle boundaries and others where limited diversity is posing a major problem.

AHI Theme 4.2: Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation

The aim is to complement 4.1 by concentrating specifically on ways to value and compensate for ES management. Valuation and compensation are conceptually and practically difficult. And, even if the value can be assigned, which should take into account economic and social costs and benefits, funds assigned to this by governments are limited and mechanisms to monitor and provide payments are non-existent. The situation is similar for carbon credits, although mechanisms are now under test. This theme therefore has a strong interaction with IR 1 (related to enterprise development) and IR 5 (incentive mechanisms).

Research contribution would be to develop economic methods to value ES and to develop different compensation mechanisms (institutional / governance / accountability arrangements, advocating platforms) for selected scenarios. This could be done by setting up some 'models' or pilots where action research helps to test and refine the mechanisms in the scenarios mentioned in 4.1. Information and methods developed should then be shared to improve formulation and implementation of treaties and agreements on these areas and to support local initiatives towards improved sharing mechanisms.

NRM Theme 5: Improved Incentives to Invest in NRM by Primary Users, Governments and Other Stakeholders

Highland areas that are particularly poor, have poor resource bases, and are far from market opportunities are particular targets for this theme, given the extreme difficulty in making investments. In addition, AHI has good evidence that facilitated collective action resulting in better by laws and ownership by local people with support by government can boost people's awareness and use their own resources to take up and apply conservation measures. Additionally, there is a gap in research findings that can help policy makers and implementers in their lobbying and policy definition at higher levels. Improved dialogue between global – regional - national and local levels is also needed, but mechanisms are few.

AHI Theme 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland Livelihood Agro-ecosystems

The aim is to improve the contributions, positions and decision making to formulate and implement overarching policies and strategies that will influence investment, priority setting and otherwise influence highland areas and peoples. Currently data collection, the data and subsequently analyses are weak. Little information is available on trends and impact on poverty and degradation and interrelated issues across the region. Taking stock of implementation issues related to existing frameworks is slow or non-existent. Policy think tanks at regional and national levels made up of African researchers are few. These shortcomings are limiting options (in terms of investments) and impact (in terms of adjustments that should be made to improve policies). Some opportunities such as SARD-M run by FAO are not being utilized by the region. Information exchanges between mountain areas, which are geographically scattered across the continent, on these issues are limited by resources, as the framework of the Global Mountain Forum is there to utilize.

Contributions that research can make include the following:

- Improved data collection, management and analysis: spatial, temporal trends and other statistics particularly on socio-economic aspects could be improved and linked to the IFPRI initiative to improve data handling and analysis;
- Develop analytical techniques to use the data for understanding trade-offs, cause-effects, and economic, social and environmental impact assessments;
- Distil success factors and principles and avail them to improve development strategies and policy formulation at higher levels.

Lastly, it is essential to ensure that end users get and use the information develop communication strategies and mechanisms that enhance the quality of information exchange between stakeholders.

AHI Theme 5.2: Support to community-action policy and by-law reform improves local NRM

The aim is to develop and spread methods that enable local community interest groups to evaluate and improve their NR sharing agreements and modalities. Traditional and new by-laws (local agreements) exist but in some cases, have not been enforced, have been forgotten about, or have been under-mined by government or other forces. Additionally, social capital (collective action) related to defining and implementing these by-laws is breaking down due to population pressure, out migration and absenteeism, and development forces. There is limited understanding by outsiders of what the local arrangements are (for example, hillside management, communal grazing, water management, joint forest management) and how they are implemented and changing. An inventory and analysis of the dynamics of local/traditional rules and norms can assist in developing methods that reinforce or reform by laws incorporating inclusion and equity measures and practices.

Another main issue is that of equity and balancing power relationships during formulation and maintenance of these agreements. It is hypothesized that positive agreements and local ownership of these arrangements will foster better NRM and adoption of NRM innovations that are needed for upkeep and improvement of the situation. AHI and partners have some pilot experience in this area (Uganda) and the hypothesis in this case was correct; thus this is a promising theme. This said, multidisciplinary inputs are needed to improve the following areas related to this theme: facilitation and negotiation methods; user friendly tools that support participatory diagnosis, analysis and policy formulation; participatory GIS methods that assist communities in spatial and historical analysis of NRM trends and conditions; and conflict and resolution mechanisms that improve accountability and balance power relationships.

AHI Theme 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support

The aim is to improve the dialogue between policy makers and their constituents to ensure better implementation and formulation of policies related to NRM. Currently, there is limited contact or consultation by policy makers, nor analysis of the impact that policies are having on NRM and livelihoods. Constituents usually are not informed about what the policies are. All of these factors and others limit policy implementation and translation into action, which is more of an issue than the existence of the policies themselves. It is hypothesized that 'vertical' dialogue would improve the understanding of the perspectives (local and national), would improve formulation of policies taking into account local differences and situations, and would improve implementation.

Some of the implementation issues, in addition to lack of knowledge and awareness of the policies include: limited mechanisms for governance, conflict resolution, and awareness of the long term consequences of non-implementation. Traditional mechanisms that are used to ensure accountability, resolve conflicts and to ensure compliance are no longer considered valid by governments and/or have been replaced or eroded.

Research contributions towards better dialogue, institutional arrangements, coordination and implementation might include:

- Facilitation methods and processes that build platforms for lobbying, advocacy and discussion on policy issues;
- Communication mechanisms that improve local knowledge of global/ national/ regional policies;
- Conflict and resolution mechanisms that improve accountability;
- Mechanisms and process that improve governance at various levels;
- Development strategies that enhance local ownership and downplay dependency.

This research can be implemented along with the watershed work, the water tower and buffer zone situations.

NRM Theme 6: Strengthened Institutions and Social Capital Improve Governance and Support to NRM

Regional testing and derivation of generically useful principles and models are needed. All highland systems are affected by the cross cutting issues inherent in this theme. Institutional change so as to be more effective and to be able to apply the principles and elements of the INRM approach and innovation system is part of this result where AHI has a comparative advantage, given the emphasis that AHI is already placing and progress made. Four themes, each targeted at different types of institutions and arrangements are envisioned:

AHI Theme 6.1: Local residents equitably engage and participate in integrated watershed management

This theme is aimed at strengthening the social capital that is required for INRM in watersheds, buffer zones, marketing, coping with vulnerability and other endeavors that require groups and people to work together. Heightened social capital should reduce dependency and increase pro-activeness, local ownership, accountability, and is necessary for good governance. It is a foundation element.

Many traditional social structures are present, but may not be able to engage in development activities, as they are formed for other purposes. In some countries such as Ethiopia, groups formed for development activities are often imposed rather than come up organically while in other countries or areas there may be a long tradition of groups that work on development (parts of Kenya) and national policy supports this. Other studies conducted by AHI and partners have earmarked success factors or elements that need to be in place for successful collective action for NRM and enterprise development among other activities. These however usually occur in islands and are not wide spread. Often processes by R&D organizations used are shallow and mechanical, and have a limited experience in organizational development processes resulting in limited sustainability.

These and other reasons mentioned in the situation analysis highlight the need for research to assist in improving methods used to enable groups and collective action. Therefore, action research on principles, methods and facilitation processes for strengthening social capital in: mobilization, innovativeness, knowledge sharing, advocacy, marketing, networking and make proactive links to development activities are needed. Likewise, facilitation methods, mechanisms and processes that deal with power relations, accountability and governance and that promote equity are needed to improve fairness in decision making, spread benefits and costs more fairly, and improve conflict management. This work can be applied in similar situations as mentioned in other sections, watersheds, buffer zones, for coping strategy work, and on water towers.

Promising methods developed through action research would be scaled up for use by 6.2

AHI Theme 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor

This theme is aimed at improving strategies and methods and the capacity of service and support organizations to use them. This is linked to 6.1 but deals with a different target group. Findings from a recent study in Uganda by AHI and partners illustrated that farmer institution development was poorly developed and serviced by NGOs and service providers. Given the importance of collective action for NRM and the

dearth of good practice, as explained in the situation analysis, research needs to make a contribution, particularly in the R4D context.

The research contributions are:

- Methodology development for service providers who need to be able to understand and engage multiple types of stakeholders in sustained action planning, implementation and innovation and to facilitate these actions in a way that does not create dependency and disrupt social capital but rather build on existing assets and structures. This is applicable in watershed management and common property management or wherever groups are needed.
- Providing an integrated set of relevant technical and management options and the context of their applicability (tackling heterogeneous situations). Research findings need to be organized into decision guides and other useful guidelines to improve service support to farmers and to use participatory approaches to improve decision-making capacity. This is applicable for improving NRM, coping with shocks & risk, advocating for supportive policies and engaging in the resource-consumption chain.
- Development and testing of facilitation methods that help these organizations improve governance and negotiation mechanisms by working on selected conflict situations to formulate methods, tools and principles. Included here would be strategies and mechanisms for cost-benefit sharing, inclusion of poor and women.

AHI Theme 6.3: Research institutions have improved their support for their staff implementing INRM

In the situation analysis, there was discussion on the need to improve the overall approach towards tackling more complex NRM and livelihood issues, and for this purpose, AHI has been working with partners on development an INRM approach. The approach as practiced currently in a pilot mode is proving to be successful, but is still under development. In order for it to work more broadly, there needs to be broader acceptance, support and application by research institutions. The operational principles and practices have been developed through an analytical process. Some of the paradigm shifts required of institutions are to allow the use of: an integrated and systems approach, better participatory methods, action research so one is involved in changing the local situation not just studying to understand it, social learning methods, broader involvement of other partners and stakeholders, and multidisciplinary team work. In order for institutions to take on these paradigm shifts, an organizational development and a change process is needed to catalyze and strengthen ability R&D institutions to manage their own changed. The main aim is to improve performance, effectiveness and impact.

AHI is currently working on processes and methods to assist organizations and their staff to ‘learn by doing’ and to ‘change while doing’ (including peer learning and monitoring methods). This process involves both researchers and managers. It is making progress, but the work is still at an early stage and it is not yet known at a larger scale, how it will fully materialize in terms of effectiveness and proven impact on the ground. In addition to this effort, AHI and partners are developing action research methods that are scientific, as well as other techniques and tools that are needed to implement the INRM approach. This theme is therefore aimed at assisting research organizations to use an INRM approach and to institutionalize it.

AHI Theme 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development

The aim is to address the major bottleneck of institutional arrangements, which are necessary ingredients to solve NRM and livelihood issues. The new concept of innovation systems holds promise in that all stakeholder involved in making a system work are involved in various actions as facilitated by a leader of the innovation. Different types of institutional arrangements are emerging and being tried out – partnerships, coalitions, networks, and consortia, among others, in order to improve coordination, synergies, and information and task sharing with a shared goal. AHI has spearheaded the development of an innovation systems approach as part of INRM, which would be useful for testing and is initiating and testing this in NARIs and with NGOs.

Research (using action research) can assist in testing and developing these types of new processes and methods. This theme would be applied to both enterprise and NRM innovation systems, more specifically in situations where it is critical for multiple actors to come together; such as, in the by –law work; in strengthening governance and collective action for NRM in watershed management; scaling up; and in finding solutions to buffer zone management. It is important to learn from a broad range of examples to understand success factors needed for different types of arrangements, including partnerships, and what works well in what context.

NRM Theme 7: Strengthened Capacities and Competencies in NRM Research for Development

The deficit areas in disciplinary and process management skills have been earmarked in the NRM and AHI's situation analyses. Through this thematic result, ASARECA aims to enhance the capacity of institutions and individual scientists at sub-regional and national level and provide leadership in the design and implementation of regionally coordinated and integrated research for development. AHI's contribution falls into 3 results areas.

AHI Theme 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries

This theme is a cross cutting one and is necessary to accomplish the INRM approach. Its focus would be to develop capacity coupled to the research activities, e.g. on-the job mentoring and training particularly in the new skill areas required. An assessment of needs has been made in two ASARECA countries and others that are interested in INRM may follow. Graduate student peer learning cohorts from the sub-region that are supervised by senior scientists and development practitioners would be another potential mechanism.

The envisioned areas for INRM are:

- new disciplinary skills areas targeted include: systems specialists (systems agronomists, land use); decision support (modeling, GIS); sociologists and anthropologists (research on gender, poverty, power relationships, coping strategies, collective action, and institutional issues); economists (market analysis)
- process management competence in (facilitation, participatory research methods, social analysis tools, documentation and performance monitoring, managing teams and partnerships)

AHI Theme 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions

This theme is also another cross cutting and necessary area and would include partnerships with IARCs and advanced learning institutions and again be linked to the research areas. Regional needs could be catered for through joint involvement in short courses, mentoring and peer learning groups. Specific Livelihood Agro-ecosystems and NRM themes for research can be co-developed to facilitate increased utilization and sharing of existing expertise in the sub-region between countries and institutions. In addition to training and capacity development, performance and other agreed upon assessment methods and incentives can enable researchers and organizations to improve their development and implementation INRM approaches and principles.

AHI Theme 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach

This theme ensures that the AHI regional program provides the necessary coordination and collaborative atmosphere to ensure the development and use of the INRM approach. It would ensure that regionality and added value to partners is a key criterion for making decisions. The outcomes would be:

- Increased knowledge exchange that eliminates duplication and speeds learning and dissemination
- Increased robustness of results through broader analysis and synthesis frame
- Facilitation that builds consensus on the focus, priorities, and strategy
- More effective partnerships and collaborative arrangements

- Fund raising and enhanced cost-benefit and role sharing mechanisms
- Enhanced innovation given expanded (regional rather than national) peer pressure, reflection, and analysis

NRM Theme 8: Amplified Impact by Effective Knowledge Management, Brokering and Sharing

Given the fact that INRM involves a number of stakeholders, the challenge of communication is great. AHI has particular interest in improving development communication, in building capacity to document, access and adapt information locally as well as to scale up and out INRM approaches and information.

AHI Theme 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders

This theme is crosscutting and would be implemented together with others in ASARECA. It is aimed at improving knowledge exchange and management, including communication and writing skills. A knowledge management system (KMS) includes information collection and depository mechanisms improve the supply of and access to information thus avoiding loss or duplication of efforts, such as with an interactive web site with archival system. AHI is developing such a system currently. This will address the now scattered but important grey literature and lack of continuity due to limited institutional memories. As long as there is connectivity, R&D practitioners can access and deposit information.

Secondly, facilitated 'communities of practice', newsletters and other mechanisms can be instituted to provide interactive information sharing mechanisms and encourage the culture to participate. This will improve exchange and utilization of information and add value to the NARS.

Given the regionality of AHI, then the networking and brokering mechanisms that are offered, as part of the KMS, can improve links between R&D actors. This can help to R&D to find common interests and advocacy areas. Various types of fora (workshops, discussion and learning groups) would increase collaboration, exchange, debate and critique on INRM.

Analysis and synthesis skills of researchers need to be improved and while doing so, increase writing and presentation skills to improve communication to different audiences using different media is needed and would be strengthened.

AHI Theme 8.2: Effective scaling up and out mechanisms improves development practices and strategies

Scaling up various types of innovations generated from pilot research sites has been a challenge. Scaling up methodologies is even more so, given the need to maintain quality and judgments, skill and experience required to design and innovate for different contexts. Scaling up and out can be seen as another type of innovation system. There are a number of elements that need to be working in order for it to work: communication products, communication processes and methods; the innovations themselves, presence of communities of practice and champions, among others. Research can be done on scaling up processes. GIS and reconnaissance surveys can be used to improve targeting (location, users and uses of natural resources) on critical ecosystems. Studies can be conducted that improve R&D workers understanding of uptake pathways and communication and knowledge sharing processes for NRM innovations. Studies and examples can also help to understand how new information and communication tools can assist to overcome current barriers, particularly for marginalized target groups (e.g. reaching illiterate poor; improving pro-activeness to seek and use information, reaching remote areas, etc).

In addition to research, AHI and partners can undertake the following to scale up their findings:

- Produce communication products;
- Provide technical advice and support virtually to those interested in INRM R4D;
- Analyze, document and communicate syntheses that disseminate lessons derived from multiple pilots to wider audiences;

- Foster networks, institutional linkages and facilitated information platforms to spread information on success factors, best practices/methods and promising strategies;
- Catalyze communities of practice and champions.

INRM RESEARCH STRATEGY – A WAY FORWARD

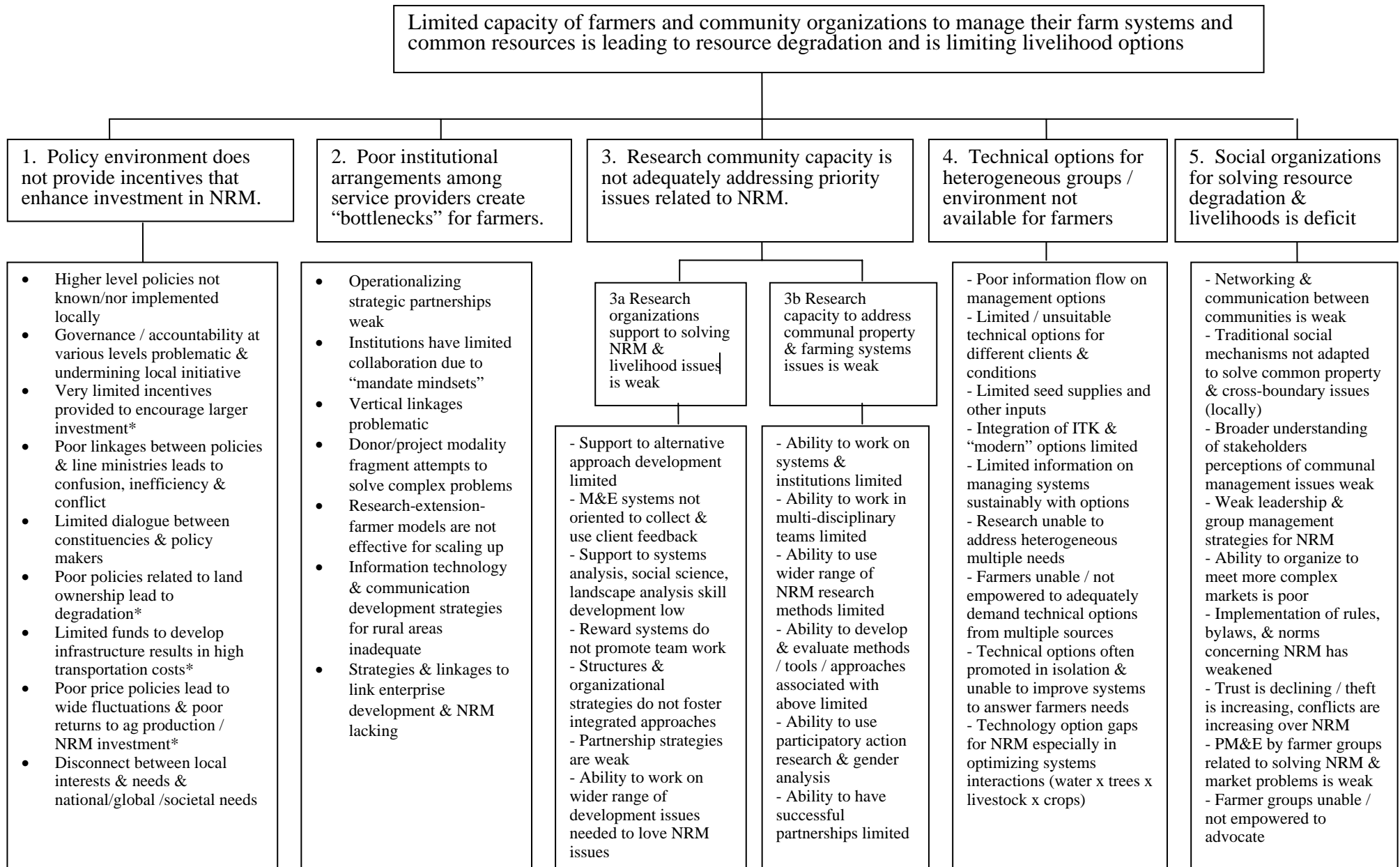
A variety of strategic research thrusts have emerged from the AHI Priority Setting Exercise, which are going to catalyze a directional focus in AHI's work particularly in the area of Policy, Technological Innovation, and Institutional evolution.

AHI's new strategic document recognizes that there is a link between INRM research strategies focusing on Institutions that have direct implications in policy and innovations. Good policies cannot be realised unless institutions creating them are sound and effective. Likewise, institutional cohesiveness and capacity is dependant on equitable and efficiently governed policy. Nevertheless, the latter inter-dependencies between Policy and Institutions requires relative flexibility in establishing an environment for INRM initiative in order to tackle the challenges and provide solutions of specific problems. The diversity of stakeholders and their localized livelihood threats require uniquely tailored solutions if any positive impact is to be achieved. This equires standardized and universal application of INRM research principles to be established for equitable and progressive change. A balance must be found between INRM universalisms and relativisms in all future approaches.

Technological Innovation, derived from the knowledge-born capacity of stakeholders, permeates INRM policy and institutions. Technology is the manifestation of knowledge or knowledge action. Technology Innovation is precisely the localized perpetual and sustainable development of cognitive tools required for positive change through INRM. Communities should be assisted to generate their own solutions; they must innovate and produce new technology from their own knowledge base while using available technology, endemic or foreign, as a secondary resource. Technological Innovation transcends empirical understandings. Although traditional and biophysical in origin. (such as soil and water conservation technologies), the focus of technological innovation must not shift or divert, but expand. Biophysical technology innovations should how ever integrate local socio-cultural technology innovation.

AHI's strategy in INRM addresses the systemic web of relationships impacting environmental degradation and consequently, on poverty sufferance. Reflectively, technology innovation, policy and institutions must address the maelstrom of related influences including INRM initiatives. Reversing environmental degradation trends and restoring environmental quality will take time; therefore, INRM is not a priority when key stakeholders are more concerned about starvation, landlessness and destitution. A good research strategy must therefore underscore conditions of security in order to unlock stakeholder incentives in INRM.

Annex 3: Constraint Tree



Annex 4: Setting Strategic Direction – Evolution of AHI’s Strategy

The African Highlands Initiative (AHI) was borne from a desire to enhance impact and to undertake necessary changes in R&D practice and policies to do so. AHI’s orientation was set at its onset using a robust regional analysis of the issues and causes in this ecoregion. The implementation strategy and AHI’s comparative advantage has been revisited 3 times using participatory processes and analyses during its history with the aim of improving buy-in of various partners, ensuring effectiveness, and that AHI adds value to other entities.

AHI has undergone four 3-year phases and at each stage has completed either an evaluation or internal review and SWOT by stakeholders as well as taking stock of accomplishments over time. Over time, these consultations and evaluations have served to improve the overall focus, built consensus and increased the buy-in, ensured added value to partners, and helped to better communicate what AHI was all about (Refer to Annex for detailed evolution). The current, renewed situation analysis and proposed areas for AHI future orientation that is presented in subsequent sections builds upon the past and ensures that AHI’s contribution to the overall NRM work going on in the region is not duplicating, is contributing towards regionally agreed upon desired results and is ensuring that resources are well directed. Highlights of progress and direction are in Table 8.

Phase	Key direction	Progress and achievements
1 (1995-97)	<ul style="list-style-type: none"> Regional themes: IPM, soil improvement, characterization & diagnosis Regional Technical Advisory Panels - Top down planning Competitive grants (soils) Regional research fellows (IPM) 	<ul style="list-style-type: none"> Solutions & understanding of regional IPM problems linked to unsustainable management of soil fertility in intensive farm systems (e.g. bean root rot and stem maggot, banana weevil and nematodes, Striga on maize and sorghum, and potato bacterial wilt); Research gaps identified and results generated on integrated soil fertility management; Characterization and diagnostic results from the 8 benchmark sites; Strengthening of partnerships & operational modalities; Start of set up of research teams and benchmark sites
2 (1998-00)	<ul style="list-style-type: none"> Benchmark sites Benchmark R&D teams Bottom-up planning (start from farmers) Striving for integration Participatory research (PAM): Farmer research groups, PM&E Intensification & diversification through integrated technological solutions chosen by farmers Technical support group Thematic working groups Continued use of RRFs – diversify topics Scientists engaged, managers not 	<ul style="list-style-type: none"> Multi-disciplinary teams with extension & development partners; Improved integration: multiple technical options tested, adapted & adopted by farmers; Increased farmer involvement, empowerment Research attitudes changing due to PR methods employed; Farmer groups (FG), formation of farmer organizations and group networks; PM&E: improved self-reflection & documentation tracking progress in new INRM approach areas; Cross-site sharing and learning Regional research dimensions: IPM, soils, attitude & behavioral change, FG & social dynamics, GIS & regional situation analysis; Capacitated site teams in participatory research methods, team & partnership management; Wider appreciation and use of INRM approaches.
3 (2000-04)	<ul style="list-style-type: none"> Participatory, Integrated Watershed Management Adopt learning & action research approach Social science methods Regional research team & 	<ul style="list-style-type: none"> Watershed methodology started Impacts visible from phase 2 technology adoption More community interest groups – scaling up phase 2 technologies Socially optimal methods to capture needs of the poor, women as well as ‘active’ poor;

	<p>analytical area focus</p> <ul style="list-style-type: none"> • Institutional change & scaling up • INRM approach defined • Multi-disciplinary site teams use INRM approach • Action research 	<ul style="list-style-type: none"> • Negotiation, conflict resolution and NRM by-laws by local communities & supported by local govt.; • Capacity building biophysical scientists on sociological methods; • NGO coalitions & partnerships strengthened • Governance & ‘demand’ mechanisms methods • Improve extension policy on farmer organizational development support • Methods & strategies: empowerment, inclusion of the poor, gender sensitive, build social capital; • Blend systems modeling & farmer preferences to improve decision making to optimize returns & NRM; • Facilitate & build farmer-to-farmer & service provider-to-farmer platforms & structures; • INRM into strategies & programs: ASARECA, SSA-CP, IDRC, EARO, and NARO. • Action research methods & guides
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CURRENT FOCUS FOR PHASE 4

AHI’s Phase 4 Intermediate Result Areas and outputs (bullets) follow. (See Annex 3 for Narrative and Logframe)

IR 1. INRM innovations developed and utilized to advance community-based participation in watersheds

- Methods to improve local learning, knowledge sharing & adaptive experimentation & innovation;
- M&E processes that improve implementation, agreements, and reflection for future actions and decision-making;
- Methods to engage multiple types of stakeholders in sustained action planning & implementation;
- Methods and approaches that improve innovativeness, networking, proactive links to development activities, advocacy and organizational capacity of local community, stakeholder groups;
- Methods to improve community mobilization, social capital & collective management of resources, marketing and conflict resolution;
- Methods & integrated technologies that improve farmers ability to generate income & invest in NRM;
- Integrated set of relevant technical and management options and the context of their applicability (tackling heterogeneous Livelihood Agro-ecosystems);
- Methods that bolster coping strategies of community groups and households to decrease vulnerability, improve ability to manage shocks & respond proactively to dynamic changes;

IR2: Development strategies, policies, and practices for INRM are facilitated

- Methods that build common understanding & mobilize & provide incentives to local leaders, service providers & constituents to implement self-led development Livelihood Agro-ecosystems that improve NRM & livelihoods;
- Decision guides of good practice & technologies & to understand trade-offs for service providers’ who support stakeholder decision making;
- Strategies for service providers that improve inclusion of marginalized groups & ensure they benefit from development activities;
- Methods that foster community-action policy reform to improve innovation, adoption & effective management;
- Methods to facilitate R&D arrangements & contributions & catalyse institutional change to improve synergies, coordination & complementarities;
- Communication strategies & mechanisms that enhance the quality of information exchange between communities, NGOs, policy makers and researchers.

IR 3: Supportive institutions and institutional arrangements for INRM are piloted

- Research methods and techniques related to implementing an INRM approach;
- Performance & other assessment methods that enable researchers & organizations to implement INRM approaches & principles;
- Mentoring & competence building events for researchers & managers in relevant skill areas (facilitation, participatory research methods, social analysis tools, documentation and performance monitoring, managing teams & partnerships);
- Methods & strategies that can catalyze self-directed institutional reforms (ways to manage paradigm shift) to enhance research management & contributions to INRM;
- Methods & strategies to improve teamwork & management of R&D partnerships to handle the multi-faceted challenges of research for sustainable development;
- Methods & strategies to manage and integrate a wide range of expertise to improve implementation /facilitation of complex innovation systems;
- Support advocacy of the use of INRM approaches;
- Mechanisms & strategies to scale up approaches effectively are tested & preliminary results are available.

IR 4: INRM information that enhances knowledge base of R&D actors is provided

- Mechanisms available that increase scientific exchange between scientists on INRM;
- Documents & syntheses that analyze and disseminate lessons derived from pilots to wider audiences;
- Technical advice & support is provided virtually to programs interested in INRM;
- Networking mechanisms are available to link R&D actors who want to share information on applying INRM approaches;
- Communication & scaling up strategies;
- Communication products on INRM available for various types of clients;

Annex 5: ASARECA NRM Strategic Themes

This framework was developed in 2004 from a situation analysis and stakeholder consultations. It is linked to the ASARECA Consolidated Framework through the results / themes contributions towards: policy, institutions, technologies and innovations and information sharing and management that are inherent to varying extents in each result.

NRM IR1:	Increased Returns and Investment to NRM from Natural Resource Enterprise Development
NRM IR2:	Reduced Vulnerability by Improved NRM Strategies for Adapting to and Coping with Crises and Shocks
NRM IR3:	Enhanced Productivity from Restored and Improved Ecosystems Integrity
NRM IR4:	Improved Benefits from Conserved and Valued Environmental Services
NRM IR5:	Improved Incentives to Invest in NRM by Primary Users, Governments and other Stakeholders
NRM IR6:	Strengthened institutions and social capital improve governance and support to NRM
NRM IR7:	Strengthened Capacities and Competencies in NRM Research for Development
NRM IR8:	Amplified Impact by Effective Knowledge Management, Brokering and Sharing

NRM IR1: INCREASED RETURNS AND INVESTMENT TO NRM FROM NATURAL RESOURCE ENTERPRISE DEVELOPMENT

This result is designed to enable the countries of ECA to sustainably use their natural resources and biodiversity endowment as a basis for competitive agriculture by supporting natural resource derived enterprises development and increase investment in NRM. Thus far, harnessing of the potential of these resources in response to opportunities for wealth creation has been limited by production and NRM constraints, limited knowledge of and access to markets, debilitating price and trade policies, poor infrastructure and limited entrepreneurship. Innovative application of the INRM innovation systems approach to link the resource management and potential strategically to markets at national, regional and global levels is key strategy for poverty reduction. The main theme in this NRM thematic result is to use a sub-regional platform to facilitate development of NR-based products and handling of issues, constraints and opportunities along relevant resource-to-consumption chains.

Targeted livelihood zones:

- Upland watersheds having degradation, small farms and intensive pressure from high levels of livestock and human population
- Marginalized households (female headed, limited labour, medium to poor) with good NR base and promising biodiversity options
- Near buffer zones of conservation areas
- Very densely populated areas with small farms where there is need for collective action
- Extensive, low diversity enterprise areas that may be degraded

NRM IR2: REDUCED VULNERABILITY BY IMPROVED NRM STRATEGIES FOR ADAPTING TO AND COPING WITH CRISES AND SHOCKS

This result is aimed at dealing with different types of crises and risks, which affect millions of people annually, and reduce their productivity and competitiveness, destroy their assets, and curtail investments. Many parts of ECA are faced with alternating floods and droughts, both leading to severe land degradation and frequent famines. These crises are made worse by health epidemics/pandemics and civil strife, which are common in the whole of sub-Saharan Africa. Policies, governance, limitations to preparedness and aftermath treatments influence occurrence, recovery, dependency and coping strategies. These all influence abject poverty and degradation syndrome present in ECA at sub-region, national, community and household levels. Most of the crises are climatic-induced or otherwise, require regional approaches and collaboration to deal with effectively.

Targeted vulnerable groups living in highland areas:

- HIV-affected
- Poor: asset constrained
- Female headed households and women
- Marginalized with limited power
- Those having limited livelihood options
- Stakeholders involved in conflicts and crises

NRM IR3: ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY

This result is an important one for all the intensively and more extensively cultivated highland areas, particularly where there is a relatively good resource base, access to unique agro- and natural biodiversity and access to markets. Mountain areas endowed with heterogeneous niches and temperate climate can more strategically use them to advantage by producing unique crops in different seasons to other areas to capture off-season and unique markets. In areas more distant to markets, non-perishable and easy to transport commodities may offer some advantage. In all areas it is important to develop strategies to ensure reinvestment back into the resource base and to repair degraded areas where possible. Farming system and client oriented intensification and diversification will be important so as to realize higher returns to labour and land, particularly in areas with very small farms and steep slopes. Given the high density of people and importance of many products produced in the highlands there are well developed trade corridors that go between countries, thus cross border trade is important when considering market opportunities. Four results areas have been identified that AHI can contribute which are a new research theme for AHI, but upcoming in the watershed work currently pursued.

Targeted areas:

- Degraded watersheds in selected scenarios with lots of poor people
- Buffer zones around protected areas
- Areas with limited diversity of enterprises and livelihood options

NRM IR4: IMPROVED BENEFITS FROM CONSERVED AND VALUED ENVIRONMENTAL SERVICES

Although there has been considerable investment in conservation in the ECA countries, the impact has been limited so they continue to experience accelerated degradation of their ecosystems. This is resulting in loss of important habitats and niches, soil, forest cover, and agro-biodiversity. Reasons are multiple: locally, farmers are unable to invest in major conservation works; weak policies, weak implementation and governance issues allowing for illegal use, exploitation and encroachment; and fulfillment of short-term needs without a long term vision, which leads to more lucrative remuneration in the short term. In order to address pressing environmental conservation challenges, there is need to develop ecosystem conservation approaches that are beneficial to the immediate NR managers and policy makers so as to achieve a balanced use of the agro-biodiversity and other environmental services provided by watersheds. This ASARECA thematic result is therefore designed to derive mechanisms that further improve the conservation of NR by increasing the actual value and recognizing the social value of environmental services that are being conserved.

Targets:

- Major cross border mountain features having an influence on water supplies
- Major important biodiversity hotspots (e.g. wetlands, highland forests, other special niches)
- Buffer zones bordering conservation areas

NRM IR5: IMPROVED INCENTIVES TO INVEST IN NRM BY PRIMARY USERS, GOVERNMENTS AND OTHER STAKEHOLDERS

This result is policy oriented and aimed at creating the realization that NRM is expensive and requires long-term investments and considerable capital. Improved incentives for natural resource managers, governments and development partners to invest in maintaining the productive potential of the NR base are essential. In

NRM, the motivation of actors may be social/cultural as well as financial/economic. The design of incentives may be improved, therefore, by better understanding of the true costs and benefits of resources conservation, participation, by resource managers in formulating the policies that influence the way resources are managed, and in designing institutional arrangements to regulate behaviour when individual actions have social and cultural as well as economic motivations.

NRM IR6: STRENGTHENED INSTITUTIONS AND SOCIAL CAPITAL IMPROVE GOVERNANCE AND SUPPORT TO NRM

This is a crosscutting theme and relevant themes to each Livelihood Agro-ecosystem should be integrated with the other themes. Institutional concerns exist for different types of institutions and include their interactions, which occur spatially and at different levels. Therefore, the INRM approach is particularly relevant and is the heartland of AHI. Examples of institutional issues requiring urgent attention include: (1) the harmonization of customary and modern legal natural resources and conflict management institutions and mechanisms while empowering local communities and individuals; (2) true devolution of power and genuine improvement of the capacity of the poor to make and articulate demands under the current trend towards decentralization; and (3) strengthening of traditional mechanisms and institutions. One of the cross cutting issues at this point in time is the dearth of good approaches and the capacity to use them. ASARECA, through this theme, intends to address issues related to strengthening institutions and social capital through research contributions towards approach development, capacity building and improving institutional arrangements.

Targets (in priority order):

- NARIs
- Selected NGOs
- Extension systems
- Local government

NRM IR7: STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT

This result is where an important regional contribution can be made by all programs and networks involved in ASARECA. Capacity strengthening along with improved quality partnerships; coordination and facilitation are all key areas where regional entities can make a contribution. There is a large shortage of skilled researchers in disciplines that can make a contribution towards INRM, including the ability to work in the “resource to consumption” paradigm. It is for this reason that research will require a new breed of researchers who can use new and integrated methods and modes of working that usefully combine technical, policy, social and enterprise issues in conjunction with improving NRM and livelihoods.

Target groups and organizations:

- Future NARI scientists and research managers
- University professors and lecturers
- NARIs, universities, IARCs

NRM IR8: AMPLIFIED IMPACT BY EFFECTIVE KNOWLEDGE MANAGEMENT, BROKERING AND SHARING

Adoption of NRM technologies and practices has been limited. There are success stories, but these are limited to pilots where higher levels of investments have been made, and tend not to spread and have limited impact. One of the critical factors limiting success and spread is poor mechanisms to collect, manage and communicate information and enhance knowledge exchange. ASARECA has recognized this deficit and each NPP is contributing to solving this issue from their perspective. This is an important contribution of an SRO.

Concerning NRM specifically, it is known that NRM is a knowledge intensive undertaking and often knowledge of principles rather than technologies is more critical. This has implications. Additionally, given its site and niche specific nature, there is local knowledge and innovation that should be captured and used in innovation systems.

Target audiences

- R&D practitioners, managers and organizations including extension
- Farmer organizations
- Government and policy makers
- Wider public
- Donor

AHI Priority Setting Exercise and Research Theme Strategy Results

PRIORITY SETTING STRATEGY

The African Highland's Initiative (AHI) Priority Setting Exercise (PSE) 2005 strayed from conventional ASARECA PSE methodology by adopting an innovative virtual approach designed to reduce production costs, expand participation, enhance efficiency and strengthen validity. AHI preferred to conduct the entire exercise trans-nationally using Internet media correspondence via centralized facilitation of communication, data collection, analysis, and output production. However, the 2005 AHI Priority Setting Exercise, though an overall success, was fraught with diverse challenges, lessons learnt, and insights gained for future virtual priority setting activities.

PRIORITY SETTING METHODOLOGY ADOPTED

Initially, fundamental knowledge and understanding of the ECA highland eco-region, of historically derived current human, socio-cultural, political, economic realities and consequently, environmental challenges and related processes, had to be consolidated before any prioritization of prospective research themes could be established. AHI, through this "Situation Analysis," presented its own unique mandate and comparative advantage of NRM in the ECA region, its achievements and lessons learned. The "Situational Analysis" was also drawn from a vast reservoir of cutting edge research and study from diverse 'experts' and scientists across a broad range of disciplines in the region and beyond. This trans-disciplinary approach, harnessed by AHI's strength as a network, provided participants of the PSE the NRM challenges (including a holistic understanding of influencing factors) that threaten agricultural productivity, rural livelihoods and national and regional perspectives, while suggesting strategic, effective, and innovative solutions to reversing environmental degradation for enhanced overall human wellbeing.

AHI produced an additional document, drawn from the Situational Analysis, classifying the ECA highland ego-region into nine major Livelihood Agro-Ecosystems (LAE) based on social, human, and environmental particularities which correlate directly with localized environmental livelihood threats and corresponding potential solutions. Moreover, this preparatory document presented 23 research themes established for prioritization by AHI, along the NRM research thrusts designed by ASARECA in 2003. Lastly, a detailed guide containing the PSE instructions for participants was prepared to standardize priority setting.

As the 2005 PSE was AHI's first attempt at virtual priority setting; the methodology of the exercise transformed iteratively and was modified according to challenges and difficulties faced. Moreover, it was clear that continual method refinement of virtual collaboration could yield greater cooperation and inter-institutional/expert teamwork rendering enhanced output.

CONDUCTING THE PSE – PHASE 1

The PSE itself was divided into two phases. In the first phase, "The Situational Analysis" and the "AHI Research Themes and Livelihood Agro-ecosystems" documents were distribute to a list of participants, selected for their good knowledge of NRM challenges and the ECA region for an interactive discussion over a period of two weeks. Prospective participants⁸ were encouraged to express their comments or critique, suggest amendments and/or modifications, and/or provide contributions to these documents for participatory added value and scientific pertinence. Subjectively orientated, participants were requested to draw their insights from their own unique experience, knowledge and expertise. Feedback was collected and internalized into the exercise, then anonymously re-disseminated to the entire forum stimulating further discussion.

We have received numerous variable responses with critique and suggestions for amendments⁹ to enhance the overall synthesis. The majority expressed sincere appreciation for the holistic comprehensiveness of the Situation presented. AHI's recognition of the current understanding of the environmental situation (in

⁸ Participants could only be ascertained by their response and feedback due to limitations of virtual correspondence.

⁹ Amendments related to concepts, theories, approaches, epistemology or ontology, often providing robust discussion over the latter's discourse

regards to INRM initiatives, stakeholder livelihood threats, including their political, economic, and socio-cultural influencing factors, current coping strategies and potential consequences), essentialises iterative involvement of that understanding through Situational Analysis. This was achieved through participatory feedback and discussion; open forum discussion efficiently identified fruitless disparage from relevant issues to be addressed. Virtual collaboration offered the capacity to strengthen institutional and inter-disciplinary collective action by transcending geographic derived limitations – participants’ location is irrelevant.

VIRTUAL COLLABORATION METHODOLOGY PRINCIPLES – LESSONS LEARNED

AHI learned many lessons and valuable principles regarding Virtual collaboration that must directly be considered when preparing a method of operation. Through rigorous analysis, including positive reflective critique, AHI’s knowledge of Virtual Collaboration possibilities and limitations offers insights many can benefit from. This knowledge, methodology derived, is presented in the following section.

Notwithstanding, the PSE phase 1 discussion clearly demonstrated that Virtual discussion, while possessing its own merits and limitations, can not substitute for ‘real’ inter-personal communication and collaboration. Innovative thought, reflection, dialectic, and ideas are often stimulated best through social interaction. Inter-personal collaboration is as perfect as its participants. Yet despite this potential, the logistics of bringing participants together from great distances and remote areas is demanding. The financial costs involved in accommodating, transporting, feeding, and tending to participants, are staggering. The time required host participants let alone the time required for participants to travel the globe, is often a luxury. Thus, sacrificed quality in virtual discussion can broaden participation itself.

While Virtual discussion provides obvious potential benefits and is more susceptible to the limitations formerly mentioned; its quality is not pre-ordained to superficiality due to its medium, but rather the time, discussion organization and strategy as well as degree of participant engagement. Luck plays a small role – a facilitator has neither control over participants’ time or will to participate. Yet, the same can be said of inter-personal collaboration. The potency of any discussion results is directly determined by the structured variables of operation the discussion is conducted upon. Open forums through extensive email lists are characterized by a vast majority of people not participation – one could illustrate the communication dynamics as ‘scientific tele-marketing.’ For every ten solicited, you may get one participant. Virtual discussions tendering strategically chosen potential participants who have previous collaboration or communicative relations are more likely to respond.

The true potency of Virtual collaboration is that the facilitator possesses complete freedom to design the discussion’s mode of operation given proper preparations. While collaborative discussion can be slowed, exercise durations are only limited by their pre-determined parameters.

A: Lack of Participation Accountability – participants in ‘face-to-face’ discussions, usually through workshops or professional cooperation, generally, attend the majority of pre-established sessions. Facilitators in Virtual discussions are powerless to control participation; it is entirely based upon the willingness of each participant, in addition to any technical problems encountered. Facilitators can only try to bombard participants with email or messages which often results in poor social relations. Facilitators must practise excellent diplomacy and consideration of participants’ time. Moreover, participants must be ‘cultivated;’ it’s fairly easy to block an email address. Contented and involved, they are more likely to participate in future collaborative initiatives.

The following examples illustrate a few of AHI’s experiences:

- Facilitator established deadlines were in large part, ignored
- Sent Receipts were ignored
- Very few individuals committed to participating
- AHI was required to wait until a sufficient number of participants had committed before closing deadlines for scoring phases.

B: Knowledge, Capacity, and Access: Evidently, it is unfortunate that the stakeholders of our collective work, the intended final beneficiaries of the priority setting exercise, predominately had no access to electricity, lack the financial resources to possess a computer, reside in remote locations lacking access to public computers, and certainly don't have technological enterprises offering internet services. Yet, in priority setting agricultural development initiatives targeting INRM, stakeholders possess the most pertinent information and knowledge of threats constraints and threats that AHI's research themes target due to stakeholders sophisticated local agro-ecological knowledge. This knowledge and farmer's priorities are documented by AHI, yet it will never substitute for direct stakeholder participation sadly. Virtual Collaboration is, and will presently, remain largely restricted to certain INRM actors.

Briefly concluding, the iterative methodology through constant development of its design, enabled AHI to conduct its priority setting exercise with participants from all over the ECA region, South Africa, Europe, North America, Asia and the South Pacific. AHI spent perhaps 1/10th of what would have been required to bring the same participants together in person. Results were established through participants contributions, the Situational Analysis became more comprehensive, a tool for all in INRM to hopefully use and contribute towards its continuous advancement. In addition, the PSE embodied institutional capacity building, collective action and information management and sharing, three distinct and critical areas AHI fundamentally advocates for positive INRM action impact.

The following examples illustrate a few of AHI's experiences:

- No farmers were among participants
- Remote locations and insufficient access to internet service restricted participation
- ISP service limited participation – bandwidth capacity for some was limited

POST DISCUSSION PHASE 1 – LAE PRIORITIZATION

After collecting substantial feedback and providing participants with enough time to study all documents thoroughly, one scoring sheet designed to prioritize the nine LAE, including complementary scoring instructions and guidelines, were disseminated via email to the entire participant list. Though continued discussion was encouraged, the facilitator established a consensus of the Situation Analysis for the purpose of continuing the exercise. Guiding the PSE within an acceptable time frame proved challenging as pressuring participants to conform any time frame risked losing them, especially without any form of participation guarantee or control.

Participants¹⁰, following the established scoring instructions, filled in the LAE prioritization scoring sheet and returned them to the central facilitator at AHI headquarters. Twenty-six scoring sheets were returned from more than 200 potential participants over three weeks, with about equal number to participants that could have been invited to PSE workshops if AHI had decided otherwise. The majority did not respond; many did not have the time resources to allocate to extensive documentation lecture and/or priority scoring. We postulate that lacking human contact in virtual correspondence played a major role. Paradoxically, virtual correspondence permitted the inclusion of many who would otherwise not be able to participate.

Scores identified the priority of the 9 LAE comparatively, according to five ASARECA criteria/objectives: Economic Growth, Social Welfare, Environmental Quality, Capacity Building, and Regionality (citation of the ASARECA document). Each LAE was scored according to how each criteria/objective contributed to, was fundamental to, and/or facilitated sustainable, positive impact in INRM innovations. LAE prioritization identified key sub-regions as points of departure for the most effective future INRM work positively contributing to livelihood wellbeing for the greatest amount of people. Five LAE were selected from the nine. Moreover, using its comparative advantage, AHI swapped one prioritized LAE for another which had not been prioritized due to imperative size and role within the ECA ecoregion. LAE established and scoring sheets collected, the facilitator began an analysis of Phase I, establish relationships, causes and probabilities while prioritizing criteria/objectives using participant's scores and their potential meaning.

¹⁰ Participants now refers to those who have responded and contributed by submitted filled in scoring sheets.

CONDUCTING THE PSE - PHASE 2

The second phase consisted of scoring 23 Research Themes' priority regarding potential positive impact and necessity for each of the five prioritized LAE. AHI personnel scored the research themes drawing upon the contributions and feedback of participants in the first phase. The majority consensus of the accuracy and thorough comprehensiveness of the Situational Analysis justified this methodology adjustment. Once all research themes for each prioritized LAE were scored, the facilitator analysed the data to establish a distinct priority order.

SCORING PRIORITY – METHOD OF ANALYSIS

A consistent method of analysing scores was used to establish priority. Each cell of each scoring sheet (LAE vs. criteria/objectives) was assigned a value ranging from 1 – 100, according to participants subjective opinion, experience, and understanding of the Situational Analysis, LAEs and Research Themes. Values assigned to each cell of each scoring sheet, were then modified by an ASARECA established weighting system. (SEE BELOW) Each criteria/objective possessed a specified value, all five totalling 100%. Thus, the criteria had been previously prioritized according to percentage weights, altering the impact of scores for each criteria, LAE, and Research Theme.

The five ASARECA criteria/objectives possessed the following weights: Economic Growth: 30%, Social Welfare: 23%, Environmental Quality: 20%, Capacity Building: 14% and Regionality: 13%. As a result, priority placed in Regionality and Capacity Building was diminished in favour of Economic Growth, Social Welfare and Environmental Quality, even if low priority was given to the latter.

LAE scores, according to ASARECA objective/criteria, modified by the weighting scheme, were summed for each LAE. Simple division produced an overall mean score for each. This was done with each of the twenty-six contributions from participants. The same method produced a mean score for each LAE across all 26 scoring sheets. Priority was established by ranking each from the highest overall mean LAE score to the lowest.

Research Themes were scored in an identical manner for consistency. Each theme was scored against the same five ASARECA criteria. For each research theme, an overall mean score was established. Once overall research theme mean scores were established, an initial priority ranking was finalized. Examination of the priority ranks revealed inconsistencies with AHI's mandate and overall institutional objectives detailed in Phase 4 (of AHI, not the PSE). Therefore, priority was increased and decreased in certain themes to correspond to AHI priorities.

PRIORITY SEQUENCING

Four fundamental pillars or paradigms for prospective INRM innovations were established. These paradigms are Technological Innovations, Institutions, Policies, and Information. The four pillars were then analysed and placed into a rational order of sequence. Information (knowledge systems, knowledge management/sharing) were identified as 'the' point of departure for future INRM innovation to create any sustainable positive impact. From this fundamental base, the three remaining pillars emerge with equal importance, consistently linked and revolving around the root of Knowledge. Within each pillar, research themes were assigned according to their final priority rank, relative to their pillar, and established a chronological path for future INRM work that would yield the greatest positive results. Sequenced research themes thus provide a rational order for INRM initiative. The model of sequencing may change according to which LAE is being addressed.

Results from reflection and discussion, during and after the PSE, clearly advocated that stakeholder empowerment for sustainable INRM action was dependant upon knowledge sharing, management, emancipation, reinforcement, and capacity building at all levels.

Scoring Results of the PSE

FINAL LIVELIHOOD AGRO-ECOSYSTEM SCORING SHEET AND RESULTS

INRM Criteria	Economic Growth	Social Welfare	Environmental Quality	Capacity Building	Regionality
	Size of the base & Change in the base, wrt costs, value added along the resource-to-consumption chain, spillovers, new markets etc. ASK the question is the effect on:	Improving Nutrition and health Targeting – poor, women and youth Building social capital and reducing conflicts Reducing risk Benefit sharing.	Erosion and pollutions - minimization Resilience and productivity - Enhancement Environmental services - Improved Investments to conservation - increased	Institutional capacity, Human resources in specialized areas New approaches and research methods Increased productivity of labour Platforms for negotiation Improved decision making	Economies of scale in searching for solutions Require wider global partnerships Improve sharing across countries
A lot of people in a big way and more quickly Few people in a small way and slowly		A large area in a big way and more quickly a small area in a small way and slowly	A lot of experts in a big way and more quickly Few experts in a small way and slowly	Relevant to all countries in a big way Relevant to one country in a small way	
AHI Livelihood Agro-Ecosystems					
LAE 1: Common Property Areas with Important Biodiversity Assets	1415 (54.4) 16.32	1685 (64.8) 14.90	2030 (78) 15.6	1520 (58.4) 8.18	1655 (63.7) 8.28
LAE 2: ‘Water towers’, highlands surrounded by lake basins & their lowlands	1805 (69.4) 20.82	1965 (75.6) 17.38	2110 (81.2) 16.24	1690 (65.8) 9.21	1785 (68.7) 8.93
LAE 3: Intensive & highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall but <i>distant</i> from major markets	1590 (61.2) 18.36	1850 (71.2) 16.38	1780 (68.5) 13.7	1710 (65.8) 9.21	1575 (60.6) 7.88
LAE 4: Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils/rainfall and <i>close</i> from major markets / population centres	1885 (72.5) 21.75	1950 (75) 17.25	1860 (71.5) 14.3	1725 (66.3) 9.28	1600 (61.5) 7.99
LAE 5: Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils/rainfall and <i>close</i> to major markets / population centres	1770 (68) 20.4	1910 (73.5) 16.90	1935 (74.4) 14.88	1815 (69.8) 9.77	1545 (59.4) 7.72

INRM Criteria	Economic Growth	Social Welfare	Environmental Quality	Capacity Building	Regionality
	Size of the base & Change in the base, wrt costs, value added along the resource-to-consumption chain, spillovers, new markets etc. ASK the question is the effect on:	Improving Nutrition and health Targeting – poor, women and youth Building social capital and reducing conflicts Reducing risk Benefit sharing.	Erosion and pollutions - minimization Resilience and productivity - Enhancement Environmental services - Improved Investments to conservation - increased	Institutional capacity, Human resources in specialized areas New approaches and research methods Increased productivity of labour Platforms for negotiation Improved decision making	Economies of scale in searching for solutions Require wider global partnerships Improve sharing across countries
	A lot of people in a big way and more quickly Few people in a small way and slowly	A large area in a big way and more quickly a small area in a small way and slowly	A lot of experts in a big way and more quickly Few experts in a small way and slowly	Relevant to all countries in a big way Relevant to one country in a small way	
LAE 6: Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils/rainfall and <i>distant</i> from major markets	1307 (50.3) 15.09	1815 (69.8) 16.05	1805 (69.4) 13.88	1623 (62.4) 8.74	1515 (58.3) 7.58
LAE 7: <i>Extensive</i> less diversified systems with moderate to steep slopes, relatively <i>poor</i> soils, <i>one</i> growing season & frost hazard, <i>distant</i> from major markets	1220 (46.9) 14.07	1660 (63.8) 14.67	1680 (64.6) 12.92	1555 (59.8) 8.37	1215 (46.7) 6.07
LAE 8: Peri-urban and nearby highland areas greatly influenced by urban centres	1815 (69.8) 20.94	1760 (67.7) 15.57	1875 (72.1) 14.42	1490 (57.3) 8.02	1555 (59.8) 7.77
LAE 9: Vulnerable areas & groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition	1525 (58.7) 17.61	2115 (81.3) 18.6	1785 (68.7) 13.74	1760 (67.7) 9.48	1770 (68) 8.84

ASARECA Weighted Objectives (Criteria)

30%

23%

20%

14%

13%

- 1) The first score (eg: 1415) represents the sum of all participant scores for one LAE prioritized by ASARECA criteria or objective.
- 2) The second number (eg: (46.9)), closed in parenthesis, is the primary score divided by the total number of participants to establish a mean.
- 3) The last score, large and bold, (eg: **16.32**) represents the mean score adjusted to established ASARECA weights for criteria or objectives.

LAE final weighted mean scores:

LAE RANK according to mean weighted Score

LAE 1 = 12.656
LAE 2 = 14.516
LAE 3 = 13.106
LAE 4 = 14.114
LAE 5 = 13.934
LAE 6 = 12.268
LAE 7 = 11.220
LAE 8 = 13.344
LAE 9 = 13.654

LAE 2 = 14.516
LAE 4 = 14.114
LAE 5 = 13.934
LAE 9 = 13.654
LAE 8 = 13.344*
LAE 3 = 13.106*
LAE 1 = 12.656
LAE 6 = 12.268
LAE 7 = 11.220

* LAE 8 was de-prioritized in favour of LAE 3 due to its regional importance identified through AHI's comparative advantage

AAI RESEARCH THEME PRIORITY – SCORING SHEETS FOR EACH PRIORITIZED LAE

Each scored cell 1-100.

Selected Prioritized Livelihood Agro-ecosystem – Rank 1 LAE 2 – Water Towers ‘Water towers’ – Major mountain features draining into lake basins and lowlands	Economic Growth - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets	Social Welfare - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing.	Environmental Quality - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased	Capacity Building - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making	Regionality - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries	
	A lot of people in a big way and more quickly (higher score) Few people in a small way and slowly (lower score)		A large area in a big way and more quickly a small area in a small way and slowly		A lot of experts in a big way and more quickly Few experts in a small way and slowly	
ASARECA NRM IR1 – INCREASED RETURNS AND INVESTMENT TO NRM FROM NATURAL RESOURCE ENTERPRISE DEVELOPMENT						
AHI 1.1: More effective participation in resource to consumption chains	18	13.8	2	9.8	12.35	
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	18	13.8	8	9.8	4.55	
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	24	20.7	11	13.3	7.8	
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	24	18.4	17	9.8	8.45	

ASARECA NRM IR2 – REDUCED VULNERABILITY BY IMPROVED NRM STRATEGIES FOR ADAPTING TO AND COPING WITH CRISES AND SHOCKS

AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	3	18.4	4	14	5.85
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	15	20.7	15	11.2	8.45
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	21	17.25	13	14	11.7

ASARECA NRM IR3 – ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY

AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	12	9.2	14	11.2	11.7
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	24	18.4	20	8.4	8.45

ASARECA NRM IR4 – IMPROVED BENEFITS FROM CONSERVED AND VALUED ENVIRONMENTAL SERVICES

AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	16.5	11.5	20	12.6	11.7
AHI 4.2: Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	22.5	18.4	16	13.3	12.35

ASARECA NRM IR5 – IMPROVED INCENTIVES TO INVEST IN NRM BY PRIMARY USERS, GOVERNMENTS AND OTHER STAKEHOLDERS

AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios	7.5	5.75	9	14	9.75
AHI 5.2: Support to community-action policy and by-law reform improves local NRM	9	18.4	15	14	13
AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support	6	16.1	19	14	13

ASARECA NRM IR6 – STRENGTHENED INSTITUTIONS AND SOCIAL CAPITAL IMPROVE GOVERNANCE AND SUPPORT TO NRM

AHI 6.1: Local residents equitably engage and participate in integrated watershed management	12	21.85	20	11.2	13
AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor	15	16.1	10	12.6	7.8
AHI 6.3: Research institutions have improved their support for their staff implementing INRM	15	18.4	18	13.3	7.15
AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development	18	20.7	18	11.7	7.15

ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT

AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries	7.5	10.35	12	14	13
AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions	7.5	12.65	12	14	13
AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach	10.5	16.1	13	14	13

ASARECA NRM IR8 – AMPLIFIED IMPACT BY EFFECTIVE KNOWLEDGE MANAGEMENT, BROKERING AND SHARING

AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders	12	18.4	13	14	9.75
AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies	16.5	16.1	12	12.6	13

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 2</p> <p>LAE 4</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall and <i>close</i> to major markets / population centres</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved - Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	

ASARECA NRM IR1 – INCREASED RETURNS AND INVESTMENT TO NRM FROM NATURAL RESOURCE ENTERPRISE DEVELOPMENT

AHI 1.1: More effective participation in resource to consumption chains	30	16.1	5	6.3	5.85
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	27	10.35	10	6.3	3.9
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	19.5	18.4	16	13.3	3.25
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	10.5	19.55	18	3.5	6.5

ASARECA NRM IR2 – REDUCED VULNERABILITY BY IMPROVED NRM STRATEGIES FOR ADAPTING TO AND COPING WITH CRISES & SHOCKS

AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	12	23	8	14	6.5
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	15	17.25	16	10.5	10.4
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	6	18.4	10	11.9	9.75

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 2</p> <p>LAE 4</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall and <i>close</i> to major markets / population centres</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
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	<p>ASARECA NRM IR3 – ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY</p>				

AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	15	11.5	16	11.2	11.7
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	28.5	14.95	18	5.6	10.4

<p>ASARECA NRM IR4 – IMPROVED BENEFITS FROM CONSERVED AND VALUED ENVIRONMENTAL SERVICES</p>					
AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	15	18.4	18	7.7	10.4
AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	12	18.4	17	13.3	12.35

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 2</p> <p>LAE 4</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall and <i>close</i> to major markets / population centres</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	

ASARECA NRM IR5 – IMPROVED INCENTIVES TO INVEST IN NRM BY PRIMARY USERS, GOVERNMENTS AND OTHER STAKEHOLDERS

AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios	10.5	10.35	17	11.2	13
AHI 5.2: Support to community-action policy and by-law reform improves local NRM	16.5	19.55	19	12.6	4.55
AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support	10.5	19.55	14	14	12.35

ASARECA NRM IR6 – STRENGTHENED INSTITUTIONS AND SOCIAL CAPITAL IMPROVE GOVERNANCE AND SUPPORT TO NRM

AHI 6.1: Local residents equitably engage and participate in integrated watershed management	15	23	18	11.2	13
AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor	15	23	11	12.6	9.75
AHI 6.3: Research institutions have improved their support for their staff implementing INRM	6	10.35	12	14	9.75
AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development	12	8.05	15	12.6	11.7

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 2</p> <p>LAE 4</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall and <i>close</i> to major markets / population centres</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>				

<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>					
<p>AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries</p>	12	9.2	15	13.3	13
<p>AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions</p>	3	10.35	9	14	11.7
<p>AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach</p>	4.5	17.25	12	13.3	12.35

<p>ASARECA NRM IR8 – AMPLIFIED IMPACT BY EFFECTIVE KNOWLEDGE MANAGEMENT, BROKERING AND SHARING</p>					
<p>AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders</p>	15	20.7	18	14	13
<p>AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies</p>	16.5	13.8	16	13.3	13

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 3</p> <p>LAE 5</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils and rainfall and <i>close</i> to major markets / population centres;</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	

ASARECA NRM IR1 – INCREASED RETURNS AND INVESTMENT TO NRM FROM NATURAL RESOURCE ENTERPRISE DEVELOPMENT

AHI 1.1: More effective participation in resource to consumption chains	25.5	19.55	2	5.6	5.85
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	34.65	13.8	10	5.6	9.75
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	16.5	18.4	8	12.6	6.5
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	9	11.5	17	9.1	9.75

ASARECA NRM IR2 – REDUCED VULNERABILITY BY IMPROVED NRM STRATEGIES FOR ADAPTING TO AND COPING WITH CRISES & SHOCKS

AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	3	17.25	11	12.6	8.45
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	10.5	8.05	7	7.7	11.05
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	4.5	16.1	10	8.4	8.45

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 3</p> <p>LAE 5</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils and rainfall and <i>close</i> to major markets / population centres;</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR3 – ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY</p>				

<p>ASARECA NRM IR3 – ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY</p>					
<p>AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders</p>	15	11.5	16	11.2	11.7
<p>AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives</p>	7.5	5.75	15	5.6	8.45

<p>ASARECA NRM IR4 – IMPROVED BENEFITS FROM CONSERVED AND VALUED ENVIRONMENTAL SERVICES</p>					
<p>AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders</p>	19.5	10.35	18	9.8	7.8
<p>AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation</p>	25.5	12.65	10	5.6	7.8

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 3</p> <p>LAE 5</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils and rainfall and <i>close</i> to major markets / population centres;</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR5 – IMPROVED INCENTIVES TO INVEST IN NRM BY PRIMARY USERS, GOVERNMENTS AND OTHER STAKEHOLDERS</p>				

<p>AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios</p>	3	11.5	18	10.5	13
<p>AHI 5.2: Support to community-action policy and by-law reform improves local NRM</p>	10.5	21.85	20	12.6	13
<p>AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support</p>	6	12.65	18	12.6	13

ASARECA NRM IR6 – STRENGTHENED INSTITUTIONS AND SOCIAL CAPITAL IMPROVE GOVERNANCE AND SUPPORT TO NRM

<p>AHI 6.1: Local residents equitably engage and participate in integrated watershed management</p>	7.5	18.4	19	11.2	12.35
<p>AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor</p>	15	11.5	13	13.3	11.7
<p>AHI 6.3: Research institutions have improved their support for their staff implementing INRM</p>	6	9.2	10	12.6	13
<p>AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development</p>	10.5	8.05	11	11.9	13

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 3</p> <p>LAE 5</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>poor</i> soils and rainfall and <i>close</i> to major markets / population centres;</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>				

<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>					
<p>AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries</p>	9	6.9	10	11.9	13
<p>AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions</p>	4.5	5.75	10	11.9	13
<p>AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach</p>	12	14.95	13	12.6	11.05

<p>ASARECA NRM IR8 – AMPLIFIED IMPACT BY EFFECTIVE KNOWLEDGE MANAGEMENT, BROKERING AND SHARING</p>					
<p>AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders</p>	21	21.85	16	13.3	10.4
<p>AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies</p>	21	16.1	15	11.9	13

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 4</p> <p>LAE 9</p> <p>Vulnerable areas & groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	

ASARECA NRM IR1 – INCREASED RETURNS AND INVESTMENT TO NRM FROM NATURAL RESOURCE ENTERPRISE DEVELOPMENT

AHI 1.1: More effective participation in resource to consumption chains	12	10.35	4	9.1	7.8
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	9	8.05	4	4.9	5.85
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	12	8.05	9	9.1	6.5
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	12	9.2	7	5.6	4.55

ASARECA NRM IR2 – REDUCED VULNERABILITY BY IMPROVED NRM STRATEGIES FOR ADAPTING TO AND COPING WITH CRISES & SHOCKS

AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	21	18.4	12	11.2	9.1
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	19.5	19.55	19	6.3	12.35
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	19.5	20.7	13	13.3	12.35

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 4</p> <p>LAE 9</p> <p>Vulnerable areas & groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR3 – ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY</p>				

ASARECA NRM IR3 – ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY					
AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	15	11.5	14	8.4	10.4
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	24	17.25	13	9.8	8.45

ASARECA NRM IR4 – IMPROVED BENEFITS FROM CONSERVED AND VALUED ENVIRONMENTAL SERVICES					
AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	12	10.35	17	5.6	9.75
AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	19.5	10.35	10	7.7	9.1

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 4</p> <p>LAE 9</p> <p>Vulnerable areas & groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	

ASARECA NRM IR5 – IMPROVED INCENTIVES TO INVEST IN NRM BY PRIMARY USERS, GOVERNMENTS AND OTHER STAKEHOLDERS

AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios	15	8.05	7	9.1	11.7
AHI 5.2: Support to community-action policy and by-law reform improves local NRM	19.5	18.4	15	11.9	9.1
AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support	3	12.65	13	11.9	8.45

ASARECA NRM IR6 – STRENGTHENED INSTITUTIONS AND SOCIAL CAPITAL IMPROVE GOVERNANCE AND SUPPORT TO NRM

AHI 6.1: Local residents equitably engage and participate in integrated watershed management	4.5	20.7	20	7.7	13
AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor	19.5	19.55	8	10.5	9.1
AHI 6.3: Research institutions have improved their support for their staff implementing INRM	6	8.05	6	6.3	12.35
AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development	10.5	12.65	8	6.3	11.05

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 4</p> <p>LAE 9</p> <p>Vulnerable areas & groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>				

<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>					
<p>AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries</p>	6	6.9	8	7	11.7
<p>AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions</p>	6	5.75	6	5.6	11.7
<p>AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach</p>	9	12.65	15	9.1	10.4

<p>ASARECA NRM IR8 – AMPLIFIED IMPACT BY EFFECTIVE KNOWLEDGE MANAGEMENT, BROKERING AND SHARING</p>					
<p>AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders</p>	12	17.25	11	10.5	11.7
<p>AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies</p>	12	9.2	13	7.7	11.7

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 5</p> <p>LAE 3</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall but <i>distant</i> from major markets</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	

ASARECA NRM IR1 – INCREASED RETURNS AND INVESTMENT TO NRM FROM NATURAL RESOURCE ENTERPRISE DEVELOPMENT

AHI 1.1: More effective participation in resource to consumption chains	27	13.8	6	9.8	9.1
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	18	20.7	6	11.2	5.2
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	12	23	14	14	9.1
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	30	11.5	10	14	13

ASARECA NRM IR2 – REDUCED VULNERABILITY BY IMPROVED NRM STRATEGIES FOR ADAPTING TO AND COPING WITH CRISES & SHOCKS

AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	9	18.4	8	14	10.4
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	15	23	10	14	7.8
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	18	23	10	14	9.1

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 5</p> <p>LAE 3</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall but <i>distant</i> from major markets</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR3 – ENHANCED PRODUCTIVITY FROM RESTORED AND IMPROVED ECOSYSTEMS INTEGRITY</p>				

AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	24	18.4	16	11.2	10.4
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	24	18.4	16	11.2	10.4

<p>ASARECA NRM IR4 – IMPROVED BENEFITS FROM CONSERVED AND VALUED ENVIRONMENTAL SERVICES</p>					
AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	12	23	20	14	11.7
AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	18	23	12	11.2	13

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 5</p> <p>LAE 3</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall but <i>distant</i> from major markets</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR5 – IMPROVED INCENTIVES TO INVEST IN NRM BY PRIMARY USERS, GOVERNMENTS AND OTHER STAKEHOLDERS</p>				

<p>AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios</p>	12	13.8	12	11.2	13
<p>AHI 5.2: Support to community-action policy and by-law reform improves local NRM</p>	18	23	16	11.2	13
<p>AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support</p>	12	16.1	12	14	13

ASARECA NRM IR6 – STRENGTHENED INSTITUTIONS AND SOCIAL CAPITAL IMPROVE GOVERNANCE AND SUPPORT TO NRM

<p>AHI 6.1: Local residents equitably engage and participate in integrated watershed management</p>	18	23	20	14	13
<p>AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor</p>	12	23	10	14	7.8
<p>AHI 6.3: Research institutions have improved their support for their staff implementing INRM</p>	6	13.8	12	11.2	7.8
<p>AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development</p>	15	13.8	16	14	13

<p>Selected Prioritized Livelihood Agro-ecosystem –</p> <p>Rank 5</p> <p>LAE 3</p> <p>Intensive and highly diversified systems with steep slopes, relatively <i>good</i> soils and rainfall but <i>distant</i> from major markets</p>	<p>Economic Growth</p> <ul style="list-style-type: none"> - Increases the size - Increases the scope - Decreases the costs, - Improves value added along the resource-to-consumption chain, - Heightens spillovers - Creates new markets 	<p>Social Welfare</p> <ul style="list-style-type: none"> - Improves nutrition and health - Targets the poor, women and youth - Builds social capital and reducing conflicts - Reduces risk - Increases benefit sharing. 	<p>Environmental Quality</p> <ul style="list-style-type: none"> - Minimization of erosion and pollutions - Resilience and productivity enhancement - Environmental services improved Investments to conservation increased 	<p>Capacity Building</p> <ul style="list-style-type: none"> - Increases institutional capacity - Improves human resources in specialized areas - Provides new approaches and research methods - Increases productivity of labor - Build platforms for negotiation - Improved decision making 	<p>Regionality</p> <ul style="list-style-type: none"> - Improves economies of scale in searching for solutions - Requires wider global partnerships - Improves sharing across countries
	<p>A lot of people in a big way and more quickly (higher score)</p> <p>.....</p> <p>Few people in a small way and slowly (lower score)</p>	<p>A large area in a big way and more quickly</p> <p>.....</p> <p>a small area in a small way and slowly</p>	<p>A lot of experts in a big way and more quickly</p> <p>.....</p> <p>Few experts in a small way and slowly</p>	<p>Relevant to all countries in a big way</p> <p>.....</p> <p>Relevant to one country in a small way</p>	
	<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>				

<p>ASARECA NRM IR7 – STRENGTHENED CAPACITIES AND COMPETENCIES IN NRM RESEARCH FOR DEVELOPMENT</p>					
<p>AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries</p>	24	18.4	20	14	13
<p>AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions</p>	12	11.5	16	14	13
<p>AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach</p>	9	13.8	16	14	13

<p>ASARECA NRM IR8 – AMPLIFIED IMPACT BY EFFECTIVE KNOWLEDGE MANAGEMENT, BROKERING AND SHARING</p>					
<p>AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders</p>	24	23	16	14	10.4
<p>AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies</p>	18	23	20	11.2	10.4

AHI RESEARCH THEME PRIORITY RESULTS

	Sub Scores				
	LAE 2	LAE 3	LAE 4	LAE 5	LAE 9
ASARECA NRM IR1					
AHI 1.1: More effective participation in resource to consumption chains	11.19	13.14	12.65	12.87	8.65
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	10.85	12.22	11.9	14.76	6.36
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	15.36	14.42	14.09	12.4	8.93
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	15.53	15.7	11.61	11.27	7.67
ASARECA NRM IR2					
AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	9.05	11.96	12.7	10.46	14.34
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	14.07	13.96	13.83	8.86	15.34
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	15.39	14.82	11.21	9.49	15.77
ASARECA NRM IR3					
AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	11.62	16	13.08	13.08	11.86
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	15.85	16	15.49	8.46	14.5
ASARECA NRM IR4					
AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	14.46	16.14	13.9	13.09	10.94
AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	16.51	15.44	14.61	12.31	9.53
ASARECA NRM IR5					
AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios	9.2	12.4	12.41	11.2	10.17
AHI 5.2: Support to community-action policy and by-law reform improves local NRM	13.88	16.24	14.44	15.59	14.78
AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support	13.62	13.42	14.08	12.45	9.8

ASARECA NRM IR6					
AHI 6.1: Local residents equitably engage and participate in integrated watershed management	15.61	17.6	16.04	13.69	13.18
AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor	12.3	13.36	14.27	12.9	13.33
AHI 6.3: Research institutions have improved their support for their staff implementing INRM	14.37	10.16	10.42	10.16	7.74
AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development	15.11	14.36	11.87	10.89	9.76
ASARECA NRM IR7					
AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries	11.37	17.88	12.5	10.16	7.92
AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions	11.83	13.3	9.61	9.03	7.01
AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach	13.32	13.16	11.88	12.72	11.23
ASARECA NRM IR8					
AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders	13.43	17.46	16.14	16.51	12.49
AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies	14.04	16.52	14.52	15.4	10.72

TOTAL SCORE BY THEME: (23 RESEARCH THEMES)

1.1: 58.5	3.1: 65.64	6.1: 76.12	8.1: 76.03
1.2: 56.09	3.2: 70.3	6.2: 66.16	8.2: 71.2
1.3: 65.2		6.3: 52.85	8.1: 76.03
1.4: 61.08	4.1: 68.53	6.4: 61.99	
	4.2: 68.4		
2.1: 58.51		7.1: 59.83	
2.2: 66.06	5.1: 55.38	7.2: 50.78	
2.3: 66.68	5.2: 74.93	7.3: 62.31	
	5.3: 63.37	6.1: 76.12	

Prioritization has been set by adding all five LAE scores for each theme together to establish a sum - The greater the sum, the greater the rank.

The prioritization method had to be changed due to the inclusion of LAE 3, the omission of 8, and the decision to include the priorities of lower echelon research themes.

AHI RESEARCH THEME ECA REGIONAL PRIORITIZATION BY OVERALL RANKING

AHI Theme	Total Score	RANK or Priority
AHI 6.1: Local residents equitably engage and participate in integrated watershed management	76.12	1
AHI 8.1: Efficiency and effectiveness of INRM research is enhanced by increased information availability and a knowledge sharing culture among R&D stakeholders	76.03	2
AHI 5.2: Support to community-action policy and by-law reform improves local NRM	74.93	3
AHI 8.2: Effective scaling up and out mechanisms improves development practices and strategies	71.2	4
AHI 3.2: Highland farm systems are sustainably intensified and diversified to satisfy multiple household objectives	70.3	5
AHI 4.1: Improved management of highland resources ensures environmental services (ES) and biodiversity for multiple stakeholders	68.53	6
AHI 4.2 Increased benefits are shared by stakeholders due to various types of policy instruments, strategies, valuation and compensation mechanisms for ES and biodiversity conservation	68.4	7
AHI 2.3: Improved preparedness, crisis management and governance strengthens local structures and assets	66.68	8
AHI 6.2: Service and support organizations more effectively strengthen the capacity of the rural poor	66.16	9
AHI 2.2: Improved impact of policies, R&D strategies and approaches used by key development actors to help vulnerable groups	66.06	10
AHI 3.1: Integrated management of watersheds and landscape niches better satisfies multiple needs of multiple stakeholders	65.64	11
AHI 1.3: Local communities demand and receive better quality services and support systems to ensure successful enterprises	65.2	12
AHI 5.3: Improved dialogue between constituents and policy shapers enhances NRM policy support	63.37	13
AHI 7.3: Strengthened regional mechanism for coordination and collaboration to develop and use the INRM approach	62.31	14
AHI 6.4: Functioning innovation systems improve the institutional arrangements necessary for improving NRM and enterprise development	61.99	15
AHI 1.4: Better policies and R&D strategies increase investment in product development and in NRM	61.08	16
AHI 7.1: Create a critical mass of skilled NARS personnel for conducting effective INRM R4D in ASARECA countries	59.83	17
AHI 2.1: Traditional coping strategies and options bolstered so as to reduce vulnerability and risk	58.51	18
AHI 1.1: More effective participation in resource to consumption chains	58.5	19
AHI 1.2: Potential markets are identified and analyzed and marketing strategies developed for high value products and environmental services	56.09	20
AHI 5.1: Quality of global and continental NRM conventions, treaties and large scale strategy sessions is enhanced by better data and analysis of highland scenarios	55.38	21
AHI 6.3: Research institutions have improved their support for their staff implementing INRM	52.85	22
AHI 7.2: Improved inter-institutional collaboration and partnerships of INRM training and capacity building institutions	50.78	23

LAE RANKING

LAE No.	Rank
LAE 2	1*
LAE 4	2*
LAE 5	3*
LAE 9	4*
LAE 3	5*
LAE 8	6
LAE 1	7
LAE 6	8
LAE 7	9

SUMMARY DESCRIPTION OF LAE

1. Buffer Zone Areas near Important Biodiversity Assets (buffer zones);
2. 'Water towers' – Major mountain features draining into lake basins and lowlands;
3. Intensive and highly diversified systems with steep slopes, relatively *good* soils and rainfall but *distant* from major markets;
4. Intensive and highly diversified systems with steep slopes, relatively *good* soils and rainfall and *close* to major markets / population centres;
5. Intensive and highly diversified systems with steep slopes, relatively *poor* soils and rainfall and *close* to major markets / population centres;
6. Intensive and highly diversified systems with steep slopes, relatively *poor* soils and rainfall and *distant* from major markets;
7. *Extensive* less diversified systems with moderate to steep slopes, relatively *poor* soils, *one* growing season and frost hazard, *distant* from major markets;
8. Peri-urban and nearby highland areas greatly influenced by urban centres;
9. Vulnerable areas and groups due to climate, war, health issues, increased competition for scarce resources, very high levels of poverty, and NR exploitation / condition

AHI RESEARCH THEME PRIORITY SEQUENCING AND MODELLING

AHI's prioritized research themes span a broad spectrum of complex issues due to the holistic approach adopted for prospective INRM, maximizing potential positive impact towards stakeholder livelihood well-being, the environment the mandated entry point for change. The East African Highlands are rapidly exhausting their fertility and biodiversity due to environmental degradation resulting from diverse factors. These soils, potentially, are amongst the richest worldwide, are in such decay the future of agricultural production and peoples' prosperity hangs precariously by a thread. The highest population density in East Africa can be found in the highlands, their livelihoods dependent upon the ecoregion's environmental quality. Yet, as a group, they are amongst the poorest and most destitute; millions face starvation and death each year. As their ecosystems continue to degrade, so does their chance of reversing ecosystemic decline and livelihood sustainability. East African food security abroad depends upon highland agricultural production, feeding more than 50% percent of the sub-continental population. Innovative holistic strategies to INRM intervention are critical to avoid a widespread catastrophic food shortage in the coming years.

Through lessons learnt from past NRM strategy and intervention that has yet to reverse environmental degradation in the ecoregion nor provide reprieve from the appalling impoverished condition of human livelihoods, prospective INRM strategies are drawn from the results of the priority setting exercise. AHI has determined that the following research strategy models can offer pre-requisite interventions or INRM vectors considering the critical need and non-existent luxury of time. Delay only translates into prolonged suffering, starvation and lives lost.

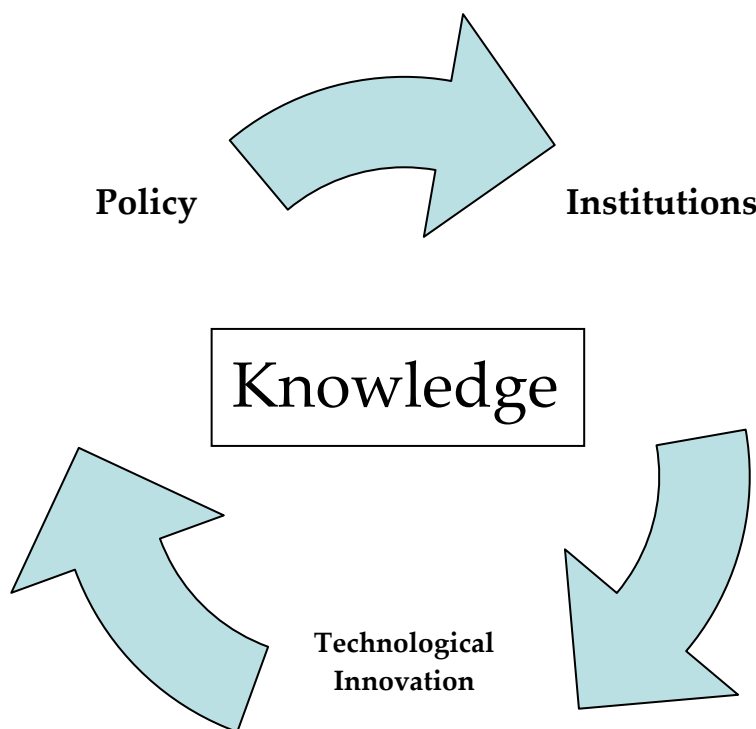
Prioritized LAE and INRM Strategy

Phase 1 identified the most critically important LAE (five selected from nine) for targeted action based upon a) the greatest volume of livelihoods and area positively impacted, b) in the shortest time period for INRM return, c) LAE facing the gravest environmental degradation. Each LAE requires specific interventions concurrent with environmental issues at stake and their root causes. For each LAE prioritized, research themes are sequenced to maximize positive impact by acknowledging pre-requisite entry points and innovative interventions for sustainability.

Sequencing

AHI has established four critical “foundations” or paradigms in which the most critical challenges are imbedded. They are, **Institutions, Policy, Technological Innovation, and Knowledge**. All prioritized research themes, according to LAE, are sequenced through these “foundations” establishing “points of entry” critical to further intervention success. All strategy must mainstream **Knowledge** into its approach to create a cohesive foundation upon which all other INRM depends. **Institutions, Policy, and Technological Innovation** require the fundament of **knowledge** to structure success.

Knowledge is the axis around which **Institutions, Policy, and Technological Innovation** revolve. Sequencing design is illustrated below.



Knowledge – Catalyzing INRM Returns

Special attention is devoted to knowledge to emancipate its comprehensive understanding for INRM strategy and action. Knowledge as the critical point of departure for INRM includes the following elements:

- Information accessibility;
- The learning culture,
- Knowledge systems' equitable capacity;
- Information management and control;
- Education (knowledge transmission);
- Existing knowledge discourse;
- Relationships of power (wealth) between knowledge systems;
- Influencing perceptions of socio-cultural identity and value;
- Stakeholder perceptions of knowledge capacity potential;
- Capacity building;
- Stakeholder empowerment;

Science provides useful tools for change, but institutionalized denunciation of alternative knowledge system contributions derived from knowledge-based discourse and inequitable relationships of power only cripple INRM potential for positive change. People perceive the value of their cultural identity and heritage through a variety of historic and current factors. Amongst these factors, knowledge ranks amongst the highest. Indeed, INRM cannot achieve its goals if stakeholders remain dependent upon knowledge intervention. They cannot be empowered if they must rely upon other peoples' knowledge, science included, to solve the problems they encounter. Empowering stakeholders starts with knowledge, stakeholder knowledge.

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