



# Navigating amidst complexity – Guide to manage R&D intervention for improving livelihoods and the environment

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# Navigating amidst complexity

Guide to implementing effective research and development to improve livelihoods and the environment



Bruce M. Campbell • Jürgen Hagmann  
Ann Stroud • Richard Thomas • Eva Wollenberg

# **Navigating amidst complexity**

**Guide to implementing effective research  
and development to improve livelihoods  
and the environment**

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# List of Abbreviations

AHI	African Highlands Initiative
CBNRM	community-based natural resource management
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIFOR	Center for International Forestry Research
ICDP	integrated conservation and development program
ICARDA	International Centre for Agricultural Research in Dry Areas
ICRAF	World Agroforestry Centre
INRM	integrated natural resource management
M&E	Monitoring and evaluation
NGO	non-government organisation
NRM	natural resource management
PAR	participatory action research
R&D	research and development
UNCBD	United Nations Convention on Biological Diversity

# About Authors

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**Eva (Lini) Wollenberg** has been actively involved with governance and livelihoods analyses at CIFOR, with a particular passion for participatory action research.

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# The purpose of this guide

This guide is mainly for researchers already involved in natural resource management (NRM). It assumes some familiarity with the often complex and chaotic reality of NRM projects, and tries to provide a systematic treatment of all the issues that may need to be considered. In some ways it is too detailed! While many issues are considered in the guide, only a subset of them have to be dealt with in any specific NRM project. This booklet will also be of interest to implementers of NRM projects, as many of the elements and strategies are common to research and implementation.

The guide is all about improving the effectiveness of research and development (R&D) in NRM, so that livelihood and environmental outcomes are enhanced. What is described here can be thought of as a “new way of doing business” for R&D in natural resource management, but builds on approaches in the agricultural, conservation and governance fields.

- Section 1 explains why we need to increase the effectiveness of R&D. The section indicates how a more integrated approach has evolved and illustrates how it can be applied (Section 1.4). For the sceptics of holism and integration, we clarify that achieving holism is often impossible and can be counter-productive (Section 1.5).
- Section 2 briefly describes the foundations of the approach.
- Section 3 of the publication covers the operational cornerstones for effective R&D interventions.
- Section 4 discusses the management of research for development processes
- Section 5 concludes.

The foundations and operational cornerstones were established during a series of four workshops involving over 200 scientists from the CGIAR and its partners. Specialists were drawn from the full spectrum of land use systems and NRM perspectives: conservation, forestry, fisheries, irrigated agriculture, dryland agriculture, and livestock production – covering the humid to arid tropics. All relevant disciplines were represented. The authors have used the workshop results as building blocks, and fleshed out the elements and strategies based on their own and other experiences.

# 1

## Why do we need a guide for more effective R&D interventions in natural resource management?

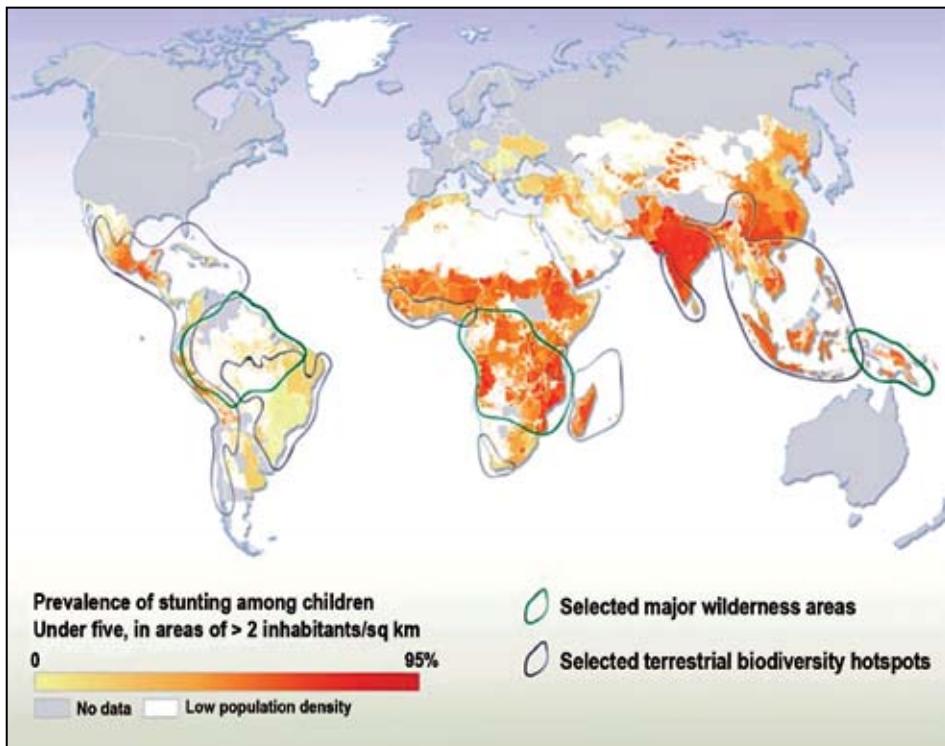
### 1.1 What are the challenges?

Billions of people living in poverty are dependent on local natural resources for their survival and livelihoods. Natural resources provide goods and services such as soil fertility restoration, regulation of water quality and quantity, biodiversity, medicines, foods, feed and fibre. These are the foundations of agro-ecosystems. Although natural resources are a key to rural livelihoods their unsustainable use by poor people themselves or by more powerful stakeholders, can result in land degradation, loss of habitat and biodiversity, and pollution.

**Natural resources**, as used here, refer to the geophysical resources of water, soil and its productive qualities, intermediate and long term carbon stocks, biodiversity of the managed landscapes, and the stability and resilience of the ecosystem of which agriculture is a part (Harwood and Kassam 2003).

There are a number of global trends that will adversely affect the rural poor: increasing rural population densities on a limited resource base; global warming and water scarcity and consequently raised variability and production risk; HIV-AIDS and changes in the social structures of rural people; and increasing commercialisation and globalisation of production, placing more stress on the environment and creating economic benefits for large companies. Without drastic changes in development policy, investments and practices, these trends will result in higher levels of poverty, as has occurred in Africa, where poverty levels are unacceptably high (Figure 1.1).

Natural systems are under severe threat in many developing countries. In many cases the poor stand to suffer. Major questions remain as to how poverty alleviation goals match with conservation goals (Adams et al. 2004). Countless studies have documented the deficiencies of previous efforts to conserve



**Figure 1.1: Global poverty levels, as reflected by stunting levels, and areas of important biodiversity; poverty in Africa has worsened in the last few decades (Sources: Povertymap.net and UNEP/GRID-Arendal, see Snel 2004; based on data from FAO, Landscan and Conservation International)**

landscapes and improve livelihoods (McShane and Wells 2003), and the need to adopt new approaches to natural resource problems. In large part because of generally disappointing experiences, the World Bank, the UN Convention on Biological Diversity (UNCBD), the Global Environmental Facility (GEF), and the UN Convention to Combat Desertification (UNCCD) have recently adopted policies that strongly commit them to new approaches to environmental problems. Much thought needs to go into how to keep these from failing as their predecessors did.

Natural resource management (NRM) is complex and multi-faceted – having policy, institutional, social, economic and technical dimensions (Box 1.1). Within NRM there can be many different reactions to dynamic change. For example, existing management practices and technologies, policies and institutional arrangements may no longer be sufficient; power relations, benefit distribution, and interests may no longer be in balance; ecological functions may be disrupted; risks may exceed management capacity; economic forces may outstrip conservation forces; and sanctions and cultural heritage associated with management practices as well as ownership patterns, may no

### **Box 1.1: Examples of complex livelihood and NRM issues**

#### **Natural product trade**

Commercialisation of valuable natural products (e.g. tropical timbers, abalone, elephant tusks, some medicinal plants) might involve large private interests, powerless local communities, and weak policy implementation.

#### **Common pool resources**

Multiple interests in common pool resources that are becoming limited may cause further resource degradation, that in turn limits livelihoods (e.g. encroachment on protected or fragile areas; high population densities in the African highlands, in the neighbourhood of small areas of high-diversity forests).

#### **Improving water harvesting**

In semi-arid regions water is often limiting to crop production, but solutions such as water harvesting come with some real trade-offs. It is not usually clear whether scarce labour resources should be allocated to water harvesting technologies or alternative, potentially more productive activities, and whether better markets for dryland production could tip the balance as to where to allocate labour. Longer-term improvements through water harvesting, e.g. higher organic matter levels, and downstream effects also need to be factored in.

longer be operating. NRM needs to deal with these issues and circumstances as they arise. This guide is about improving our R&D effectiveness in dealing with these issues.

## **1.2 Do we need R&D for natural resource management?**

Many people are asking: Is there a role for research and development (R&D)? How many times have we heard from supposed beneficiaries of R&D that they do not see the role for research? How many funding agencies have expressed doubt regarding the role for R&D? Literature suggests that research has made limited contributions to most of the major NRM initiatives used in the development arena, such as Landcare, eco-agriculture, community-based natural resource management (CBNRM), and integrated conservation and development programs (ICDPs).

The impacts of research in natural resources and agriculture for major rural populations have been modest, especially in Africa (Box 1.2). Much of this research has attempted to adapt technologies from developed countries to developing country conditions; it targeted innovations that could yield quick benefits to respond to urgent needs. In the agricultural sphere, major

investments went into genetic improvement of a few commodity crops to enhance productivity and improve resistance to pests and diseases. The gains were largely confined to areas of high agricultural potential and they often benefited more prosperous rural dwellers, missing the poorest of the poor. In many cases this research yielded short-term gains at the expense of long-term degradation of soils, water, biodiversity and non-cultivated land. The initial spectacular gains of the green revolution are unlikely to be maintained.

### **Box 1.2: Research in the African Highlands – any impact?**

For more than a decade, the mountainous southwest corner in Kabale, Uganda, has had multiple R&D organisations developing NRM and commodity-related technologies. This has resulted in limited or localised adoption, even though participatory technology development approaches have been used. The technologies have covered agroforestry tree lots, improved fallows, conservation hedge barriers, improved potato varieties and disease management techniques, soil fertility improvement technologies, and bean varieties and management techniques. Spread is still limited by poor information and communication approaches, by limited organisational collaboration, and limited links between rural dwellers and government programs. Historical underpinnings, such as colonial enforcement of conservation structures, trade being limited by conflict, and poor infrastructure, are among other challenges that have left a negative legacy. New efforts have started using an integrated NRM approach including: facilitated community analysis and reformulation of NRM by-laws; landscape analysis tools that communities can use (including GIS mapping); learning to deal better with power inequalities that disrupt development programs.

There is now widespread recognition that the sustained improvement of the wellbeing of rural people in developing countries will require a different kind of research. It will have to give more emphasis to management of risks, reduction of dependence on agricultural inputs, avoidance of long-term depletion of productive potential, and more careful control of environmental externalities. It is argued that research needs to reinvent itself (see Section 2.3). There is need for an NRM approach that embraces multiple scales of interaction and response, embraces a high frequency of non-linearity, uncertainty, and time lags, and involves multiple stakeholders with often contrasting objectives and activities. The approach has to have an impact on real-world problems. We need an approach that can make a contribution to complex issues and address the multiple factors that have so far limited the solution of major problems. We also need an approach that is better able to address issues in their social and institutional context.

### 1.3 Why a guide to more effective R&D interventions?

Meeting the immediate needs of poor rural people in a manner that allows society to maintain the supply of environmental goods and services is undoubtedly one of humanity's most pressing challenges. New approaches to NRM, or at least variants of old approaches, are emerging. This book is derived from the discussions of the 'integrated natural resource management' (INRM) community of the CGIAR, a loose grouping of CGIAR scientists and partners. Sensing the challenges facing managers and researchers of natural resources, the foundations (Section 2) and operational cornerstones (Section 3) were identified in a series of workshops investigating best practice in INRM. Navigating amidst complexity will require a new sense of purpose and innovative interventions. This book describes the cornerstones, elements and strategies needed to achieve this sense of purpose and quality.

#### **INRM definition**

*INRM is an approach that integrates research on different types of natural resources into stakeholder-driven processes of adaptive management and innovation to improve livelihoods, agro-ecosystem resilience, agricultural productivity and environmental services at community, ecoregional and global scales of intervention and impact* (Thomas 2002).

### 1.4 Links to past approaches

Is the NRM approach described in this book any different from the farming systems approach, the ecosystem approach, the landscape approach, or any other such fad? There is an evolution in thinking and practice, where new tools and elements are added to existing approaches thus giving rise to 'new' approaches. So, for example, from the farming systems approach emerged participatory technology development and farmer participatory research. The main shift was from an approach directed by an external actor towards greater 'participation' and empowerment of rural dwellers. We also see similar (but differently named) approaches emerging in different sectors. For example, much of the recent thinking on INRM emerged in the agricultural field, while the ecosystem approach, with many of the same elements, emerged from the conservation field (and is now enshrined in the UNCBD).

At the one end of a continuum are the approaches guided by environmental and conservation sentiments (e.g. conservation planning). At the other end are approaches that give primacy to livelihoods and resource use (e.g. sustainable livelihood approaches). In the middle are those approaches that try to bridge conservation and development objectives (eco-agriculture, ICDPs, INRM). Although all of these approaches have NRM as their backdrop, they have varying points of departure: conservation, community development,

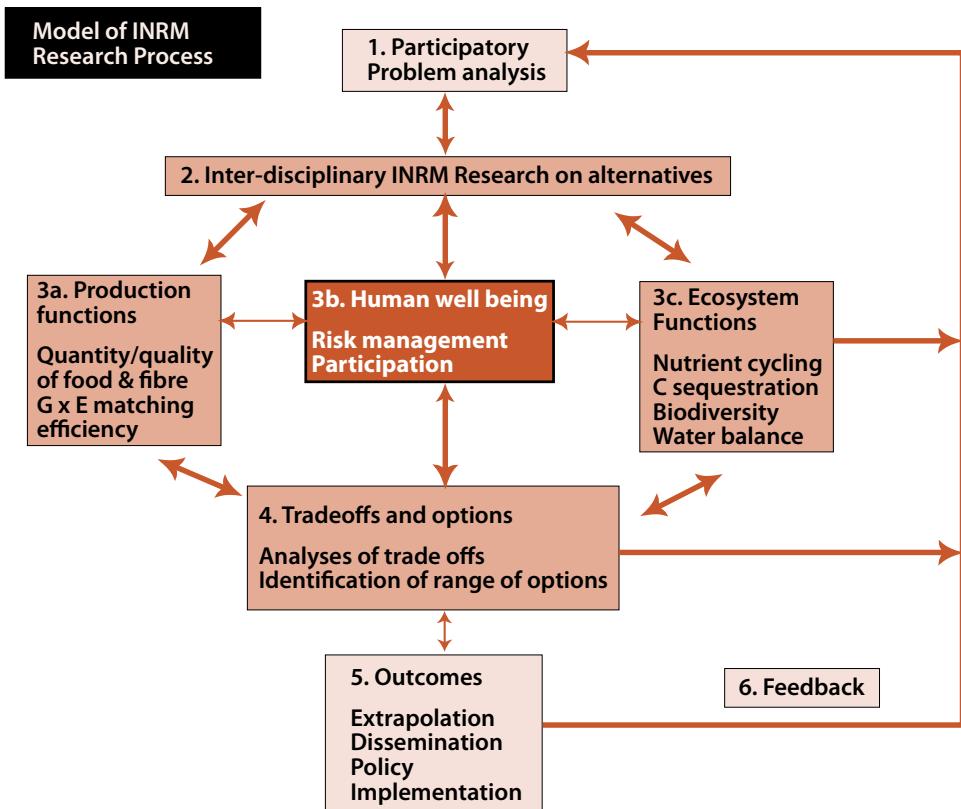
empowerment, policy or research. These points of departure are due to the different driving forces of the different ‘interest’ groups who have diverse mandates or organisational affiliations. Some of the approaches are anchored to varying degrees in the community itself while others are driven by external organisations. For example, Landcare is more strongly rooted in the grassroots (at least at conception), whereas CBNRM and ICDPs are examples that are externally driven, although taking place largely at the community level.

The INRM approach developed out of an analysis of NRM initiatives. In the INRM Task Force meeting held in Penang (Sayer and Campbell 2004) it was proposed that INRM research should:

- follow a systems approach;
- be process-orientated but lead to measurable impacts and outcomes;
- work at multiple scales with multiple stakeholders;
- address issues of trade offs;
- employ new tools and methods;
- be amenable to scaling up and out; and
- complement and often build on, research on germplasm improvement.

An ***idealised*** INRM research process would consist of the following six steps (Figure 1.2), though these are seldom a simple linear sequence:

- Step 1 is the identification of problems through participatory diagnosis involving land users, policy makers, rural development organizations and researchers.
- Step 2 is in the formulation of integrative research hypotheses that are studied by inter- or cross-disciplinary teams of researchers, land users and other partners.
- Step 3 is research on production functions, human wellbeing and ecosystem functions, requiring different teams of disciplines from traditional biophysical, social and environmental sciences. Research is focused on alternative technological, institutional and/or policy options to solve the problems and improve adaptive capacity. Agronomists, economists, soil and animal scientists could focus, for example, on production aspects while others address ecosystem services (ecologists) and social scientists are involved in human wellbeing studies. Fostering of truly cross-disciplinary hypotheses and activities is a key and innovative process at this step to ensure integration.
- Step 4 involves the explicit attention to trade-offs (and synergies). Inevitably there are no win-win situations therefore there is a need to analyze the likely scenarios with different options.
- Step 5 outcomes emerge from extrapolation, dissemination, policy development and implementation of options. Much of this work is done by more development-orientated partners and less by researchers. Research



**Figure 1.2: Idealised INRM research process (Thomas 2002; Harwood and Kassam 2003). While participatory approaches are only mentioned under step 1, participatory methods can be mainstreamed, to lesser and greater degrees, in all steps.**

on how best to disseminate outputs, scale out and up, and ensure impact is, however, an important research activity.

- Step 6, as a crucial part of learning cycles, is the feedback into the process with renewed problem diagnosis, new hypothesis formulation etc. At each of the steps, feedback methods need to be developed.

In this model many of the traditional reductionist research approaches remain valid. For example, traditional CGIAR research on production functions involving improved germplasm and agronomy would continue. Indeed to ensure stakeholder commitment in NRM research a benefit is needed usually within one growing season and this is often best obtained through the intervention with improved germplasm. However, more attention is given to ecosystem functions bringing in approaches and thinking from ecology, for example expanding temporal and spatial scales for nutrient cycling.

Human wellbeing is central to the approach with a focus on poverty alleviation and understanding of the livelihood strategies of the rural poor. Placing people at the centre requires a switch in thinking and hypothesis development. A focus on production, human wellbeing and the environment inevitably requires an analysis of the trade-offs involved as it is unlikely that any proposed solution or intervention can satisfy the demands of all interested parties. New science is required at this level of analysis that blends social, economic, biophysical and environmental disciplines.

A useful way to illustrate this change in thinking is to think of a typical problem such as the need to improve the efficiency of water use. A purely production function approach would pose the following hypothesis:

*The introduction of improved water saving/collecting technologies for rain fed agriculture can significantly improve production potential.*

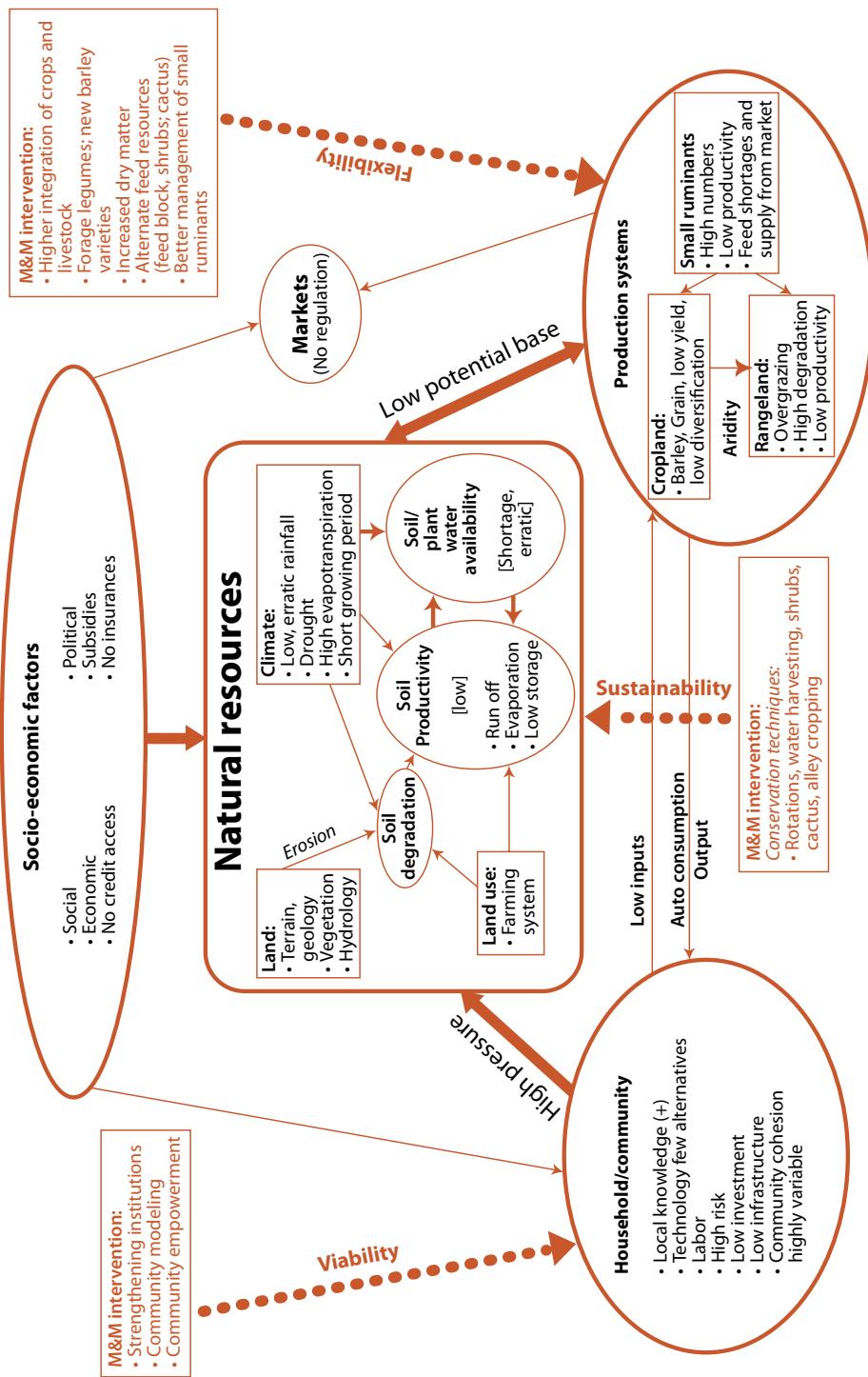
However, in INRM we can pose the hypothesis differently to encompass a broader range of issues that forces participants to think beyond their disciplinary boundaries. Thus the above hypothesis can be re-formulated as:

*The introduction of improved water saving/collecting technologies for rain fed agriculture can significantly improve household poverty status.*

To aid in the unravelling of the complexities in any natural resource system the development framework that is derived from stakeholder participation and collaboration is often a useful visioning tool. An example of this is shown in Figure 1.3. This example is taken from a project to develop integrated crop-livestock production systems, and the figure indicates the interventions chosen by communities in collaboration with other partners in the project that included national and international research organizations and policy makers. Integration is brought about by understanding and researching the holistic nature of the problem and the contextual conditions, in a more comprehensive approach to those taken previously, and often using new methods and tools. In this example, the improvement of social capital via the development of community action plans resulted in improved natural, human and financial capital with greater adoption of the technological interventions that were the initial entry points (Thomas et al. 2003).

## **1.5 Is this all about process and what can we achieve?**

As readers become familiar with the guide, they will see that many of the cornerstones are about R&D **process**. Given that there are eleven cornerstones (Table 1.1; Section 3), it can be a *complex, daunting challenge* to manage the



**Figure 1.3: An overview of the biophysical constraints and inter-relationships with production systems, households and communities in the low rainfall areas of the Mashreq and Maghreb (M&M) regions of West Asia and North Africa (Thomas et al. 2003)**

**Table 1.1: Overview of the eleven cornerstones to achieve effective R&D (modified from Turkelboom et al 2002; Harwood and Kassam 2003). In most circumstances only a portion of these will need to be tackled in specific projects as the conditions for some cornerstones will be satisfactory and not limiting research effectiveness.**

<b>Shared focus:</b> Shared problem and opportunity focus among partners	There must be consensus on the problems to be addressed, and the desired research and development aims.
<b>Partnership cornerstone:</b> Clear partnerships and collaborative arrangements built on trust, ownership and joint commitment to vision and impacts	Partnerships must be built on mutual trust, respect and ownership. The partners must combine science with good husbandry of, and responsibility for, the resource base, combined with appropriate incentives. Clear institutional roles and commitments at each level
<b>Teamwork cornerstone:</b> Effective cross-disciplinary learning teams of R&D agents	Teams able to work effectively across disciplines with good team management
<b>Facilitation cornerstone:</b> Effective facilitation, coordination and negotiation at different levels	Facilitation and coordination of interactive partner processes across levels.
<b>Governance cornerstone:</b> Enabling governance and policy that provides incentives, capacities and resources to key stakeholders	Attention to policy issues that constrain NRM
<b>Organisational cornerstone:</b> Local organisational capacity for collective action and self-governance	Local social and political organizational structures must exist to facilitate NRM implementation
<b>Information cornerstone:</b> Access to information on technical, institutional, market and policy options	Continuing, easy access to cutting edge science and local knowledge to ensure their assimilation into sustainable systems. Information synthesis and communication strategies, often built on GIS technologies must be in place. In many cases it will be reductionist efforts that are bringing this information to the table.
<b>Learning cornerstone:</b> Shared creativity and learning through exposure, experimentation and iterative reflection	Participatory action and a research/learning approach in an iterative fashion.
<b>Incentives cornerstone:</b> Interest and energy created in the short-term to ensure commitment to the longer term goals and processes among partners	NRM management solutions should have realistic short and medium term gains to make them economically realistic and attractive. Increases in productive efficiency are nearly always required.
<b>Scaling-up cornerstone:</b> Explicit scaling-up/out strategy building on successes and strategic entry points	Clear practical strategies for scaling up and extending NRM processes must be developed.
<b>Research design and process cornerstone:</b> Effective research design and process to integrate research and development objectives	Cross-disciplinary, adaptive learning processes for researchers and development workers to provide a continuum of research and development.

process and give due attention to all cornerstones. Furthermore, many readers will *recoil from the thought of expanding their reductionist research into the social, ecological and farming systems arenas*. In addition, the poverty and environment problems to be tackled by NRM research are inevitably *in regions where planning, implementation and policy development are not simple*.

In this guide we try to be complete by presenting all the issues and cornerstones, but *accept that achieving holism is often impossible, and indeed may well be counter-productive*. As Harwood and Kassam (2003) document, individual case studies will often have some focus areas of endeavour and not achieve holism. Given all of the complexity in social ecological systems it is very easy to be lost in the complexity with no R&D progress. *Section 2.2 tackles some of the issues regarding not being lost in complexity*.

We also start from the premise that *reductionist research is crucial to success of R&D*, and that *the challenge is to place this reductionist research in the broader context*, and to ensure participation and empowerment so that stakeholders have a stake in the R&D process, and thus assist adoption and scaling up and out. In many circumstances the bulk of the R&D effort will be reductionist research; in other circumstances the bulk of the effort will be synthesis and stakeholder management, drawing on reductionist research for answers to specific questions. Getting the balance right for the specific problem is crucial.

*As to the eleven cornerstones, in specific regions and contexts some will be exceptionally important to address while others may be satisfactory and not require any attention from the R&D team.* The eleven cornerstones serve as a checklist of potentially important process issues to be tackled, but it is up to individual research teams to select out those process issues that hamper progress in their specific work.

Depending on the circumstances, each cornerstone will have differing requirements for formality of process. With high skill and experience (as with the better farmers), many processes can be shortened (Dick Harwood).

*Given the nature of the places where NRM development interventions are likely to be made, I think we need to reflect more of the realities and less of the ideals. I feel it may be misleading to suggest all these cornerstones can be fostered. It's a bit like telling a teenager that if only they can achieve X Y S they will have a perfectly integrated and balanced life when they grow up. Why not confess to more of the chaos, imperfection and necessity for trade-offs and compromises from the start? Our responsibility is to report from real, not idealised experiences (Eva Wollenberg).*

# 2

## The foundations for more effective natural resource management

Before describing the cornerstones, elements and strategies needed to operationalise NRM interventions (Section 3), we briefly outline some of the foundations (Sayer and Campbell 2004; Harwood and Kassam 2003; Campbell et al. 2006) behind the approach. A set of principles have been suggested, grouped into three categories (Figure 2.1):

- (a) learning approaches – committing to action research, learning and experimenting among stakeholders;
- (b) systems approaches – what types of action are needed where?
- (c) organisational models for implementing effective NRM.

The operational cornerstones and the foundations are closely linked, as indicated in Table 2.1.

### 2.1 Learning approaches

A commitment to learning approaches is seen as a fundamental value in achieving effective NRM (Figure 2.2). One of the key lessons in dealing with complex multi-stakeholder systems is that management must be organised in a way that promotes active and conscious individual and social learning. In devising approaches for learning, ideas established in three rather different traditions are used: adaptive management, social learning and action research (Maarleveld and Dangbegnon 1999).

For someone firmly grounded in farming systems research or in the ecosystem approach the key difference in the approach described in this book would be '*getting into the system*'. For example, in research, no longer is systems analysis from an objective distance – instead researchers are fully part of the



**Figure 2.1: Principles for more effective natural resource management**

system, being one of the many actors, with the research process firmly driven by the users of the research results. Thus rural people will be partners, not passive beneficiaries, in development projects or in research endeavours. Empowerment will be a key word in the lexicon. The use of participatory action research (PAR) entwines the research and development processes so as to gain understanding within a particular social/institutional context, while influencing change at the same time. For example, PAR can be used to find ways to improve collective action for water point management as part of integrated watershed programs. It will involve dealing with varying stakeholder interests and perspectives, perhaps facilitating institutional change, and reflecting on progress.

In mainstream research and development, the prime objective is often to bring improved technologies into the system. In a multi-stakeholder situation there will be multiple objectives, and it is unlikely that any single technological intervention will suit all stakeholders. Standardised technologies that work in many contexts will only be part of the solution. Given systems' complexity

**Table 2.1: Principles for effective NRM, and some of their relationships to the operational cornerstones**

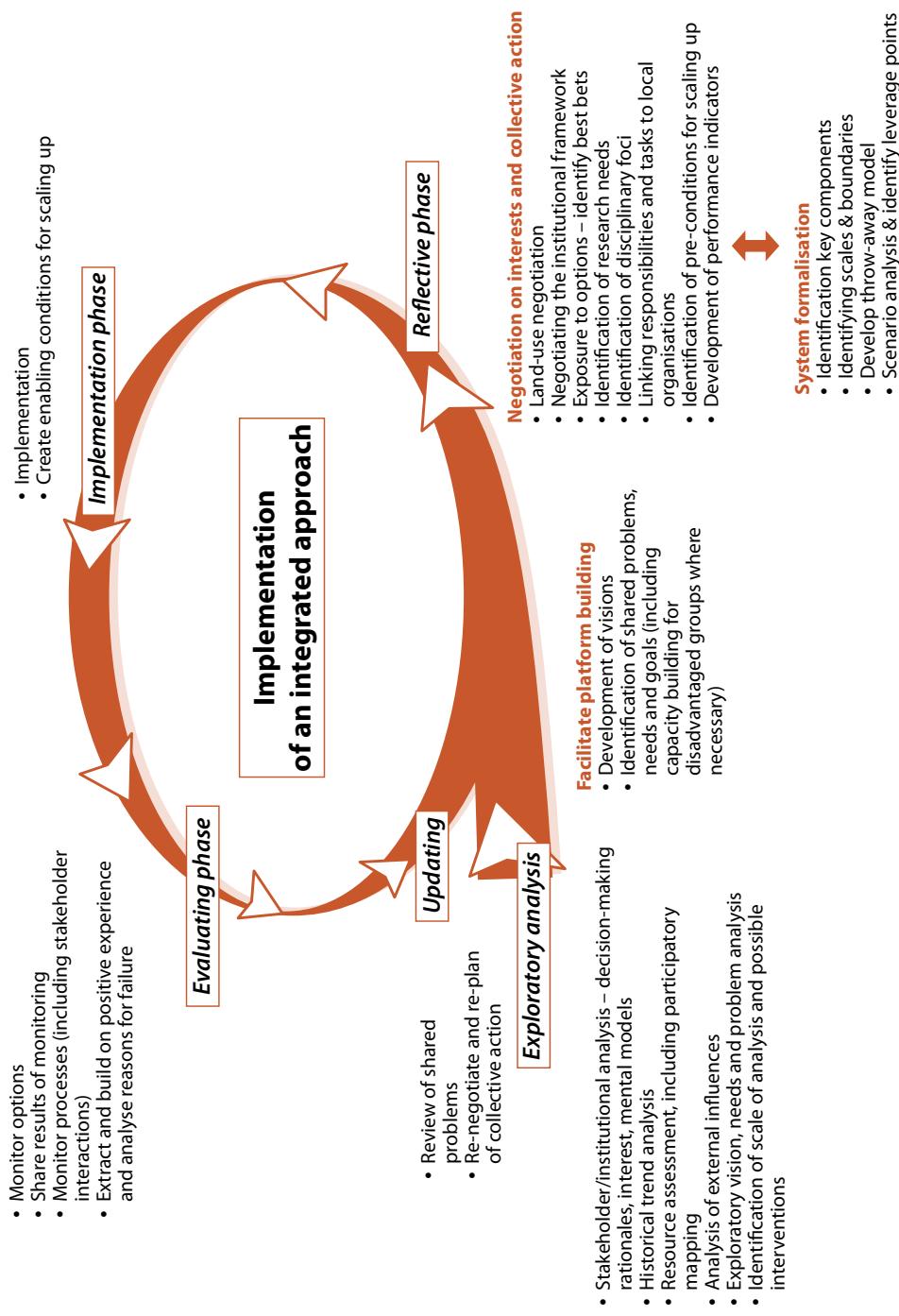
Main categories	Principles	Operational cornerstones	
		Key cornerstones	Other cornerstones of relevance
Learning approaches	Getting into the system (e.g. using participatory action research) Promoting adaptive capacity Mainstreaming monitoring and evaluation, and impact assessment	3.1 <b>Shared focus:</b> Shared problem and opportunity focus among partners <b>3.2 Partnership cornerstone:</b> Clear partnerships and collaborative arrangements built on trust, ownership and joint commitment to vision and impacts <b>3.8 Learning cornerstone:</b> Shared creativity and learning through exposure, experimentation and iterative reflection	3.6 <b>Organisational cornerstone:</b> Local organisational capacity for collective action and self-governance <b>3.3 Teamwork cornerstone:</b> Effective cross-disciplinary learning teams of R&D agents
Systems approaches?	Balancing hard and soft sciences	3.3 <b>Teamwork cornerstone:</b> Effective cross-disciplinary learning teams of R&D agents	
	Approaching systems from an organisational and institutional perspective	3.5 <b>Governance cornerstone:</b> Enabling governance and policy that provides incentives, capacities and resources to key stakeholders <b>3.6 Organisational cornerstone:</b> Local organisational capacity for collective action and self-governance	
	Multiple levels of analysis and intervention	3.10 <b>Scaling-up cornerstone:</b> Explicit scaling-up/out strategy building on successes and strategic entry points	
	Integrating across numerous dimensions	3.3 <b>Teamwork cornerstone:</b> Effective cross-disciplinary learning teams of R&D agents	
	Becoming focused systems thinkers	3.1 <b>Shared focus cornerstone:</b> Shared problem and opportunity focus among partners	
Organisational models	Establishing new modes of organisation		

Main categories	Principles	Operational cornerstones	
		Key cornerstones	Other cornerstones of relevance
	Changing incentive systems		
	Developing leadership and facilitation skills	<p><b>3.4 Facilitation cornerstone:</b> Effective facilitation, coordination and negotiation at different levels</p> <p><b>3.2 Partnership cornerstone:</b> Clear partnerships and collaborative arrangements built on trust, ownership and joint commitment to vision and impacts</p>	<p><b>3.7 Information cornerstone:</b> Access to information on technical, institutional, market and policy options</p>
	Burying the research development continuum	<p><b>3.9 Incentives cornerstone:</b> Interest and energy created in the short-term to ensure commitment to the longer term goals and processes among partners</p> <p><b>3.11 Research design and process cornerstone:</b> Effective research design and process to integrate research and development objectives</p>	
	Managing knowledge	<p><b>3.7 Information cornerstone:</b> Access to information on technical, institutional, market and policy options</p>	

Note: The numbers refer to Section numbers.

and dynamism, one of the prime objectives will be to *improve the adaptive capacity* of the system, that is the ability of actors to sustain a flow of the diverse products and services that poor people depend upon under constantly changing conditions. An important part of this will be increasing the ability of stakeholders to manage a broad range of factors, thus increasing their flexibility and ability to respond to exogenous influences. In the research context, high-technology research on the components of the systems is still vital but has to be placed in the context of specific biophysical and socio-economic conditions.

*Mainstreaming monitoring and evaluation, and impact assessment* is crucial, as this is a key tool for adaptation, learning and performance enhancement. This provides data for further negotiation amongst stakeholders and resource allocation decisions.



**Figure 2.2: An idealised learning cycle in R&D for natural resource management (adapted from Hagmann et al. 2002)**

## 2.2 Systems approaches: What is required where?

*Getting the balance right between 'soft' and 'hard' approaches* will be a key challenge. In development-related research, many traditionally trained scientists adopt a 'hard' science approach in which there is only one correct answer. Scientists working alongside local resource managers understand 'constructivism' (Douthwaite et al. 2001). They observe the multiple realities of the different stakeholders and come to realise that constructing new realities requires full participation, ownership and empowerment of local stakeholders. Innovations in NRM are occurring more frequently through the 'trials' of grassroots NGOs than in experimental plots of scientists. With the mainstreaming of participatory approaches, development practitioners have increasingly taken a 'soft science' approach, i.e. incorporating the people aspects of the system.

A new weight will be given to social science perspectives. We will need to *approach systems from an organisational and institutional perspective*. Social-ecological systems are influenced by the day-to-day management decisions of large numbers of stakeholders – from local to global. Each decision influences the interests of other stakeholders, both now and in the future. Many of the institutions (norms, rules and regulations) aimed at balancing different stakeholder interests are of limited effectiveness. This implies that considerable analysis and intervention will have to be devoted to institutional and organisational issues – from village level institutions to international agreements.

For those involved in action at small spatial scales (e.g. NGOs working with one community, farmer participatory research), we see them (or their partners) increasingly using tools to achieve impact at multiple levels – *multiple levels of analysis and intervention* are envisaged. And it is not the case of just adding the landscape level. Specific issues may mean that we have to work at three or more levels. For instance, in order to reward communities for conserving biodiversity, change will have to occur at the international convention level, national and district officials will need to make provision for new forms of land use, and communities will need to manage conservation areas and distribute benefits equitably. Hagmann and colleagues (Hagmann et al. 2002) provide an example of impacts at multiple scales. They undertook research that spanned the plot to policy scale; their work resulted in successful interventions at the plot level and important reorientation of thinking within the national extension service.

No longer is single sector development or reductionist research sufficient. Complexity will have to be embraced. This will mean having to cope with multiple problems and opportunities that will require integrated approaches. Therefore, *integrating across numerous dimensions* will be a key concept – we will have to integrate across scales, across multiple stakeholders with divergent

understandings of problems/opportunities, across different system components, and across the research and development continuum. For researchers, a challenge will be to get the appropriate balance between reductionist research and more holistic, cross-disciplinary work. Reductionist research is crucial to progress in R&D but the challenge is to set it in the broader context, and to get the appropriate balance between reductionism and holism.

The problems posed by complex systems require us to *become focused systems thinkers*. Given the complexity of resource and livelihood systems, the main challenge is to focus on the impacts being sought and not get lost in hundreds of peripheral issues. A variety of tools to tackle complexity will be necessary, such as models, databases, geographical information systems, and decision and negotiation support tools. Negative attitudes towards modelling abound, often based on the heavy data requirements of large and complex simulation models. While such complex models undoubtedly have their place, the concept of ‘throw-away’ models is attractive – working computer-implemented models that are built in a few days to solve a particular problem and then discarded (Lynam et al. 2002). Much recent work has used participatory modelling, in which stakeholders assist in the development of models and model results are fed back to communities using participatory techniques such as role plays.

Brian Walker and colleagues in the Resilience Alliance argue that complexity is not boundless but has its own natural subdivisions and boundaries, and that 3-5 key variables often drive any particular system (Holling et al. 2000). The trick will be to identify these variables, taking care that slow variables are not forgotten. Slow variables change imperceptibly but when they reach a threshold the system may switch rapidly into a new state.

Given the complexity of NRM systems, a key feature will be having clarity of objectives, understanding of tradeoffs and consequences of alternative types of intervention, monitoring of outcomes and making corrections to the past course of action.

*The key to successful INRM research is to focus on the critical factors and their interactions within each capital asset that are limiting sustainable productivity. Collaborative work among stakeholders, development workers and scientists must identify and focus on the smaller, and hopefully manageable, set of variables that must be tackled to accomplish the project's goals (Harwood and Kassam, 2003).*

## 2.3 Organisational models

Implementing NRM effectively will inevitably lead to rethinking the culture and organisation of NRM agencies (Ashby 2001). The management environment is faced with a long-term future that is unknowable; it has to deal with non-equilibrium conditions, multiple aspirations and ambiguity. Agencies involved

in NRM are likely to *establish new modes of organisation*: becoming learning organisations, where top management promotes organisational flexibility; developing conditions favourable to complex learning; and encouraging integration of scientists with other stakeholders.

Hand in hand with this will be *new incentive systems* for those in the NRM agencies. So, for example, a scientist may get more kudos for a publication with partners than for his own single-authored publication. Scientists building quality partnerships will be highly sought after.

*New leadership and facilitation skills* will need to be developed. Research leaders will have to be good facilitators and synthesisers. In a world where information overload is becoming a problem ('we are drowning in information, while starving for wisdom'; Wilson 1999), there will be an increasing need for leaders and natural resource managers who can bring together appropriate information at the right time, after careful critical review of the main system drivers and simplification of the complexity, ask the right questions, offer options, and facilitate wise decision making. A key element to success is likely to be facilitation of appropriate processes. Moving multiple stakeholders through the muddy waters will require advanced facilitation skills. This will be at multiple levels. So, for example, in a farmer's group one farmer may be nominated for training in facilitation. At the district level, a professional facilitator may be hired to orchestrate multi-stakeholder negotiations. 'Facilitator' will never be 'master of ceremony'! Depth and quality of discussion must be ensured and different perspectives must be negotiated.

We would argue that research needs to reinvent itself. Recent advances in NRM have drawn heavily upon advances in our understanding of social learning (Maarleveld and Dangbegnon 1999). This tells us that resource management must be based upon continuous dialogue and deliberation among stakeholders. Ultimately, in the ideal scenario, all management is experimental and all research involves managers – there is little distinction between management and research (Sayer and Campbell 2004). Roussel and colleagues, writing about the industrial sector, have described this new relationship between researchers and managers as 'Third generation R&D' (Roussel et al. 1991). They portray this type of research as being a bit like jazz; it requires constant improvisation. This implies that researchers can no longer remain exclusively external actors. Instead, they need to engage themselves in action research to develop appropriate solutions together with rural dwellers. This will increasingly mean that the distinction between research and development becomes less clear; we will be *burying the 'research-development continuum'*.

*Knowledge management* will be required to deal with the diversity of information held by different actors and applying it at various scales. And more

# 3

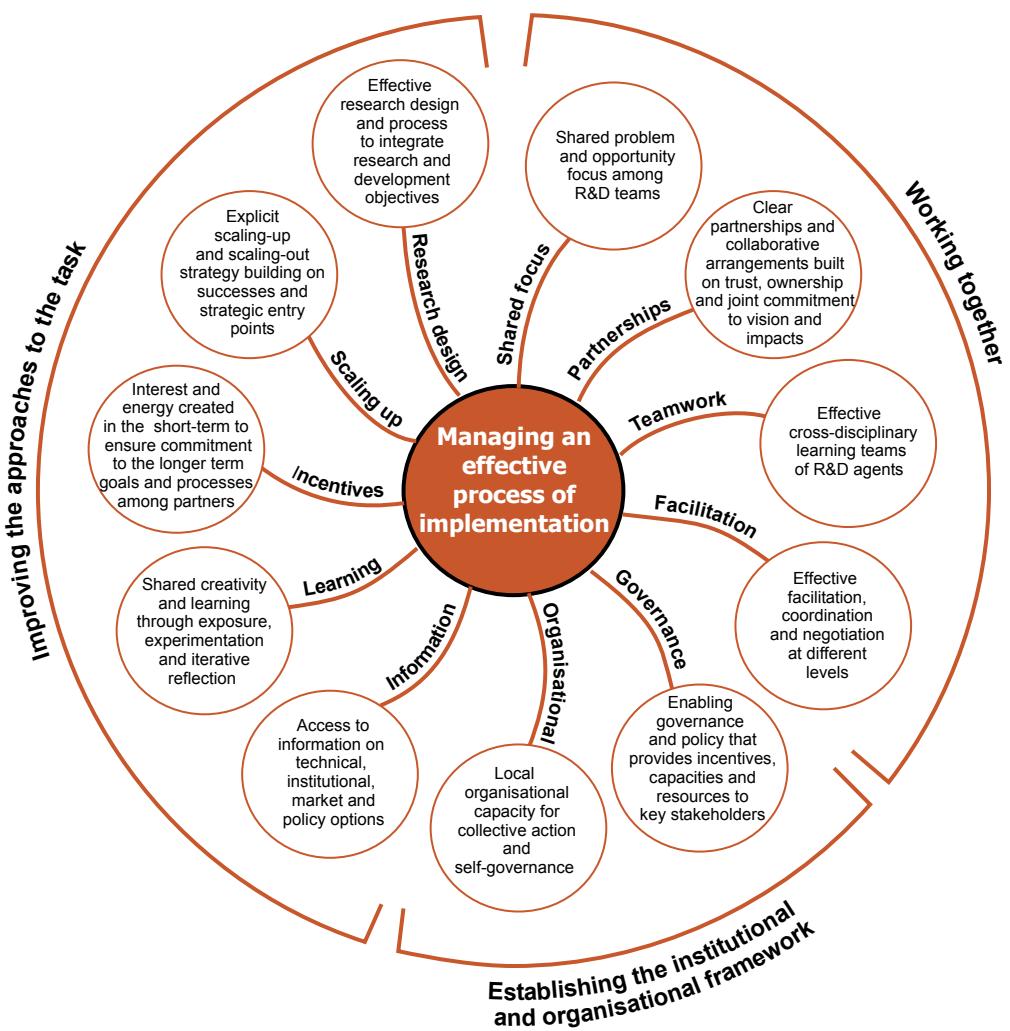
## Operational cornerstones for managing NRM interventions

The operational cornerstones for managing NRM interventions are based on the LearningWheel, a methodology developed by Jürgen Hagmann to systematise experiences of multiple stakeholders (Annex 1; Hagmann 2005). This particular LearningWheel, with its eleven cornerstones (Figure 3.1), was developed in the Aleppo workshop (Turkelboom et al. 2002) based on the analysis of the stakeholders' experience and building on the foundations developed in earlier workshops. It describes NRM as a comprehensive systemic process involving a number of key functions ('cornerstones') which need to be in place or developed if interventions are to be successful.

Experiences from a variety of cases from across the world were shared and systematically analysed for the success factors. In most cases, the experiences of various stakeholders fell into few domains and rarely addressed the whole system. However, the totality of experiences contributing to building this common frame provides a rather complete picture. Building on that analysis, the success factors were clustered into a set of cornerstones for managing NRM interventions.

The major utility of the LearningWheel – besides consolidating the perspectives into a common framework – is its application to practical situations in NRM initiatives and programmes. Partners can use the framework as an analytical tool for strategy development, strategic monitoring and steering of NRM initiatives. It can also be used as a knowledge management system; to re-integrate the lessons and experiences gained at different sites.

The cornerstones represent the core functions and characteristics that must be provided for successful, self-sustaining NRM interventions. The framework is based on the principle of systemic intervention, which stresses the interdependence of factors in any intervention. Overlaps between the



**Figure 3.1: NRM LearningWheel – Operational cornerstones to manage NRM interventions (see Annex 1 for a description of the LearningWheel methodology, a facilitation and strategy developing technique developed by Jürgen Hagmann)**

cornerstones are unavoidable and desired in this perspective. The framework facilitates the analysis of gaps, bottlenecks and the identification of critical entry points and priorities for intervention.

Although eleven cornerstones are presented, this does not mean that all eleven have to be considered in detail in all cases. In many cases, the conditions related to some cornerstones may be very favourable and thus those cornerstones may not require attention from the R&D team. The challenge for research teams will be to identify the critical cornerstones that need to be dealt with.

### **3.1 Shared focus cornerstone: Shared problem and opportunity focus among partners**

#### ***Why is this cornerstone important?***

Implementing NRM, amidst the inevitable complexity of multi-stakeholder endeavours, requires a clear vision of where to go and how to get there. The key to success of any multi-stakeholder action is a shared understanding of the problems and opportunities. If a shared vision can be achieved then partnerships can be much more successful. The LearningWheel itself can be used as a tool to create a shared understanding and vision of the way to implement NRM programmes among a diverse range of stakeholders and partners involved in the implementation teams.

#### ***What are we aiming at?***

In this cornerstone, the aim is to develop a shared understanding of problems and opportunities. This usually results in common visions, agreed priorities, clear agreements, and/or joint actions plans. Mechanisms for thorough analysis of issues, negotiation, re-negotiation, and conflict management may need to be in place for this to occur. A particular benefit of the LearningWheel in R&D teams is the creation of a shared understanding of a NRM process as a result of the joint analysis. The LearningWheel helps to learn together, to recognise the complexity and get a grasp of how to handle it.

#### ***Elements and strategies<sup>1</sup>***

##### **Shared vision and goal among stakeholders for the process**

- Understand how stakeholders organise and participate so as to help avoid platforms where persons with less confidence or power find it difficult to speak out.
- Ensure an open and transparent atmosphere of exchange at platforms so as to guarantee the articulation of needs and demands of all stakeholders.
- Negotiate the vision and goal for the process amongst stakeholders.

##### **Well-articulated inclusive demands that arise from deep, joint analysis of issues, problems, and needs**

- Use validation and triangulation processes to better understand the various dimensions of issues.
- Capture and do not hide different views (Box 3.1).

<sup>1</sup> In presenting elements and strategies, elements are presented as bold headings with strategies for each element presented as a series of bullet points.

### **Box 3.1: Defining the problems and visions for natural resource governance in catchments in southern Zimbabwe**

In defining a vision of the future in Romwe micro-catchment in southern Zimbabwe, the research team split the catchment community into three groups: women, older men and young men. This was an explicit attempt to capture and not hide differences because the older men and young men had a rather different perspective on NRM, centred on the lack of land for new households and elite capture of benefits. The groups had rather different visions, and any negotiated position for the entire community produced in a single large group would have lost the richness of perspectives. At a higher level, community representatives and district officials were given the opportunity to build future scenarios about natural resource governance. Through careful planning of the agenda, the opportunity was given to the weaker community group to present their scenario first, while the district group only presented after the break-out discussion groups. This allowed the issues raised by the community group to be incorporated into the discussion, with the result that elements appeared in the district perspective. The outcome would have been very different if the district had presented first, as they had initially requested. As the community was unfamiliar with meeting district officials and found it difficult to negotiate and discuss such issues with the district leaders, several days of preparation were held with the community prior to the meeting, so they could confidently discuss their proposals for the future. Thus, in arriving at an agenda for natural resource governance, considerable facilitation was needed to ensure that the multi-stakeholder processes would give a voice to the weaker groups.

- Facilitate an understanding of the spatial extent of problems through the use of spatial visioning tools, such as material flow maps, village maps and three-dimensional landscape models.

#### **Commonly understood opportunities**

- Ensure an appropriate and early baseline diagnosis, to assess constraints and opportunities, and to identify research needs. Special attention needs to be paid to market opportunities and niches that rural dwellers are unlikely to know.
- Make sure participants such as rural dwellers are exposed to opportunities where these are unfamiliar. This exposure will often involve cross-site visits, but could be based on various technologies. For example, in Indonesia, even in quite remote villages, there are often VCDs, which neighbours will cluster around in the evenings. Carefully produced VCDs can be used to expose rural dwellers to new opportunities.

**Jointly agreed action plans based on negotiation and prioritisation**

- Devise better tools to prioritise problems, in a manner acceptable to all partners.
- Facilitate gap analysis and identify possible support and services.
- Facilitate inclusiveness and differentiation to reach negotiated priorities and action plans.

***Challenges in achieving quality***

To reach joint agreement, there needs to be ongoing partner discussion and negotiation from the beginning. All too often, as illustrated by the Biodiversity Support Program (2000), ‘in the rush to forge alliances, conservation professionals and organisations, and other stakeholders charge into activities without first truly clarifying goals and objectives.’ In one such case, the multiple partners only loosely defined the goals and objectives in their proposal. In the first meeting it became apparent that the partners thought differently about what they wanted to achieve and how they wanted to initiate activities. In another case, a jointly written concept paper formed the ‘glue’ and was the single most important contributing factor to the success of that work. Unfortunately, in the rush to meet funding deadlines there are more cases of bad practice than good in clarifying collaborative goals.

It has to be recognised that in some circumstances, achieving a joint vision may be too difficult. For example in Malinau, Indonesia, the benefits derived from logging are short-lived for local people, and the people are then left with a less productive resource. The district officials have a clear role to play in this through forestry and land use regulations, and land use planning processes. Therefore they are a key partner in the research process. However, the district officials are also beneficiaries of the logging incomes, so do not take kindly to the research team attempting to empower local people. A number of multi-stakeholder meetings were facilitated, but the ability to move towards a common vision has been severely limited.

### **3.2 Partnership cornerstone: Clear partnerships and collaborative arrangements built on trust, ownership and joint commitment to vision and impacts**

#### ***Why is this cornerstone important?***

Partnerships and collaborative arrangements can enable better co-ordination, planned interaction, and development and implementation of joint projects among the diverse groups with a stake in or capacity to improve NRM. Partnerships occur in varying degrees of ‘intensity’ with varying levels of commitment and investment. They are a basic ‘need’ and ‘ingredient’ when trying to solve complex NRM problems, because of the need for various perspectives, disciplines and competencies that can have a bearing on the problem. Complex NRM problems cannot be solved through compartmentalised actors working in isolation. Collaboration among stakeholders and resource people with different functions, skills and perspectives, if well facilitated, can generate an atmosphere that allows for sharing, exchange and creative problem solving. Collaborative arrangements should reflect a strategic mix of: official organisations; influential organisations; organisations with capacity to mobilise resources; service providers; technical specialists in relevant aspects of research and development; and the beneficiaries of the interventions.

Partnerships can help broker communication and relationships among groups that would otherwise not pay attention to, understand, or even know about each other. They can also provide links into official decision-making or influential organisations that can help provide larger-scale and longer-term impacts by virtue of the fact that there is a relationship established.

In any NRM activity, the degree of involvement of different groups varies and changes over time. There is normally a core group, who have a direct role in designing and implementing initiatives, and who often take the lead in forming, facilitating, and sustaining partnerships that have particular aims. This larger set of individuals or organisations will take on roles in selected activities through collaborative arrangements over specified time periods. Some groups will choose to actively not collaborate in an NRM initiative and may even undermine it. The latter needs management by the core team.

#### ***What are we aiming at?***

If partnerships and collaborative arrangements were successful, we would see that collaboration among groups would be driven by a shared identified problem and a joint desire to have an impact. There would be recognition that this goal would supersede any single group’s aims and capacities. This vision would lead to a joint realisation that a partnership is needed so that partners would openly negotiate their interests to address the shared vision



Researchers in a long-time partnership with WWF in Central Africa, jointly working on lessons for improved implementation of conservation and development

and goal through joint action. This would encourage groups to enter freely into collaboration. Complementary roles and responsibilities among members would be clearly articulated and followed, provided this is the basis for a partnership. Partners would then bring together their key competencies, disciplines, and organisational affiliations and apply them into action.

Partners would feel motivated to collaborate with each other due to mutual trust, respect for differences, transparency and openness. There would be a lack of competitiveness or manipulation, good leadership, and clear incentives. Power differences among partners would be recognised and handled to accommodate weaker partners and enable them to act with confidence and develop their capacities. There would be mechanisms put in place to handle differences and manage any conflicts. Rules and norms that are jointly agreed upon would assist this process. If a partner breached the trust and/or did not follow through on commitments, then sanctions or measures would be identified ahead of time to deal with the situation. Regular monitoring and feedback would occur to ensure the quality of partnerships. Partners would take the resulting insights seriously and act upon them. There

would be good communication, frequent exchange of information and free, easy access to information among partners. Face-to-face activities would be sufficiently frequent to enable more in-depth communication and strengthen relationships. Activities together would go beyond exchange of information and seek to generate creativity and enthusiasm for problem solving. Partners should therefore feel they are gaining from the relationship and that there would be a balance of contribution and benefits for each partner. Credit for achievements would be shared fairly and according to agreement.

### **Elements and strategies**

#### **Need for partnership clearly established and partners identified and assessed**

- Assess the functional requirements for partnerships and what is needed from potential partners, recognising improbability of perfect match.
- Decide on what type (e.g. intensity) of partnership is needed for the given situation.
- Identify organisations or individuals with shared interests, experiences, and common concerns. Sharing a common foundation generally provides a stronger basis for joint action.
- Conduct an ‘actor’/partner analysis (e.g. who is there; what are their capacities, working modalities, and values) to help in assessment. One needs to be strategic in terms of who is likely to innovate and capture opportunities. In assessing potential partners one needs to look at previous work and achievements, read their reports; and make visits to their work sites and offices to assess their ‘track’ record. The following needs assessing: potential level of commitment; financial/human resource viability; organisational, program, technical and communications capabilities; political motivations; geographic interests; approaches; and within-organisation power differentials.
- Analyse strengths and weaknesses and tradeoffs regarding the capacity of partners for collaboration and complementarities.

#### **Synergies and complementarities maximised with clear roles and balanced competencies**

- Assess the partners’ potential more deeply as the partnership unfolds.
- Know each others strengths and weaknesses, to maximise the relationship. Clarify contributions and expectations from all parties.
- Review and re-visit expectations and contributions to help clarify what each partner thinks it can contribute and wants from the partnership
- Establish roles and responsibilities in relation to the tasks at hand and in managing and leading the partnership.

- Strengthen roles through working together and meeting periodically; responsibilities can be renegotiated.

**Shared ownership established and common values and principles identified**

- Agree on the mission, goal and purpose of the partnership. This can set the framework for building on shared interests, experiences and common concerns. The impact that the partnership is hoping to achieve should be clearly articulated in detail.
- At the onset identify values and principles.
- Develop a memorandum of understanding (MOU) or letter of agreement that is flexible yet communicates vision, and expected roles and rules (particularly about resource sharing and other basic requirements and expectations about the partnership). These may include a terms of reference (TOR) for each partner.
- Periodically revisit the underlying values and principles so as to harmonise these between the partners.
- Uncover any differences and work on these areas together.
- Visit each others field work, give presentations to each other.
- Discuss mutual benefits and incentives, as well as balanced contributions of resources, at the onset of the partnership. These should be reviewed periodically to ensure shared ownership.

**Fair and equitable conditions and processes for decision-making and reaching agreements, and for monitoring the partnership are established**

- Establish processes and mechanisms to ensure clear operational modalities with checks and balances to ensure accountability.
- Establish communication and feedback mechanisms; review these periodically.
- Ensure strong leadership that is inclusive, fair and accountable.
- Establish ways to deal with unequal partners and power relationships as well as ways to negotiate and/or deal with differences. Have mechanisms to uncover differences so they do not fester.
- Promote transparent information sharing and allow for divergence and convergence of opinions.
- Periodically conduct partnership appraisals that serve to highlight the strengths and weaknesses and areas within the partnership needing work.

**Challenges in achieving quality**

Responsibility of partners within a partnership cannot be underestimated. Partners need the capacity and experience to participate, otherwise various types of problems can arise. Partnerships need to be negotiated and sustained – but if capacity is weak, there is limited understanding of quality, and there are

poor monitoring and feedback structures, then the partnership is likely to falter. Tensions can build up when roles and responsibilities are not clearly handled – some partners may feel used and unappreciated - which will negatively affect their contribution. It is important to differentiate between different types of partnerships so that an appropriate model is chosen according to the context.

Choosing partners is often not very easy and leadership and members may find this challenging. There is usually a turnover in leadership or membership, so there need to be mechanisms in place to identify replacements and bring them up to speed. Sometimes, there are limited choices for partners and less than optimum partners may have to suffice. It may be difficult to maintain work relationships with those that are not chosen as partners, so diplomatic methods need to be found for dealing with those who were not selected. Often there are existing relationships, good and/or bad, that are built upon. Sometimes, old debts or grudges have to be buried, and this takes good leadership and negotiation skills.

Unequal power relationships, resource endowments and skill levels can pose a major management challenge and create conflict. The leader may not maintain a neutral position and thus may disturb trust in the partnership. There may be a partner that overtakes their authority and co-opts or alienates others. There may be a problem maintaining inclusiveness, but there may also be a problem having too many partners. Also, many of these partners might not be committed. Another problem could lie in representation, for example, where elites are always picked, excluding the less advantaged or less articulate. There may be higher transaction costs where there is a culture of agreements that are not respected (sometimes verbal). It may be difficult to balance between inter-dependency and the need to operate independently at times.

All of these pitfalls take considerable time and resources to resolve, and the required level of input is often under-estimated. It is often not easy to predict pitfalls, particularly if there is limited experience. Different world views and methods need to be understood, and this will be an iterative process. Sometimes principles and values encompassed within work modalities may be difficult to harmonise and may require organisational change. For example, one partner might give handouts while another seeks dependency. If these values are too divergent, then it is likely the partnership has little potential. Often this is difficult to judge in advance; hence the importance of conducting a good partner assessment prior to embarking on a partnership.

### 3.3 Teamwork cornerstone: Effective cross-disciplinary learning teams of R&D agents

#### ***Why is this cornerstone important?***

'Cross-disciplinary teams' refers to relatively small groups of researchers; development agents, that could be from government or non-government organisations; community facilitators; and others who have complementary skills. Participants join together to accomplish a project that requires the *integration* of varying expertise and perspectives. This is different from a multidisciplinary team which is one that assembles to do work but each tackles a specific objective more or less separately.

A team must have a common purpose and goal to which they are committed, and have an interdependent approach for which they hold themselves mutually accountable. They should be a 'learning' team – in that the group is actively involved in jointly proceeding through planning, action, reflection, and re-planning processes. The exchanges taking place within the team should be rich given that different perspectives and expertise bring different ideas and dimensions. When appropriately and effectively used, teams can be a means of achieving greater results through synergy. Teamwork is an important way to approach and solve complex issues where it is recognised that multiple types of expertise, including the mental models, disciplinary 'tool kits' and ways of working, are needed.

The bottom line is that teamwork must result in mutual benefit and in this respect it is a positive form of working with others. More specifically, teamwork needs to lead towards creating something unusual or innovative where each person is able to meet their own goal plus a larger unifying goal. Teamwork is often driven by an organisational need to achieve something that individuals in the organisation cannot achieve alone. Therefore, the team must receive organisational support and credit for operating in a teamwork mode.

#### ***What are we aiming at?***

Teams are a social phenomenon that take on many technical dimensions, and need to be consciously managed as a process and for content to get the most out of the group. Teams require leadership, recognition of intra-dependency of the members, clear roles and responsibilities, and a strong sense of mission. They need to set up rules, norms and ways of managing themselves to ensure that conflicts are resolved and that there is a decision-making process. They have to work closely together, supporting each other with ample facilitation to ensure time and quality of interchanges all lead to efficient and satisfactory work outputs. Members need to be willing to share responsibility and accountability.



An interdisciplinary team in Ethiopia, encompassing foresters, ecologists, modellers and sociologists, taking time out with the villagers.

To get the most out of a team not only requires a strong link through content and mission but a ‘chemistry’ and motivation. This must be fostered through leadership, shared experiences and an openness to communicate, share, learn, provide and accept feedback, and monitor progress. There must be mutual benefits, respect for differences, while maintaining individual self-esteem. These dynamics need time, work, and often capacity to function in this mode. Also, appreciation of the benefits and potential outputs may need to be developed and experienced. The assumption is that the products and outcomes can only be achieved through teamwork; making this investment an accepted cost.

Within a team, individuals will better understand their preferences for focusing their energy; gathering information; making decisions; living a certain way; responding to team challenges; interacting with others; and contributing to the team. There should be a strong sense of personal accomplishment, not only in content, but in these types of personal skills.

There are many similarities between teams and partnerships, for example the need for good leadership, decision making processes, conflict management processes, rules, and norms. However, partnerships differ from teams in that they are usually less close knit and always involve people coming from different organisations.

Many research organisations and universities are moving from an individual approach towards a ‘team’ approach. This is occurring as research agendas broaden into systems, social and institutional concerns, and competition for resources heightens. To do this work, researchers’ roles need to change and the research organisation needs to support this change in their terms of reference, and in their performance management and reward systems. Roles will involve team management, acting as ‘change agents’, facilitating quality capacity building events, and conducting research where contributions will be made in a team context, not only as an individual.

## ***Elements and strategies***

### **Issues requiring teamwork recognised and supported**

- Facilitate a process that ensures clear identification of the issue and its various dimensions, including opportunities and assets available to ‘fix’ the issue, the potential impact if solved, the gaps in information, and the capacity of R&D providers to make a contribution.
- Develop/use a multi-stakeholder approach and institutional analysis to ensure that the issue is a felt need. This may be done from various perspectives and levels.
- Given the problem focus and analysis, consider what expertise at what stage will be required – relating the contributions to the solutions and outputs.
- Develop research and development questions that will serve as the anchoring or basis for the R&D activities – and specify the methods and roles within the methodology (see cornerstone 3.11). Re-check the analysis to ensure that this issue is relevant for a team of experts to handle – e.g. that the team mode has a comparative advantage and is really required to solve the problem.

### **Effective and dynamic team management practices that include performance monitoring, credit sharing, leadership, demarcating roles and responsibilities**

- Establish roles and responsibilities in relation to the tasks. Each member can compile a contribution and expectation matrix of their perspectives of themselves and others – to serve as a way to clarify roles.
- Define a performance description for each member and the team as a whole. Set up a system for periodic review and reflection and renewal. Set up a

monitoring plan so that everyone knows how each person is doing and how the team is doing over time.

- Define a clear credit sharing policy for various types of outputs.
- Define what is expected of the leader – what types of decisions should he/she make, what does the team want the leader to do on their behalf, how should he/she represent the team.
- Identify rules on meetings, reporting, reflecting and feedback among other areas, so the team can clearly operate. Review these from time to time.
- Establish the norms for respect, consultation, timeliness, sharing, and understanding mutual differences.
- Establish ways to handle weaker team members.
- Have rules on resource use, accountability and of dismissing team members who do not comply.
- Conduct feedback and reflection sessions periodically. Revisit vision and goals. Monitor progress being made, identify and face challenges together.

#### **Incentives and motivations developed for working in teams so that the team is perceived as adding value as a group and for individual members**

- Establish a reward and incentives performance system in the organisation based on team outputs and performance.
- Manage peer pressure to foster teamwork.
- Ensure joint identification of compelling research work where the team can clearly see why it needs to be established and where each individual's clearly defined role and responsibilities allow them to see their contribution and benefits from success.
- Ensure good facilitation and leadership so as to bring out creativity and 'ah-ha's' during design, implementation and reflection stages of the work. Creativity must be supported throughout the process.
- Ensure good design of the research and ensure clear understanding of how multiple disciplines contribute, so as to facilitate sharing and exchange as the work proceeds. Shared experience, mutual respect and time spent communicating and listening leads to appreciation of cross-disciplinary learning. Eventually, some members will be able to work across disciplines given this exposure and will feel a sense of personal accomplishment.

#### **Common conceptual frame employed**

- Facilitate understanding of systemic impacts, trade-offs and leverage points from a variety of perspectives through working together.
- Ensure concepts become borne in and grounded in practice. Iterative conceptual thinking and discussions should take place after periods in the field. These should be documented.

- Spend time to share, explain and re-explain your knowledge base, tool kits and mindset. Leadership should encourage this and team members should do it freely.
- Conduct periodic review sessions to update on performance and progress. This allows airing of challenges and conflicts, enables people to take a ‘longer view’ on how they are getting along. Document this to illustrate team learning.

### **Organisational commitment towards holistic problem solving and impact through co-operative rather than competitive models**

- If possible, have a facilitated internal review and discussion concerning the use of teams and how it links to the overall organisational objectives and strategic directions and methodologies. Use this as a starting point to justify teamwork focused on issues that will be resolved only through teamwork.
- Review how (or how not) the organisation is supporting teamwork, assuming it has been agreed that this is the best way to solve some of the problems that fall within the organisations mandate. This might include incentive schemes, monitoring and evaluation, performance monitoring, expected types of outputs, planning and quality issues, capacity building support, among others. Can team members be co-opted in from other organisations and are partnership arrangements supported?
- If possible, have a facilitated revamping of organisational support structures and operations, if needed to support teamwork.

### **Competence developed**

- Identify skills and competence gap areas for teamwork and team management, and put into place a plan to address these gaps. Competence development is a ‘perk’ and can serve as an incentive to improve teamwork and output delivery.
- Mentoring is an important competence development method – particularly where practice and theory builds upon reflection and conceptual development related to real life experiences. Develop a way to mentor the teams – how to do cross-disciplinary R&D work, how to use the learning cycle, how to manage and operate in a team.

### **Challenges in achieving quality**

There are a number of key challenges in managing an R&D team; many barriers need to be identified and handled. For example, organisational support may be limited, research may be compartmentalised, and attitudes and behaviours may need adjustment. Team management is a skill in itself. There may be limited culture or experience in doing this and it becomes a capacity

issue, which needs to be addressed. Good leadership is a key requirement, but how do we develop skills to do this, and how do we monitor leadership and take action, if it is ineffective? There is much time spent in restructuring, reorganising, priority setting and planning, so that fatigue must be dealt with. However, change is needed and is dynamic. There is continual turnover of staff and new people named to new positions. How do we keep the new people informed on the history and where we have reached, so as not to be derailed or repeat what we have already experienced? Partnership management is part of teams – particularly when team members are co-opted through partnership arrangements. Skills to manage the socio-cultural aspects of partnerships and teams may be limited and need competence development. Time spent on these areas is perceived by many as transaction costs and seem to get in the way of substantive research. We also must consider educational organisations, as they are churning out graduates that are not aligned with some of the new ways of working.

### 3.4 Facilitation cornerstone: Effective facilitation, coordination and negotiation at different levels

#### **Why is this cornerstone important?**

Given the complexity inherent in most R&D with multiple stakeholders, inequity, power struggles, and multiple levels of analysis and intervention, it is crucial that there is effective facilitation of the process, well co-ordinated actions and facilitated platforms for negotiation. Facilitation should ensure full ownership of and participation in the process by stakeholders as a condition for successful NRM. However, participation is not a substitute for clear leadership of the process at the different levels. By leadership we are not advocating old-style command and control formats or, at the other extreme, mere moderation. Rather we see a major role in ‘guiding’ facilitation which provides orientation and direction through challenging people deeply to determine their direction.

The foundation of effective NRM, as outlined in Section 3.8, is a learning approach among stakeholders. Process facilitators, persons who guide the adaptive learning cycle with multiple stakeholders, are essential to facilitate a common understanding and vision, the negotiation of interests and the integration of knowledge among stakeholders (to name a few of the facilitation functions). They also have a strong role in keeping the momentum of the process going and identifying the right actions at the right time to make the loose ends meet and create the energy for stakeholders to work together.

For NRM to be effective, a coordinator with a clear mandate to integrate all the research efforts is essential. S/he should achieve the fine balance between detailed disciplinary knowledge and cross-disciplinary knowledge, between natural and social science perspectives, between case studies and synthesis, and between positivist and constructivist traditions. Coordinators are ‘integration managers’ who pull in the required expertise from different sources at the right time in order to develop the outputs and outcomes of the process. Therefore, coordinators need themselves to be good facilitators and both roles can be combined at certain levels.

Re-definition and negotiation of roles and responsibilities among stakeholders is bound to occur during R&D implementation. ‘Learning to play the roles’ is a continuous process of engagement among stakeholders towards improving the performance. Management of the *hub* of the LearningWheel, that synchronizes the actors, their contributions and activities at any point in time, requires leadership and team work. This ‘process management’ has usually remained a missing function in implementing development research. Often, no quality assurance mechanisms for coordination and facilitation are being developed and put in place, nor is there awareness for it within development interventions. Researchers who want to engage in action research are often

confronted with a situation which forces them to get into process facilitation and management despite the fact that other actors would be better placed to assume this responsibility. Institutional arrangements and the competence to assume these functions need to be developed at different levels.

### **What are we aiming at?**

In an effective NRM process, facilitation and coordination is required at different levels, each of which demands different types of facilitation with different qualities of facilitators and process managers:

- at community level to mobilize the community, enhance their organizational capacities and take them through their learning and negotiation process in a systematic way;
- at the level of service providers who need to respond to community demands and development opportunities in a concerted and competent way;
- at the level of the larger organisations and policies which need to be conducive and supportive to such processes; and
- at the level of the overall process, where the different contributions need to be integrated and interfaced while moving towards the desired goals.

In NRM processes, one can distinguish between the following types of facilitation:

- *Facilitation for transformation.* This is oriented towards bringing in new ideas and modes of working and thinking, and dynamising the organizational setup (e.g. at community level and often in organizational development in institutions). It is geared towards emancipation of individuals in organizations/communities to become pro-active and entrepreneurial in dealing with their own issues, organising and articulating themselves.
- *Facilitation for training and competence development.* For example, among service providers, facilitation is often applied to coordinate and develop the required skills and competences to provide adequate services. In communities it can also be used to build or enhance specific skills.
- *Facilitation for process management.* This is geared towards coordination, negotiation and managing high quality learning processes through facilitating stakeholders and promoting cross-disciplinary integration, knowledge sharing and learning. Process design is a core capability in this process.

There are certain patterns and characteristics which are common to all the different types and levels of facilitation. Among many others, some general principles and strategies are: the de-politicisation of the process through fact-based negotiation; the creation of a culture of feedback and appreciation; the promotion of a culture of questioning; and, the creation of discomfort

through confrontation with realities and behavioural patterns which have contributed to the situation in which people are. Good facilitation is rather psychological and builds on empathy and logic. It is steered through a ‘guiding star’ in terms of vision of the outcome of a process, clear guiding principles and values (Hagmann and Chuma 2002). In terms of process management, new methodologies need to be further developed to ensure quality in process implementation (e.g. like the LearningWheel; Hagmann 2005).

Good facilitation will be crucial to the success of many of the other cornerstones – it can ensure: shared focus; appropriate collaborative partnerships built on trust, ownership and joint commitment; effective cross-disciplinary teamwork; appropriate governance and policy outcomes; better local organisational capacity; good knowledge sharing; and, shared learning. Thus many would argue that facilitation is the cornerstone of the cornerstones!

Depending on the state and type of NRM process, all the levels of facilitation need to be in place at certain stages in the process. It requires a critical analysis of requirements and available competencies to ensure that the right people are in the right place – a major factor for success. An iterative self-reflection exercise (e.g. every half year or annually) with the whole team and some stakeholders can be a powerful way of collaboratively steering an intervention and learning effort together.

## ***Elements and strategies***

### **Capacity for process facilitation**

- Identify all the different levels at which facilitation skills are going to be needed. One also needs to identify the type of facilitation needed (e.g. training, change management, negotiation and conflict, etc).
- Identify an individual (or individuals) who have the capacity for process facilitation.
- Where needed, e.g. perhaps at community level, build capacity for process facilitation.
- Clarify the context with the facilitator – clearly state what is needed from the facilitator and develop a guiding vision with them.
- Coach the facilitators during the process as a means to learn, feedback and continuous improvement in facilitation.

### **Mechanisms and institutional arrangements for facilitation**

- Develop institutional arrangements among the main actors that ensures facilitation at the different levels (e.g. community facilitation should ideally be a function of community development agents, not of researchers).

- Develop community-based facilitation services, so that communities have easily determined means to locate and use facilitators and can use 'external' facilitators from other villages which are not involved in their own socio-politics.
- Have mechanisms to assess and feedback to facilitators, and where necessary, to change facilitators.

### **Coordination and integration of NRM process within development planning**

- Work with development agents and their organisations towards integration of research into their activities, where the scaling-up is part and parcel of the system.
- Have mechanisms to identify gaps among scales and levels in terms of development planning.
- Develop strategies to link scales and levels in terms of decision making, planning and implementation.

### **Systematic monitoring and reflection processes for learning**

- Develop systematic monitoring and reflection methods that can assess the quality of facilitation, the degree of integration and the effectiveness of platforms for negotiation.
- Develop means to use this monitoring and reflection so that lessons learnt are incorporated in the next learning cycle.
- Develop a knowledge management system to ensure continuous learning, methodology development and conceptualisation of the lessons.

### **Platforms of service providers, resource managers/users, business interests and authorities**

- Establish and facilitate appropriate platforms where multiple stakeholders can get together to discuss thorny issues in an open and honest way.
- Facilitation of continuous analysis of interests, disagreements and conflicts.
- Competence development among service providers to respond adequately to the demands.

### **Build up demand and opportunity focus**

- Facilitate a demand and opportunity analysis with communities and service providers.
- Support communities to articulate an informed and deep analysis of their demand for services.
- Facilitate the interface between demand and supply of services for a joint learning between communities and service providers.



A facilitator taking time off to get involved in village life - building relationships never stops!

### ***Challenges in achieving quality***

Weak facilitation is likely to be the major flaw in applying the R&D processes outlined in this guide. If the facilitator has not fully understood the LearningWheel methodology (Hagmann 2005), the analysis might be shallow and miss essential issues. The application of the cornerstones as well as any other methodology can easily become a mechanical application without deep understanding and analysis. However, the success of process facilitation lies in the flexible application while ‘reading the process’. This will be the most challenging quality to achieve for less experienced facilitators.

Often it requires discussions about the quality and performance of the process which are ultimately more important than the outcome. The joint perspective of the stakeholders in the system is the foundation for successful changes. If a facilitator does not allow enough time for these debates, a shallow analysis is the result. The creation of an open, transparent atmosphere inviting honesty is central to the success.

The R&D cornerstones presented here promote the melding of external and local knowledge, with local empowerment in the process. However, it is not easy to responsibly empower while balancing the power, and to provide necessary attention to a wide range of stakeholder needs and interests. Sufficient time and facilitation skills are required to achieve this — which is not often available.

### 3.5 Governance cornerstone: Enabling governance and policy that provides incentives, capacities and resources to key stakeholders

#### **Why is this cornerstone important?**

Policies enable or constrain change by affecting the incentives, capacities and resources of different stakeholders (Box 3.2). They also legitimise actions that stakeholders might otherwise consider illegal. Where policies are not enabling, they can become objects of action in the R&D.

#### **Box 3.2: Limited devolution in local forest management in China**

Responsibility for the management of collective forests in China has been transferred from the Forestry Department to village committees and from village collectives to households. However, there has not been a full transfer of rights, particularly rights to harvest and market timber. A study of 15 villages in Guizhou, Yunnan and Hunan Provinces conducted in 2000 showed that timber harvests were highly regulated through the use of cutting quotas, cutting permits, transport permits and processing permits. Such partial devolution created conflicting incentives and limited local people's enthusiasm for tree planting and sustainable forest management. Farmers were more interested in bamboo in Suining, west Hunan for example, because bamboo harvesting was much less heavily regulated and taxed than timber (see below for a discussion of taxes). Villagers were not keen to plant Chinese fir (a timber species) in Libo, south Guizhou before the trading of living trees and plantations was allowed because obtaining harvesting permits was such a burden. For the same reason, households in Chuxiong, central Yunnan were most enthusiastic about eucalyptus trees, from which they harvest leaves for oil extraction, and fruit and nut trees. Villagers interviewed indicated that they were not active in planting timber species because they were not able to harvest and market timber when the need for income arose, but instead depended on calendars and cutting plans established by the government. Forest use rights are important, but rights to harvest and dispose of forest products are equally important in encouraging tree planting and protection (Dachang and Edmunds 2003).

Policies especially important to NRM include: decentralisation and devolution of governance and resource management; clear land and resource tenure; clear vision of rural dwellers' access to resources and benefits from them; clear division of roles and responsibilities among organisations; reduction of perverse incentives created by taxes and regulations; and citizens' rights to organise, lobby and participate in decisions that affect them.

Governance, and the policies guiding it, describes how groups make rules and decisions. The different actors in government or civil society organisations

shape how NRM decisions are made and may themselves be the facilitators of NRM. Governance ideally accommodates multiple interests, protects the interests of disadvantaged groups, seeks to maintain public goods, encourages accountability and transparency of decision makers to their constituencies; allows for appeals processes and mediation; and is conducive to the collective action required for NRM. Institutionalising NRM through government can create larger-scale impacts and longer-term processes for change.

### ***What are we aiming at?***

In this cornerstone we seek decision-making and rules that enable different groups to co-ordinate their actions to jointly manage a set of natural resources over time in innovative, responsive and socially just ways. We seek checks and balances on the authority of decision-makers to ensure accountability to weaker groups. Indicators of ideal conditions include whether stakeholders are aware of their rights (e.g. to natural resources, for accountable representation) and can enforce them. Stakeholders should be able to analyse policies, understand trade-offs of different policy options, and negotiate a position about policy reform. Weaker stakeholders should be able to mobilise and form alliances to advocate for policy change. Representatives of weaker groups should be well informed about their constituents and act as effective communicators who can influence decisions in multistakeholder forums. Weaker groups should have direct access to government officials who often visit them. Policy information is shared and co-ordinated among relevant stakeholders. Policy making is informed by monitoring of impacts. Fiscal, tenure, market, infrastructure and devolution policies exist, to enable better management of resources.

### ***Elements and strategies***

#### **Awareness of different stakeholders about policies and governance systems influencing them**

- Provide stakeholders with original policy documents and discuss them. Offer summaries and policy analysis to support discussion. Establish information centers or libraries where people can access these documents. In Malinau, Indonesia, CIFOR used annual meetings among communities to bring in resource people to discuss national policies, and local officials to discuss their interpretation of them. Policy briefs were also provided to both communities and government officials to enhance their understanding of new decentralisation laws and their implications
- Conduct analysis of policies and their impacts through comparative research across countries, legal scholarship, policy study groups, or dialogs between policy makers and local people. Analyses should indicate implications

for incentives, resources and capacities of stakeholders. They should also highlight policy inconsistencies and contradictions, the adequacy of sanctions and the division of roles and responsibilities.

### **Policy development, reform and implementation reflecting field reality**

- Mobilise advocates both inside and outside of the policy-making process.
- Make policy makers aware of conditions in the field through documentation of the impacts of policy, and through hosting public consultations, group discussions and field visits that include policy makers.
- Facilitate deliberation among stakeholders about policy alternatives and future scenarios.
- Broaden stakeholders' networks and options through cross-site visits.
- Test policies on a small scale through pilot programs with regular reflection.
- Strengthen legal drafting capacities, where necessary. Government agencies or third parties need to be more aware of local realities, including the possibility of the R&D team directly providing legal text (as occurred in the drafting of several laws relating to community management of forests in the Philippines).

### **Interests of relevant stakeholders represented in decision-making**

- Choose representatives that are accountable to a clear group of stakeholders.
- Ensure representatives consult with and report back to their constituencies.
- Facilitate direct representation of village groups through supra-village groups, such as federations in Orissa, India that advocate for rural dwellers' rights to forest management.
- Build communication and negotiation capacities of representatives. Build awareness among members of the constituency to demand better representation and better communicate their interests.
- Create more transparency about how decisions are made and budgets allocated.
- Define stakeholder groups transparently. The definition of stakeholder groups and balance of representatives from each is a political decision that may require deliberation.
- Enhance direct participation through public consultations based on announcements made adequately in advance, settings accessible to rural dwellers and responsiveness in follow-up actions taken. Also, wait between periods when final drafts of policies are released and when they are approved to allow for vetting by different groups, and facilitating discussion of policies at village level.
- Strengthen rural peoples' influence through preparatory meetings with role plays, documentation of main messages to be delivered and supporting

information. Train villagers how to prepare proposals to government officials and explain to them how government offices are organized. Provide access to decision makers through informal visits and presentations of dialogs to channel information about local interests. Sometimes it is important to get authorities to sponsor or attend events to provide buy-in. Implementing mechanisms for peaceful protest and managing conflicts can also contribute to effective representation of rural peoples' interests.

### ***Challenges to achieving quality***

Money politics and corrupt decision makers may make policies irrelevant. Decision-makers may be more accountable to stakeholders with the most influence, rather than to principles of the law, social justice or science. This is especially the case in frontier areas where there is little government presence or legal enforcement (Kaimowitz et al. 2003). Abrupt changes in regimes can create uncertainty, leading people to ignore or mistrust policies due to constant policy revisions by government (Dachang 2001). Where policy change is slow, on the other hand, people may lack motivation to try to change policies.

The policy environment is influenced by customary and state authority from the village to global level. Huge policy contradictions and inconsistencies



Building a common vision for NRM policy in Burkina Faso with researchers, NGO officers and Ministry of Finance and Ministry of Agriculture officials.

occur at these different levels. Government co-ordination is often weak among different sectors or levels of administration. There is also competition and conflict between customary and state authorities. In assessing the policy environment, it is necessary to understand how the contradictions and inconsistencies play themselves out in implementation. *De facto* policies and authorities may not be written, especially in places remote from government centers. Local officials often have weak capacity and incentives to implement policy as envisioned by its creators.

The quality of public judgement among stakeholders may be poor, especially where people are poorly informed and lack opportunities for critical debate. Special effort should be made to encourage individuals and organisations to better understand policy and governance issues, and use analysis and open discussion to create more informed and deliberated opinions.

### **3.6 Organisational cornerstone: Local organisational capacity for collective action and self-governance**

#### ***Why is this cornerstone important?***

Resources such as forests, rangelands, wetlands and water are frequently shared, and the impacts of their management are usually felt on larger populations. Collective decision-making and self-governance are therefore necessary to represent the interests of the different groups involved, as well as to co-ordinate knowledge, skills, actions, influence and resources. Strong collective action can create the social energy necessary to catalyse change.

Local capacities for collective action and self-governance are essential to NRM and occur through organisations such as villages, user groups or farmer associations (see Box 3.3). The self-governance function of these organisations is complementary to governance by the state, and can be especially important in remote areas where government has little presence. Local organisations support people to act locally using local knowledge and responding to local needs. They also represent local interests in interactions with other stakeholders.

#### **Box 3.3: Self-organized forest management in Uttarakhand, India**

Holta village in Uttarakhand initiated protection of its civil lands around 1986 on its own. Village water sources had dried up and firewood and fodder had become scarce as a result of unregulated forest use by surrounding villages and encroachment on communal land. Village youth successfully persuaded the encroachers to vacate the commons, setting an example by giving up their own encroachments. Letters were sent to the heads of village councils from surrounding villages that anyone entering the forest would be fined. Major conflicts followed with one village going to court against Holta over unclear boundaries of their respective lands. However, as forest condition improved and water availability increased, resistance from neighbouring villages declined. In 2000, all the village's biomass needs, excepting those of timber, were met from the regenerated forest. Vegetable cultivation had become feasible with regeneration of three natural water sources. Rules had been framed for grass, tree leaf fodder and firewood collection and were strictly enforced, with all households contributing to pay a watchman. The committee had representatives from all hamlets and castes and representatives of the village women's association had also wedged their way in. Community relations with the Forest Department, however, were extremely sour, as the latter considered local harvesting of timber illegal (Adapted from Sarin et al. 2003).

### **What are we aiming at?**

In this cornerstone we are aiming to achieve user-based organisations that establish rules for sustainable natural resource management, a procedure for decision-making about them and sanctions for those who break the rules. The organisation should be a learning organisation that enables different sources and types of knowledge to be applied to resource management, as well as monitors the condition of the resources and adapts to changing circumstances and needs of the group. It needs to be accountable to its members and well linked to external groups. Trust, communication and social networks among members of the organisation should be high.



Being welcomed in Setulang village in Malinau (Indonesia) - a village with a high degree of local organisational capacity, and where R&D can be effectively implemented

## **Elements and strategies**

The elements of capacity for collective action and self-governance have been well described elsewhere (Ostrom 1990). We summarise those elements here that are relevant to NRM.

### **Motivation and incentives for collective action**

- Facilitate awareness about the value of the resource to the group by documenting its benefits, local people's dependence on the resource and potential scarcity.
- Facilitate fair distribution of benefits through transparency about the criteria for sharing benefits (e.g., in proportion to labour expended, costs, land, or needs). There should be a process for people to appeal decisions.
- Increase the predictability of returns to efforts. Facilitate norms, rules and sanctions that legitimate and enforce agreements and promises. Ensure that the costs of monitoring, managing and using the resource are reasonable. Improve communication, transport and information about the resource to assist manageability.

### **Self-governance based on democratic principles**

- Foster an organisational structure and culture that encourages commitment, ownership and participation by members. Make conditions of membership clear.
- Facilitate mechanisms that make decision-makers accountable to members and represent members fairly, including elections of representatives by users, financial support from users, transparent decision-making and budget allocation, and consultation and reporting requirements (Ribot 1999). Strong two-way communication is essential.
- Enable effective internal decision making and co-ordination. Clear procedures for decision-making should exist and be supported by members.

### **Management of linkages and cooperation with others**

- Work to influence policy makers to influence higher-level decisions to make them more favourable to and consistent with local conditions. Work with other local organisations to create federations and coalitions that wield influence through larger numbers and complementary resources.
- Develop networks that provide advocacy, skills development, links to credit or markets, communication services, funding or other functions. Identify government, non-governmental or other sources of support that complement and strengthen the local organisation. Clarify roles, responsibilities and expectations in collaborations.
- Establish autonomy from external authorities for the setting and enforcement of certain rules, especially concerning control over access and harvesting.

### **Capacity to adapt to external and internal changes**

- Maintain flexibility in structure and operations of the organisation. Create resources to identify and respond to short-term opportunities or threats. Avoid long-term commitments. Ensure that members can carry out multiple functions.
- Use strategic planning that is forward thinking. Create options that can be expanded or reduced in implementation. Anticipate risks and create contingency plans.

### **Competence of local organisations (Table 3.1)**

- Improve the organization's access to information and capacity development through improved communication and networking. Use strategic planning exercises to identify gaps in knowledge and sources for acquiring information and skills. Learn how to write proposals and to whom to send them.
- Enhance business skills and economic analysis to develop competence in financial management, analyses of opportunities and risks, use of credit, investment, local markets, international green markets, price changes, taxes, and government budgeting.
- Enhance skills in conservation and assessing sustainability. Develop an understanding of how harvesting times, places, quantities or means affect natural resource benefits into the future. Develop land use plans together with other stakeholders to identify conservation areas and critical resources.

### ***Challenges in achieving quality***

A realistic assessment should be made of local organisational capacities and their potential for strengthening. It is easier to work with existing strong local organisations than to strengthen weak ones or build new ones from scratch.

Representation of interests is impossible to fully achieve in organizations. Interests are diverse even in homogenous groups and some people are more influential than others. Complete participation by members is costly and members may lack interest to participate frequently. It is important to be realistic about levels of participation, build in opportunities for members to discuss their differences and create checks and balances on the power of decision makers. It may be necessary to create sub-groups of organisations for disadvantaged groups to give them more influence.

Representatives of local organisations may feel more accountable to the R&D team than to their own constituency; especially if material rewards are offered. Paying these individuals is not advised. It is important to clarify whether the representative is expected to act on behalf of the group or in their individual capacity. If the former, there should be downward accountability measures to ensure the group's interests are adequately represented.

**Table 3.1: Learning together for renewal in community development: Community emancipation through fostering rural innovation and local organisational capacity\***

Stage	Steps
Initiating change	<ul style="list-style-type: none"> <li>• Building trustful relationships with communities</li> <li>• Identifying local organisations</li> <li>• Identifying local innovations and innovators</li> <li>• Sharing and reflecting with communities</li> </ul>
Searching for new ways	<ul style="list-style-type: none"> <li>• Creating local ownership for problems and challenges</li> <li>• Identifying and learning about service providers</li> <li>• Identifying and exploring possible solutions to learn about</li> <li>• Sharing and reflecting with communities</li> </ul>
Planning and strengthening local organisational capacity	<ul style="list-style-type: none"> <li>• Developing community plans with local organisations</li> <li>• Developing strategy for local organisational transformation</li> <li>• Linking with identified sources of local innovation</li> <li>• Linking local organisations with service providers</li> </ul>
Experimentation while implementing action	<ul style="list-style-type: none"> <li>• Enhancing creativity for experimentation</li> <li>• Trying out new ideas</li> </ul>
Sharing of experiences	<ul style="list-style-type: none"> <li>• Assessing innovations with the wider community</li> <li>• Village to village sharing of innovation process</li> </ul>
Reflecting on lessons learned and re-planning	<ul style="list-style-type: none"> <li>• Reviewing progress in local organisational capacities and innovations</li> <li>• Planning for next learning cycle based on experiences</li> </ul>

\* By Jürgen Hagmann, Kuda Murwira, Paulos Ficarelli, Edward Chuma, and local R&D team in Northern Province, South Africa.

### 3.7 Information cornerstone: Access to information on technical, institutional, market and policy options

#### ***Why is this cornerstone important?***

In most situations where better NRM is needed there is a high amount of variability and dynamism due to micro-habitats, seasonality, climate, economic, historical, and other determinants. Gender dimensions, resource endowments, and age groups are among some of the social dimensions that determine the accessibility and benefits derived from resources and opportunities. Given the high level of uncertainty, risk, and other relatively local and specific circumstances, researchers are realising that it is better to provide information about numerous options rather than being prescriptive or using a ‘blanket recommendation approach’. In this way the application of technological, institutional or policy options is guided by site specific conditions and/or preferences and the socio-economic factors influencing decision making.

It is now recognised by many R&D practitioners that ‘locals’ have valuable knowledge that should be utilised by understanding, promoting and enhancing it. This realisation has largely arisen from the increasing use of participatory methods – bringing researchers, in particular, closer to rural dwellers so that local knowledge is more appreciated and complemented. There is continued discussion of the limitations of current research and extension systems and approaches in ‘reaching’ rural dwellers and that relatively ‘top-down’ fixed advisory services are not making an impact. These dynamics, local knowledge, limitations to current institutional arrangements, and the realisation that there are multiple sources of innovation have given birth to the relatively new idea of fostering innovation systems. These systems see innovation as a ‘living’ and dynamic process with multiple sources of ideas and combinations that derive from an experimental or innovation process. ‘Managing’ innovation systems is more complex than using on-farm research or in some cases participatory technology development, in that it recognises the social nature of technology (i.e. it is generated in a context, by someone with specific needs; may be bound by time and space; and is iteratively developed through an experimental–learning process). This view avoids treating innovation as a relatively static, controlled environment, where the source may be seen as unidirectional.

Managing ‘systems’ whether they be technology development, policy formulation, enterprise development, or marketing systems requires different roles and sets of skills; facilitation, rather than determining the process from the outside; appreciation and exploration of multiple sources of innovation, rather than unidirectional; improving local experimentation and iterative learning skills; brokering and linking sources of information rather than managing one way flows; and understanding the context of ‘what works well where for whom’ rather than managing controlled site specific trials.

## **What are we aiming at?**

By aiming to improve access to information on various types of options, one would hope to see rural dwellers able to select and use options from a wide range of possibilities, and experiment, analyse and interpret findings for their situation. Rural dwellers would be able to use the information to make better decisions for initiating and developing micro-enterprises so as to improve their market orientation. Rural dwellers would be more proactive in making and expressing their demands and seeking technologies from research and service providers. Researchers would be better able to facilitate innovation in diverse circumstances and to interpret what works well for whom given their understanding and analysis of critical success factors and decision making. In addition, they would be more responsive to rural dweller demands and second-third generation research issues. Overall, the research and innovation process would be more dynamic and include more actors. There would be less dependency on local institutional arrangements and more proactive information seeking and sharing behaviour. Service delivery systems would be accountable to their users, and would be successful at enhancing information links, in collecting and organising information and availing it in multiple sources and support systems.

## **Elements and strategies**

### **Knowledge captured from different sources**

- Find ways to combine rural dweller and researcher knowledge to improve rural dwellers' ability to manage and researchers' ability to provide support (technical, information and competency) of the innovation process.
- Manage knowledge acquisition through partnerships, attitude change, and changes in institutional arrangements. Management of innovation systems assumes that there are multiple sources of technologies and information, for example, local and expert.
- Develop well-articulated inclusive demands that arise from deep, joint analysis of issues, problems, and needs.
- Increased use of visioning, maps and simulation tools to link research to rural dwellers.

### **Development of innovations**

- Use indigenous knowledge in strategies of research plans and in the innovation process.
- Improve and use a more straightforward adaptation of technological knowledge and principles.

- Use methods, tools and approaches available from the NGO domain. Although rural dwellers currently manage their systems to the best of their ability, new tools, methods and information might enable them to do this better.
- Increase testing of technologies within and driven by the production context (markets and policies).
- Assist in making the production to consumption chain work, and provide production information/technologies that help rural dwellers address market demands (quality, quantity, and timing). Enterprise development requires market intelligence, managing links between production and consumer, and business skills.

#### **Documentation of the innovation system and the appropriate technologies**

- Use effective communication material, documentation, training and on-site interaction.
- Improve documentation on the context of technology development and use, of sources of innovation, and analysis of success factors and patterns. This will aid wider promotion and inform new research areas.

#### **Making innovations available – pathways of exposure & promoting**

- Make a broad selection of technological options, as opposed to prescriptive recommendations, available to rural dwellers.
- Integrate among technologies, institutions and policies during implementation.
- Bring out the success stories (ensuring that the context for success is clearly documented)
- Understand and utilise social networks and local technology dissemination pathways.

#### ***Challenges in achieving quality***

Managing innovation systems substantially changes the role of the researcher and demands somewhat different skills, as mentioned above. It requires a different priority setting process in that one is no longer looking for the ‘best’ or minimum set of solutions that is pre-judged by outsiders, whether it be policy, institutional or technical. Rather one is trying to foster multiple sources and types of innovations to arise for different circumstances and needs. The social dimension to technology and policy must be strengthened (currently economic and technological dimensions are stressed). Analysis tools must help the innovation and associated decision making processes by assisting innovators to better see patterns and factors of success, trade-offs, and risks. This will improve the efficiency and payoffs to the process.

### 3.8 Learning cornerstone: Shared creativity and learning through exposure, experimentation and iterative reflection

#### **Why is this cornerstone important?**

New ideas and competencies give people more choices and capacity to bring about change and adapt to circumstances. Participants in R&D and NRM can benefit from being creative and learning about their own actions, the change process, and about learning itself (Maarleveld and Dangbégnon 1999).

The art of R&D interventions is determining the most appropriate ways to facilitate learning loops among different groups for different issues over time. Learning loops begin with a new idea, often developed through exposure to new knowledge. People then try the idea through an experiment or other innovation (Box 3.4). They monitor the results and reflect upon what they observed. They implement the lessons they have learned to begin a new cycle. So-called social learning (Buck et al. 2001) helps improve communication and

#### **Box 3.4: Using adaptive management to develop sustainable harvesting of Jatamasi, in Humla, Nepal**

In the western Himalayan district of Humla in Nepal, a community-based ecosystem management project used biological monitoring to determine the sustainable use of medicinal and aromatic plants. Although people in the region had a long experience of collecting plant products for local as well as commercial use, the project did not have any convincing basis that indigenous harvesting practices were optimal in terms of productivity and conservation impact. The project undertook participatory action research to identify the best harvest intervals and collection methods for four commercially harvested medicinal plants, including a well known rhizomatous herb called *Jatamansi* (*Nardostachys grandiflora*), by incorporating a five-year biological monitoring plan.

While the five-year monitoring plan was prepared to assess the outcomes of various harvest intervals, the project team also developed a rapid method to find an optimal harvest interval using indigenous knowledge of the local people engaged in resource management. Under the rapid assessment, three patches harvested previously in three different years were located with the help of collectors, and two more were identified for subsequent harvest treatments, which the project could monitor directly. The results were analysed to assess the effect of harvest intervals across the two habitat types – bushy cover and open ground.

Applying the same harvest levels as villagers had used before, in two newly selected sites, the five patches were harvested according to rotation periods of five, four, three, two and one year in a period of two years. This allowed the project team to record the annual yields of fresh Jatamasi roots and rhizomes for up to five years of a rotational cycle within a period of just two years. The analysis revealed that the yield increased significantly until four years of age. In the fifth year, the yield increased but not significantly. A harvest interval of five years was therefore recommended (Adapted from Oijha and Bhattacharai 2003).

build relationships among groups by developing mutual appreciation for and interdependence on each other's knowledge. In Nepal, these channels were used to better link forest user groups with each other and with policy makers by sharing monitoring information about forest degradation (McDougall 2001).

### **What are we aiming at?**

Creativity and learning should be developed to foster innovation and integration of stakeholders' visions, knowledge and competencies. Stakeholders should reflect upon past practices and act to improve them. Multiple venues and styles of facilitation should be used to best meet the needs of different stakeholders and their learning cycles. A balance should be sought between more informal, tacit knowledge and formal, explicit knowledge. Trials should be conducted initially at small scales to minimize risk.

### **Elements and strategies**

#### **Exposure to new ideas**

- Accelerate the exchange of ideas among different people. Encourage dialog among groups, especially those that ordinarily do not communicate easily with each other. Invite resource people to share their observations and ideas.



Getting involved in action research in Ethiopia - new directions for Wondo Genet College of Forestry

Give innovators from inside the community more visibility and support to exchange their ideas.

- Organise visits to other settings or sites of innovation, including cross-visits or study tours. Meeting other innovators can provide inspiring role models, and people outside their usual environment tend to be more relaxed, open, and see things in new ways. It helps to have a critical mass of people on the visit that can support each other in the follow-up activities.
- Discuss extreme future scenarios to help people break habits of thinking and think more creatively about a wider range of unanticipated actions and events.
- Monitor the social and biophysical environment. This can accelerate access to information and action about changes that could otherwise go undetected.

### **Experimentation and innovation supported**

- Make creativity, risk-taking and local innovation a positive norm and give people recognition for their efforts. Facilitate social acceptance of innovators and new ideas. Create social pressure and competition for innovation. Understand barriers to creativity and risks and develop strategies to overcome them.
- Institutionalize systematic sharing through farmer field schools, routine meetings and networks.

### **Monitoring and documentation enabled**

- Implement collaborative monitoring among stakeholders. Choose informal and formal data collection methods that are suitable for the groups conducting the monitoring, their audience, and the type of data. Adapt the content of monitoring to include both topical and long-term issues.
- Use multiple media for monitoring and sharing information. Photo documentation and use of remote sensing imagery allows for images to be discussed among broader groups of people, and can be useful as legal evidence. Sequences of images can tell compelling stories about changes that resource managers' experience. Results of reports can be circulated in newsletters. Share results in different stakeholder forums to increase transparency and accountability of R&D. Repeating the message in different forms helps the R&D team to better internalise the information.

### **Evaluation and reflection processes incorporated**

- Design processes for reflection by different stakeholders. Create processes for evaluation and feedback appropriate to styles of stakeholders. Ensure that beneficiaries and weaker groups have opportunities for reflection and feedback. Create opportunities for bringing all stakeholders together to

develop a mutual understanding of conclusions reached by different groups.

- Use a mix of ‘rolling’ and one-off evaluations. ‘Rolling’ evaluations are frequent and routine; they ensure that teams stay alert to opportunities for improvement. One-off evaluations coincide with the end of major activities or learning cycles. They can provide the perspective of distance. Schedule evaluations and reflections to maximise participation by stakeholders who can take follow-up action.
- Create a balance between structured and informal learning. Facilitators should create opportunities to generate as well as tap informal knowledge. Too much structured learning can increase costs and interrupt flows of activities, leading to decreased motivation. The balance will vary among stakeholders and activities.

### ***Challenges in achieving quality***

Common obstacles to good learning and innovation are inadequate time commitments, material costs, lack of facilitation capacities, and difficulties in bridging cultural diversity or power differences among groups. Allowances need to be made to make the time and bear the expenses of learning.

Intensive learning in single organisations is easier than across organisations and stakeholders. Strong partnerships, governance and organisational capacities facilitate sharing among stakeholders. Continuity among core team members ensures that knowledge acquired through informal learning stays with the team.

Approaches to learning should vary and be imaginative to keep people stimulated to be involved. The benefits of learning should be clear to provide incentives for learning. Stimulating creativity and learning can be a lengthy, multistage process. Costs should be allocated in ways that reflect capacities of different stakeholders to bear the costs (Buck et al. 2001). Periodic reflection about how the team learns best and what kinds of learning are cost-effective are necessary.

There is a tendency for projects to focus on monitoring biophysical conditions and project impacts, without looking at the organisational processes underlying them (Buck et al. ibid). Effort should be made to monitor organisational relations and management decisions.

Biases of the facilitator can influence who participates in the learning and how. It is important to make possible biases explicit from the start so different stakeholders are aware of them and can address them.

### **3.9 Incentives cornerstone: Interest and energy created in the short-term to ensure commitment to the longer term goals and processes among partners**

#### ***Why is this cornerstone important?***

When working with community interests and development processes, particularly in an action research mode, researchers need to develop and use a community organisation approach that is tailored to the specific conditions and existing institutional arrangements (illustrated in Table 3.1). Whatever the R&D agenda might be, the various stages of working with communities must be thought through in advance and seen in ‘process’ terms. For example how should outsiders enter into the community; how should they build trust and confidence of the community (Box 3.5); how can the agenda evolve out of local needs; and how can the momentum evolve and energy be maintained as the work goes on?

#### **Box 3.5: Increasing the opportunities for self-determined development in the Tapajós-Arapiuns Extractive Reserve, Brazilian Amazon (by Schroth, G. and da Mota, M.S.S.)**

The 650,000 hectares of the Tapajós-Arapiuns Extractive Reserve, which was created in 1998, is inhabited by over 15,000 people in about 70 communities. These communities are almost all sited along the two rivers that give the reserve its name, leaving a large area of uninhabited forest in the more remote part of the reserve. Ideally, extractive (or sustainable use) reserves, as defined by Brazilian environmental legislation, could be a framework for combining forest conservation with development for its traditional inhabitants. But neither of the two objectives comes automatically or easily. In this project, the authors attempted to develop, together with communities in the reserve, opportunities for more diversified livelihoods for the reserve inhabitants, based on land use practices that are compatible with forest conservation. In view of a previous project in the region which had attempted to introduce externally defined tree crop combinations and had left many in the reserve indebted with little to show for their debt, an important principle of the present project was that it should reduce the dependency of the inhabitants from outside interventions, rather than increase it. This required innovations to be simple, cheap, and adaptable to present land use practices.

The population of the reserve depends mostly on slash-and-burn agriculture for the production of cassava flour, a low-value product with a significant environmental impact. However, the communities also have a strong tradition of planted rubber agroforests. After a thorough study of traditional knowledge and practices, the project first approached a number of communities to discuss a set of practices that could improve the productivity of rubber agroforests, including a simple method to eliminate seedlings of low productivity from new plantings and a more conservative but also productive tapping method. This work created a relationship of trust with the

communities, which were impressed not only by the test method for evaluating small seedlings in the field, which often yielded unexpected results, but also by the fact that the researchers knew and valued their traditions and practices. They also liked that the project did not oblige them to anything, was open to everyone to enter or leave, and presented itself rather as a basis for discussion than a fixed package to which the farmers had to subscribe.

Given that in the afore-mentioned credit scheme many inhabitants had been delivered seedlings, allegedly often of poor quality, from external nurseries, the activation of a community nursery in one of the villages was of strategic importance. The nursery has meanwhile sold thousands of fruit and timber tree seedlings in the reserve and is recognized by the Ministry of Agriculture. When the project proposed to the communities to plant cocoa – a native but underused crop in the region - in the understorey of secondary forests, thereby also introducing a form of secondary forest management, the only external inputs needed were improved cocoa seeds (cheaply sold by the government service) and plastic bags. Farmers from neighbouring communities either purchased the seedlings for a low price, or worked a corresponding number of days in the nursery. The project presently works to enable the communities to offer reforestation services to local wood-consuming industries, which are legally obliged to reforest annually in proportion to their wood consumption.

An early indicator of positive impact of the project may be that some inhabitants now proudly show trees that they have planted in their slash-and-burn fields and fallows, sometimes not far from the stumps of trees that they have cut down only a few years ago.

As part of this process, an important aspect, addressed in this cornerstone, is to have an explicit strategy and resources allocated to address short term concerns of the recipients (Box 3.6). This should be done while building commitment and addressing at some point more complex issues that may take more time to understand and solve. Rural dwellers want and need short-term payoffs to satisfy their immediate income and food needs; therefore, a strategy to link improved NRM to improved livelihoods at the onset is basic and essential. A project or R&D team should not give handouts and create dependency, but should ensure that participating stakeholders or beneficiaries are receiving some form of immediate incentive to continue participating (e.g. new knowledge or new varieties). In other words, explicit ‘entry points’ need to be identified when coming into new situations. These can continue to be used even when working with a community over the long-term.

Some formal research usually must be conducted to improve understanding of the situation, and to test hypotheses. However, this research will, more than likely, have no direct or immediate benefits, so there needs to be continued incentives for maintaining good quality engagement. There is a need to show ‘accountability’ toward local needs through addressing major short-term concerns expressed by beneficiaries.

### **Box 3.6: Ensuring impact in the short-term in Khanasser**

Short-term benefits are difficult to deliver since many NRM technologies only have long-term impacts. In Khanasser, Syria, a prime focus was on practical technologies that can have an impact, but in addition a variety of activities were conducted to ensure impact in the short-term. These included better agronomic management of cumin, participatory barley breeding, the introduction of vetches into barley rotations, improved water harvesting techniques for the cultivation of tree crops such as olives, and short-term lamb fattening procedures that use low-cost diets. Improvements in tree crops are important for both short- and long-term commitment to the better management of soil and water resources. Farmer interest groups were created for each of the interventions.

While technologies were the ultimate focus, as much attention at the start was given to training – recognising the value of knowledge. For instance farmer travelling workshops were facilitated, such as the trip to Baylounan where farmers could be exposed to a number of technologies. In an area that has little support from extension agencies, the project established a local office in one of the participating villages with a full-time facilitator who was chosen by the local community. This office is focusing on helping communities change their approaches to problem solving. Opportunities were identified for investments for which a local development project could provide loans through a credit scheme. Another area explored related to opportunities for marketing of feedstuff, stock buying, etc. The time scale for delivery of benefits related to technologies should be clarified with farmers, so that no false expectations are raised.

*Based on work conducted by ICARDA's Natural Resources Management Program.*

Experience from various sources such as AHI in Africa and CIAL's in Latin America indicates that crop varieties that address food and income concerns, help diversify or intensify production, have been excellent entry points. In addition, holding training courses, sponsoring field tours, farmer field schools or farmer competitions are other excellent short-term incentives. Some R&D teams use the formation of local organisations as part of the entry point. For example, forming farmer research groups may be seen as an entry point. It should be cautioned prior to starting new structures, existing social structures and their purpose should be understood.

### ***What are we aiming at?***

The aim is to not only have committed farmer/interest groups becoming engaged in longer term activities, but having some short term incentives that encourage engagement at the onset. Researchers should be able to identify entry points that provide such incentives, and should be able to organise this as part of an organisational management and change process. It is important

to strategise on entry points and incentives in order to choose mechanisms that are not causing dependency.

### ***Elements and strategies***

#### **Promising options are identified that have quick benefits/returns**

- Facilitate actions building on assets that lead to short term successes that are relatively low cost. Use these initiatives to evolve into other activities, such as finding NRM solutions that may require substantial investments and the pay-off may be long term.
- Identify potential strategies that improve the integration between market-driven and NRM solutions and can be exploited to ensure that both livelihoods and environments are catered for in a sustainable way.
- Match household needs with market niches, and in turn try to match these with NRM strategies.
- Consider less technical strategies to provide incentives to rural dwellers to help them make investments. For example, in the form of new policies, building community capacity to seek loans/apply for grants, or through improving links between income and NRM.



Ensuring impact in the short-term can be linked to longer-term investments. So for example, improved crop varieties and irrigated production can be quite easily linked to catchment management interventions.

**Balanced resource inputs to build upon local assets, improve competencies and avoid dependency and mismanagement**

- Material resource input levels should be based on the ability level to manage such resources in a transparent quality/performance-based, and accountable manner.
- Use appreciative inquiry to encourage local identification of assets and gaps. Then assist local people by identifying possible support organisations or information that can fill the gaps and build upon local assets.
- Indigenous knowledge should be a starting point and communities should be the basis of action and planning. Note and build upon people's strengths, build ownership and self-reliance.

**Long term vision and outputs jointly defined, expectations clarified, and contributions from different partners and benefits accruing from the process are clear from the start**

- Work with rural dwellers and their organisations in ways that clarify roles and responsibilities, and gain trust and respect. Build upon the strengths of local knowledge and do not undermine it.
- Explicitly include these aspects in the local community organisational strategies that are used in action research.

***Challenges in achieving quality***

One of the main challenges is to ensure that ways of working and short term incentives do not create dependency, especially dependency that is based on the lifetime of the project only. There may be a need to find strategies to deal with external (outside your control) causes of dependency. For example, local NGOS may be giving handouts or paying per diems to collaborating rural dwellers. Ways to convince partners to change their approach is needed.

Another challenge may be to maintain research activities, while trying to support (and justify this activity in the research organisation context) more development type incentives. It takes skill and resources to manage entry points at the same time as pursuing other research objectives that will indirectly or eventually add value to the process.

Rural dwellers are often not able to invest unless there is an incentive; therefore, they tend to have short term perspectives and many immediate needs. It takes special strategies to engage rural dwellers in longer term change processes, particularly when it requires significant investment and when the payoffs are not initially visible. This is often the case with NRM projects.

### 3.10 **Scaling-up cornerstone: Explicit scaling-up and scaling-out strategy building on successes and strategic entry points**

#### ***Why is this cornerstone important?***

Deep involvement of R&D actors in specific sites can yield valuable insights at these sites. But we need to ‘Go to scale’, ‘to bring more quality benefits to more people over a wider geographical area more quickly, more equitably and more lastingly’ (Gonsalves 2000).

The dissemination of conventional technological research products, such as high-yielding crop varieties for example, follows a simple linear route from researcher to extension worker to rural dweller (the ‘transfer-of-technology’ model). NRM does not necessarily yield these technological packages and is usually not amenable to this sort of dissemination (Douthwaite 2002). In NRM, resource users and managers, extension officers and other service providers, and researchers should be participating from the initiation of the R&D process. Extending benefits to many people is largely a function of understanding the impact pathways, and planning and investing at the outset to create the enabling environment for scaling-up. Thus scaling-up becomes part of the research process rather than a delivery mechanism for a finished product. Embedded in the concept of scaling-up is the idea that any change (technological, institutional and/or policy) is brought about by the formation and actions of networks of stakeholders in an innovation system, in what is essentially a social process of communication and negotiation.

*Scaling-up is vertical, e.g. through institutions, and through organisational competence development and improvement. Scaling-out is horizontal, e.g. from community to community, involving service providers. Scaling-out is used to define spatial extrapolation of successful approaches to other sites with similar circumstances, in other words, replication (with adaptation) at the same scale but at different locations.*

#### ***What are we aiming at?***

NRM is acting locally but considering scale from the beginning – it is avoiding the pitfalls of pilot schemes that go no further than the immediate area of influence of the project. It is ensuring that the high levels of investments in specific sites translate into impacts for a much broader constituency. Scaling-up recognises the different clientele that are potential recipients of technologies, and the various methods and approaches so as to improve the relevance and usefulness of communication products. NRM participants will need to manage the various elements of going to scale as a system and put energy and thought into this management process. Going to scale is more than achieving high

levels of adoption, it also involves being aware of the various types of impacts (social, economic, environmental), both positive and negative, that need to be taken into account. So scaling-up should not lead to negative off-site impacts as a result of the wide uptake of specific practices. Another aim will be to validate and improve the technology and methods in different contexts by developing and using a feedback and monitoring system.

## ***Elements and strategies***

### **Promising options for scaling-up developed**

- Develop approaches for distilling lessons on methods and technologies. This will involve learning from contextualised successes and failures including understanding impacts and trade-offs. Strategic entry points for scaling-up have to be analysed, such as identifying who to work with to ensure scaling-up, where to work and what to work on.
- Analyse strategic entry points for scaling-up (who you work with, institutional context and history, where you work and what you work on).
- Ensure there is available material for scaling-up.
- Identify the incentives and motivations to make scaling-up work (e.g. market incentives).

### **Organisational partners for scaling-up and out engaged**

- Assess the functions and performances of potential ‘users’ or service providers in the innovation system.
- Develop a joint strategy for scaling-up, and learn and validate from the broader testing or application of the intervention.
- When selecting partners, think about how they are working in terms of scaling-up and what they learn through their pilot work.
- Identify uptake pathways and means of dissemination to inform the approach and mechanisms used.
- Conduct policy analyses to identify bottlenecks or enabling conditions. This should also result in the identification of partners needed to bring about policy change. As a practical example, take one of the hypotheses in the early version of the Sub-Saharan African Challenge Program – ‘needed investments in rural infrastructure and in enabling environments for private sector development have not yet been made.’ If this is a valid hypothesis, we need to have financial planners in economic ministries in the research process from the outset as scaling-up will be highly dependent on their interventions.

### **Competent service providers and appropriate organisational arrangements**

- Develop strategies to ensure that service providers have the capacity and organisational structure to enable the management of a quality scaling-up process.
- Ensure that organisations have the necessary competency to manage the organisational dynamics and partnerships, so scaling-up can be facilitated.
- Develop competencies so that participatory approaches to scaling-up are used.

### **Knowledge and information shared**

- A communication strategy will need to be developed to target products in various media for various ‘users’ and situations.
- Develop feedback mechanisms to find out how useful the information is and to identify further information to better target ‘client’ information needs.

### ***Challenges in achieving quality***

Getting the appropriate partners for scaling-up will inevitably involve some serious challenges. For example, what may be innovative work at the local level on institutional arrangements for managing micro-catchments may not catch the imagination of the macro-planners involved in the water sector. Their top-down approach to dividing the country up into ever smaller bio-physically defined management units may bear little reality to how local users organise themselves. Yet capturing the macro-planners’ imagination sufficiently, to engage in pilot studies and learn from them, may not be possible as they have their own agenda and macro-issues to solve. However, without them the possibility of scaling-up would be diminished.

Building competencies in service providers will be a key challenge, involving major time investments. Almost always, NRM practitioners will need to have or facilitate to have champions in key service organisations. And once the competencies are built, there will have to be some degree of stability in the service providers. Any organisational collapse will be disastrous to the entire scaling-up endeavour.

There are busy times at the start of projects, and projects inevitably, get behind schedule in the first few months. We are proposing that even more activities have to be conducted in the first few months of projects: scaling-up strategies need to be devised; some organisational analyses need to be conducted, so that the key partners can be identified; the impact pathways must be clear and a communication strategy must be devised. To ensure this occurs, in addition to the more usual start-up activities, extraordinary leadership and facilitation is required (Section 3.4).

### 3.11 Research design and process cornerstone: Effective research design and process to integrate research and development objectives

#### **Why is this cornerstone important?**

In NRM, the research and development process is interlinked (see Section 2.3). The research component of the process needs careful consideration because there are many departures and different considerations compared to more conventional research. In NRM R&D there will most likely be a combination of methods applied in a series of steps; methods may come from different disciplines and there may be a mix of more formal and ‘informal’ methods. Quantitative and qualitative techniques and data will be generated and will need analysing. Results will be generated from the local level and from policy levels. Research team members need to be conversant in, appreciate and value different methodologies. This will enable better design and analysis through drawing from a wider ‘toolkit’. Achieving the appropriate balance between reductionist science to answer very specific questions and more integrative science will always be a challenge.

In NRM R&D the aim is to inform development processes from research findings that are usually generated in local and situation-specific contexts, such as the case of community-based NRM in Zimbabwean wildlife regions, joint forest management in Nepalese foothills, and identifying and verifying livelihood options in buffer zones surrounding some of Uganda’s national parks. The nature of this work is that it must be done in context. However, it is desirable to be able to generalise across a wider set of situations, and be able to explain context (what works well where, with whom, and why). If this can be done, a localised investment will have more pay off, and methods and information can become international public goods. This requires careful research design in at least two levels – at a given site or pilot location, and across sites or at the more ‘regional’ dimension.

Participatory action research (PAR) lends itself to generating more situation-specific findings (see Section 3.8). It ‘is a flexible spiral process which allows action (change, improvement) and research (understanding, knowledge) to be achieved at the same time. The understanding allows more informed change and at the same time is informed by that change. People affected by the change are usually involved in the action research. This allows the understanding to be widely shared and the change to be pursued with commitment’ (Dick 1997). Research should add a dimension of rigor, accuracy, and assurance so that what one observes, hears, and interprets is well founded. It should add value to the development process by providing good information – that informs the process and those involved in making decisions and taking actions. If research is not

conducted with quality processes and science, then one might as well leave it aside and proceed with the development process in a less rigorous trial and error mode. PAR is often misunderstood and not seen as a quality science process for two reasons: it is very different from conventional scientific method; and secondly, some practitioners, with a poor understanding of action research, call what they do ‘action research’ when it is simply unevaluated action.

In NRM scientists need to consider a much more flexible approach to doing research. When using PAR, the outcomes are left more open, fuzzy and flexible and next steps are based on the outcomes and analysis from the last step, leading to less fuzzy understanding. The research design process needs to be thought through, but also left fluid. It is this flexibility that is one of the main differences to more formal research processes where the design up front is rigorous, usually fairly static and controlled.

It has been difficult to pin down the quality processes that should be inherent in PAR and other research approaches that fall towards the less controlled end of the spectrum. In the R&D approach advocated here we are combining PAR in its purest form with more controlled and quasi-experimental types of research to be able to answer research questions. We also combine PAR with organisational and policy analysis. In addition the PAR conducted in the field will inevitably be linked to reductionist science happening in more controlled circumstances.

*If you want to know how things really work, just try to change them (Kurt Lewin).*

*Truth is elusive; but research, well-conducted, can provide a warrant, an adequate assurance, for the assertion which we eventually offer. We may not be able to claim that we have pinned down the truth. But if we can say that our methodology and evidence allow a reasonable claim to be made, then that is as much as anyone can reasonably demand (Dick 1997).*

### **What are we aiming at?**

We need to be able to produce credible results that are useful to specific situations as well as used to analyse across situations, making the results more useful to a wider number of practitioners. Researchers and development partners should be able to recognise good quality PAR. They need to be able to appreciate contributions to methodology and finding solutions to research questions using multiple methodologies and analysis techniques. Researchers should be in a position to design credible research that can answer relevant development questions. They should be able to frame these questions after discussions with colleagues and beneficiaries. They should be able to analyse and interpret results and share/feed these back to partners who can immediately use them and put them to the test.

## ***Elements and Strategies***

**Well formulated research questions are grounded in key development challenges that take into account multiple scales of inquiry**

- Focus research questions on solving a problem or providing a better understanding of the causalities and/or solutions for identified conditions, while catering to different levels of inquiry.
- Develop a conceptual model (e.g. showing cause-effects of problems, decision making structures, driving forces and effects of dynamic processes) to assist in deriving the research questions (e.g. see Figure 1.3 as an example of a conceptual model). Develop a good knowledge and understanding of the area and of the people who live there. Design clear questions, which are not easy to arrive at and if not done well can lead to inappropriate choice of methods and analysis. Understand local knowledge.
- After choosing the problem, use deductive logic to develop a hypothesis about the relationship of the crucial variables and the situations.
- Given the hypotheses, use a rigorous, iterative process (going between site and regional concerns) of generating and cross-checking research questions – across topics and scales – that can test the hypotheses, or lead to new ones. The new hypotheses may inform development processes at sites as well as contribute towards more generalisable knowledge.
- Determine research gaps based on problems or lack of understanding that can have a large influence on the development process (as a way of priority setting). Ensure the research question is researchable and is of some significance. Plan for the balance between reductionist research and more integrative research.
- Review scaling-up strategy (such as, locations, audiences, organisations, targets) in relation to the research questions (Section 3.10). Do this to ensure that the research will result in important, generalisable, explainable information that is useful beyond site boundaries and within site boundaries.

**Choices of research design and comparative frameworks across sites that enable understanding of important causal factors, related conditions, and/or demonstrate diversity (through case studies).**

- Drive the choice of methods and implementation process in line with the hypotheses and associated research questions. PAR could be used if situation-specific knowledge is required, but a more formal research design may be required, if it is important to extract meaningful relationships between discrete variables. A PAR-influenced design should be used if it is important to understand social situations where there are a complex set of relationships between indiscrete variables and it is not possible to choose which variables are crucial.

- Consider the hypotheses, research questions, and type of design required when coming up with sampling regimes, control factors, and quality control mechanisms so as to get valid results through a rigorous process.
- Researchers can use the PAR cyclic process of asking generalised and then progressively more focused questions. This will lead them towards identification of some crucial relationships.
- Researchers should be conversant with the pros and cons of various options and inputs. Knowledge of relevant disciplines can assist in understanding and making these choices.

**Choice of methods and implementation and analysis strategies caters to different types of inquiry, reflects an integration across disciplines, and considers research and development process quality**

- Review different methods or series of methods that might be used to answer the question. Some of the determining factors to consider might be: scale; social context; and sufficiency of qualitative data. Researchers should be conversant with tools and methods, design considerations, analysis techniques and assumptions inherent in the methodology used by economists, sociologists, anthropologists, systems agronomists, hydrologists and ecologists..
- Consider how methods should be mixed and sequenced.
- Research team members should use their knowledge to jointly examine and choose methods that can be used sequentially to answer research questions.
- Roles and responsibilities can then be assigned, so consider expertise and capacity building needed to do the job. This leads to training, partnership arrangements, and collaborations.
- Derive performance and quality criteria so that the R&D team can review designs, implementation techniques, and analysis and interpretation tools, to check on the quality of the process before and after it happens.
- For data analysis it is useful to start by discussing your hunches, likely outcomes, key themes and general trends with colleagues and key informants. This begins with the first shred of data collected.
- Set up quality control systems particularly for data collection and handling. Do this by developing interdisciplinary quality standards for data collection and reporting that are agreed upon across the partnership. Determine what the accepted standards are for each discipline. Pilot test each field instrument. Ask key informants how they would structure the instrument, collect feedback from enumerators, etc.

**Impact orientation and value of results for beneficiaries**

- Evaluate whether the research is likely to have impacts. The desired impact should be clearly defined and understood by all concerned.
- Scrutinise whether particular research is impossible or difficult to implement, and/or whether it is unethical.
- Test value of the potential results prior to implementation.
- Test whether the research is likely to feed directly into decision making.

***Challenges in achieving quality***

The suite of different types of research and methodologies needed for effective R&D that can answer problems and build understanding in NRM situations is not yet widely practiced, nor understood. Methods are still under development. One can easily feel overwhelmed with complicated research management. Most people are trained in a given discipline, therefore there is incomplete knowledge regarding the research possibilities. PAR is just starting to receive acceptance as a serious strategic research method. Research managers also have limited knowledge, and limited monitoring and evaluation systems with the result that measuring research performance is less than ideal. Therefore, research managers and peer reviewers who are not practitioners do not know how to judge PAR or mixed methodologies. There is a weakness in coming up with research questions and testable hypotheses.

# 4 Managing the research for development process

This chapter is about managing the research process to ensure quality. It reiterates some of the key features of R&D in natural resource management (Section 4.1) and then goes through some of the key stages in the R&D process. The chapter also shows how the LearningWheel can be used. The LearningWheel emerged out of practice, and is then applied to inform better practice.

## 4.1 New orientations for R&D

‘Research for development’ (R4D) or ‘Integrated Natural Resource Management’ (INRM) are slogans that need translation into reality. Learning is no longer seen as exclusively for research, but should be fostered as part of all innovation systems. The research process has to become more embedded in the development process, with work on a wider set of issues in different ways than in the past. Some of examples of this new approach include:

- going beyond technology development to do research on *processes and approach development* (scaling up, local organisational development, participatory policy formulation processes, management of partnerships, watershed management approach, institutional change processes);
- research on *methods* (participatory technology development, facilitation methods, participatory mapping of local ancestral domains, multivariate trade off analyses incorporating different perspectives); and
- research on *policies, social aspects and institutions* (such as, impacts and critique for improving the functioning of market chains; developing methods and processes that improve community-based NRM, with participatory by-law analysis, formulation and implementation mechanisms; communication

mechanisms for rural villages; and, social networking so as to foster dissemination of technologies, incorporation of local knowledge and strategies).

While concrete *products* are still considered necessary, equal and in fact in some cases more weight is now attached to outcomes such as *empowerment*, *capacity building*, *organisational strengthening* and *policy reforms*. These outcomes are considered central to sustainability and effectiveness of development programmes. They represent a more pragmatic yet far reaching understanding of how change takes place. Yet none of these outcomes can be achieved through rules of thumb or fixed activity menus. They require serious attention to the context, and demand a high level of sensitivity, and skill to negotiate ‘process’ rather than merely technology dimensions. A heightened attention to process represents a substantive shift in attention from sheer magnitude of change to its quality manifest in participation, ownership, innovation and eventual sustainability.

Much of NRM research is working with social and institutional processes in a development context, so are best conducted *within or embedded* in the development process with development partners so that learning and experience can be informed and accumulated in the action-learning cycle (Figure 2.2). In this mode, research can inform the process and be informed by the process, develop methodologies that are directly applicable, improve the orientation of the research agenda as it unfolds because needs emerge from the process, and results can be presented back to and feedback collected from beneficiaries relatively quickly.

Intertwined research and development processes calls for managing a change or development process as well as a research process. This may seem complex and to many researchers beyond their usual role and expertise. Challenges in combining PAR with more conventional research processes have triggered work on the development of research methods and tools themselves; for example, formulating different types of research questions and associated designs; integrating various disciplinary-related research tools, methods and perspectives into research questions that require multifaceted investigation; and, operationalising research at different scales or systems levels.

## 4.2 Creating a common understanding and vision

A key step in the research process is creating a common understanding and vision of the research process (Section 4.1: Shared focus cornerstone). The LearningWheel can be used as a tool to create a common understanding and vision of the way to implement R&D among a diverse range of stakeholders and partners involved in the implementation teams.

### 4.3 Designing new programs and strategies

The LearningWheel can also be useful in setting up new programmes, in that the approach can be used to identify, with stakeholders, the main areas for interventions. Key functions and related possible partners/stakeholders can be identified in an inclusive and rigorous process in which all partners can win through the synergies. The LearningWheel is a tool to select more clearly the required partners and prioritise core activities of each partner.

### 4.4 Monitoring and evaluation (M&E)

As part of the action-learning cycle, monitoring and evaluation becomes crucial (Section 3.8: Learning cornerstone). The LearningWheel can be used as a framework for M&E. Implementation teams can use the LearningWheel to reflect on their interventions and analyse the state of the art for each cornerstone. This helps them to reach a common perspective on where they are, what they consider success and what the knowledge and design gaps are in their existing intervention. An iterative self-reflection (e.g. every half year or annually) with the whole team and some stakeholders can be a powerful way of steering an intervention and learn systematically together.

### 4.5 Integrating decentralised learning at different sites and scales

Most commonly, NRM approaches are applied to ‘pilot sites’. These serve as accessible, manageable ‘units’ where experimentation – learning through trial and analysis, observation, and monitoring over time – takes place with the multiple actors who live and work there.

By engaging for relatively long periods in pilot sites, the R&D team members can develop a much deeper understanding of social dynamics, networks, dimensions of power and influence – basically understand the context that can be very informative for understanding and influencing, in a more informed way, better livelihood and NRM strategies.

R&D teams can only work practically in relatively small areas; however, pilots can be chosen in such a way to embrace several scales – for example, integrated watershed management pilots usually work with individual rural dwellers and their households (farm level), with sub-sets of the community (interest or resource user groups), villages, immediate landscapes that embody resources/interests that fall across several communities, districts and other higher level administrative or decision making units.

Another consideration is that of scaling-up and scaling-out (Section 3.10: Scaling-up cornerstone). There is a need to develop at the onset a framework

that helps to organize and envision the research outputs at different scales and how they are linked.

We imagine iterative steps between concurrent regional and site work. The site work should contribute directly to achieving local impact and success, and be linked to regional (and global) work where more strategic products – e.g., approaches and methods – are generated from synthesizing and analysing the outcomes from the sites. Learning loops should be occurring at both scales. Each site is involved in doing its own research, process management, and reflecting and learning so as to address its research questions. The work must be well documented so that there can be links made between experiences on certain areas and comparisons, syntheses and generalizations can be generated across sites.

## 4.6 Knowledge management

Application of PAR and the learning cycle within R&D and managing decentralised learning calls for designing an appropriate knowledge management system to ensure efficient data collection, analysis and interpretation, so that those directly involved, as well as others outside the project can capitalise on the knowledge generated. Process monitoring and documentation yields rich data, insights and lessons which can be used for upscaling, dissemination and policy advocacy.

The Learning Wheel can be used as a knowledge management tool. The lessons and experiences, and methodologies/tools used to enhance each of the cornerstones can be organised by using the cornerstones as the key organising concepts (e.g. through interactive websites).

Process monitoring and documentation is a key step and takes place throughout implementation. Process monitoring and documentation is a system of managing and analysing information on the relationship and contextual elements in projects. It complements the existing monitoring and evaluation methods and adds value, insights and perspectives not otherwise available using routine methods. The documentation system must be an integral part of the work, documenting the results in terms of biophysical, social, policy, and capacity changes, and must be more inclusive, explicit and useful not just internally for implementation teams, but to the ‘external’ agencies and audiences. In PAR, documentation must be rigorous and well organised, or there will be no learning and no research – only action.

# 5

## What are the implications of all this?

Research and development within NRM arenas is undoubtedly in an exciting phase, with a whole suite of organisations in different contexts embarking on more integrative research. Given the need to view rural development problems from multiple perspectives, the time is ripe for new approaches to NRM research. There are converging tendencies in conservation, development, agriculture and governance. Competencies in inter-disciplinary work are higher than before. Numerous actors recognise the need for change in research systems. The principles and operational cornerstones provide a comprehensive description of a new way of doing business. The R&D approach advocated here is much more than the integrated management of soils, water and other resources. It is also distinctly different from farming systems research approaches and farmer participatory research.

So, how can the R&D approach described here become a reality? Although the operational cornerstones do provide a means to establish better R&D and while some of the principles will be readily accepted by most researchers, at another level reforming R&D can be a mammoth undertaking. For many researchers, a move away from the current incentive system is difficult in the short term. How many scientists in academic institutions, where the vast majority of researchers are trained, would be willing or able to shift their incentive systems from numbers of refereed publications to the quality of developing partnerships? Enlightened leadership from numerous actors is needed for the R&D described here to become a reality.

However, the operational cornerstones do provide a good starting point, as the elements and strategies are concrete ways in which process and practice can be improved. But, managing eleven, or at least the most important

cornerstones with multiple stakeholders at different levels is an enormous challenge (Sections 1.4 & 4).

Getting lost in the complexity is a real concern. In addition, a cookbook approach is not ideal, because effective R&D needs creativity to match particular contexts. Once you have read this booklet, consider putting it away and devising your team's own R&D elements and strategies!

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# **Annex 1. The LearningWheel – a methodology to generate concepts from practice and manage experience-based knowledge**

The LearningWheel methodology, developed by Jürgen Hagmann, generates experience-based conceptual frameworks from practice, building on the lessons and success factors of practical case examples in an appreciative manner (Hagmann 2005). In several analytical steps, workshop participants distil the success factors which were central to generate successes in different cases and experiences. These are clustered into ‘cornerstones’ and systematised into a LearningWheel conceptual framework.

The ‘**cornerstones**’ of the LearningWheel frame are fundamentals of successful interventions which are in systemic interaction with the other fundamentals. Based on ‘systemic intervention’, each of the cornerstones need to be addressed as otherwise the weakest one becomes a threat to the whole approach. This does not mean that they all have to be actively addressed, some of them might be in place anyway, others which are identified as gaps, can be addressed through linkages and partnerships. In this sense, the LearningWheel serves as a checklist which can also be used for self-reflection and evaluation of initiatives and for the design of new initiatives.

Each cornerstone is processed further in terms of its ‘**elements’/‘ingredients**’ which are the key components making up the cornerstone, ‘**key strategies & processes**’ to deal with the elements, and ‘**possible ways to implement**’ within these strategies. These components are also distilled from participants’ experiences and brought together into a table (Table A.1) which can be complemented through lessons and experiences. The whole framework is an open system which can be adapted (e.g. new cornerstones might be added when felt necessary). Possible links to available experiences and websites describing them help to make the whole framework a ‘learning frame’ for knowledge management in multi-stakeholder initiatives.

**Table A.1: An example of a table framework that can be used by participants as part of the LearningWheel methodology**

CORNERSTONE	CONTENT (ELEMENTS/ 'INGREDIENTS')	KEY STRATEGIES & PROCESSES	POSSIBLE WAYS TO IMPLEMENT
		•	•

In each of the cornerstones, the gaps in existing knowledge and experience can be defined and then specifically explored in different places by different people in future actions. Their insights, lessons and experiences can then be integrated after some time into the overall umbrella approach and so all the parties involved in this systematic joint learning process can obtain a much broader and faster experience base than alone.

The participatory process of developing the LearningWheel is logically structured in an analytical manner. Often, individual cases have only lessons, success factors and promising strategies in some areas, but when analysing a variety of different experiences/cases together, a comprehensive framework can be developed.

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The Center for International Forestry Research (CIFOR) is a leading international forestry research organisation established in 1993 in response to global concerns about the social, environmental, and economic consequences of forest loss and degradation. CIFOR is dedicated to developing policies and technologies for sustainable use and management of forests, and for enhancing the well-being of people in developing countries who rely on tropical forests for their livelihoods. CIFOR is one of the 15 centres supported by the Consultative Group on International Agricultural Research (CGIAR). With headquarters in Bogor, Indonesia, CIFOR has regional offices in Brazil, Burkina Faso, Cameroon and Zimbabwe, and it works in over 30 other countries around the world.

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# Navigating amidst complexity

Guide to implementing effective research and development to improve livelihoods and the environment

This booklet is directed towards those who are implementing natural resource management (NRM) projects, undertaking research on NRM, or setting policies for NRM. It is focused on the best ways to improve the effectiveness of research and development (R&D) in natural resource management so that livelihood and environmental outcomes are enhanced.

The foundations and cornerstones presented in this booklet were established during a series of four workshops involving over 200 scientists from the Consultative Group on International Agricultural Research (CGIAR) and its partners. Specialists were drawn from the full spectrum of land use systems and NRM perspectives: conservation, forestry, fisheries, irrigated agriculture, dryland agriculture, and livestock production – covering the humid to arid tropics.

What is described here can be thought of as a “new way of doing business” for R&D in natural resource management, and builds on approaches from the agricultural, conservation and governance fields.

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