

## **In Search of Substance**

### **'State of the Art' of Approaches, Strategies and Methods for Improving Natural Resource Management and Livelihoods**

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#### **Abstract**

*The global sustainable development agenda supports equitable development that ensures sustainable use of the natural resource base and improves livelihoods. SARD and World Bank embrace the idea that agriculture is the engine that will drive economic growth and that the existence of technologies and legal frameworks as well as social and institutional capacity will propel this development. This paper reviews success factors for achieving sustainable development, highlighting both internal and external factors that are needed to enable improved livelihoods and environmental management in the rural sector. Many of the internal success factors revolve around being better able to do and control a number of aspects of rural development – the so-called “empowerment factor”. External factors support the community and include enabling policy and institutional environments, market economies, availability of information and advisory organizations, good governance, good and accountable management, and existence of platforms for discussion and exchange. Many of these elements have been brought into the integrated natural resource management (INRM) research approach. Following an overview of the Sustainable Agriculture and Rural Development (SARD) paradigm and a synthesis of key success factors for SARD, the paper reviews approaches, strategies and methods in NRM research. The paper then consolidates the INRM research approach based that has emerged from diverse NRM approaches and is built on SARD principles. The paper concludes by distilling five key factors enabling sustainable development and natural resource management, and their implications for research challenges and needs.*

#### **Introduction**

The global sustainable development agenda supports equitable development that ensures sustainable use of the natural resource base and improves livelihoods. SARD and World Bank embrace the idea that agriculture is the engine that will drive economic growth and that the existence of technologies and legal frameworks as well as social and institutional capacity will propel this development. This said, there are global trends that are worrying: increasing populations with a shift to urban areas; global warming and climate change resulting in greater variability; HIV-AIDS and changes in the social structures of rural peoples; increasing commercialization of production that will put more stress on the environment and continue to marginalize less well-endowed groups; continued restructuring and decentralization with related transaction costs emphasizing demand-driven systems, partnerships and collective action; and better ICT technologies making information accessible to a wide population.

Success factors for achieving sustainable development were reviewed noting that both internal and external factors are needed to enable improved livelihoods and environmental management in the rural sector. Many of these have been promoted by development projects, but it was noted that trade-offs and complexities are integral to any given situation – and these need to be dealt with rationally. Many of the internal success factors revolve around being better able to do and control a number of aspects of rural development – the so-called “empowerment factor”. Pro-activeness, equity, local ownership, self-reliance, and general increased capacity are major cornerstones to success. External factors support the community and include: enabling policy and institutional environments, market economies, availability of information and advisory organizations, good governance, good and accountable management, and existence of platforms for discussion and exchange. A review of approaches and methods for R&D shows inclusion of these success factors from conservation and agricultural perspectives, with community-based, agro-ecosystem, and livelihood approaches underpinning many of these and NRM as their backdrop. Many of these elements have been brought into the integrated

natural resource management (INRM) research approach now being used for solving R&D issues. The review of the evolution of research approaches takes us through the commodity era, to farming systems research, to participatory technology development and farmer participatory research, onto INRM. This evolution also contributed towards INRM components enabling it to be applied to solve NRM and livelihood issues within the current research for development paradigm. It is notable that there is high speed generation of concepts and approaches, they are often 'externally driven, with little time built in to reflect and learn from experiences and build capacity needed.

In conclusion a cross analysis was made of the approaches and 5 key factors of success were identified: policy environment should favour local participation, investments have to pay early on, processes need to strengthen local institutions, economies need to diversify, and R& D arrangements need to be clear. Cross cutting features were also elaborated. Various gaps for INRM research to address were: contributions that natural resources are making to livelihoods and poverty alleviation as well as its contribution to the overall economy, various technical NRM areas, integration and systems management, social and institutional dimensions of INRM, and how to change the policy and institutional environment. Challenges highlighted for Africa that include four "ins" should receive integrated support from public investment because they are critical foundations for NRM investment: incentives, information, inputs, and institutions needs to come into these principles: knowledge-intensive INRM; farmer-centered policy and research design; and improved NRM must pay.

## **Global Strategies for the Future: Framing Sustainable Agriculture and Rural Development (SARD)**

During the WSSD it was decided that sustainable agriculture and rural development (SARD)<sup>1</sup> remains a valid development paradigm since the concept was articulated ten years ago, even though there has been considerable change and evolution since that time. It is within this context and the global vision of the key features of developing world agriculture, and in Africa in particular, that this paper describes and assesses the state of the art of various approaches, methods and tools that have been applied towards reaching these objectives. One of the main conclusions is that the agricultural sector still needs to be promoted and enabled as a viable source of rural livelihoods and in harmony with the environment.

*"Agriculture plays a crucial role in addressing the needs of a growing global population, 'Land is inextricably linked to poverty eradication, especially in developing countries. Enhancing the role of women at all levels and in all aspects of rural development, agriculture, nutrition and food security is imperative. Sustainable agriculture and rural development are essential to the implementation of an integrated approach to increasing food production and enhancing food security and food safety in an environmentally sustainable way."*

– WSSD Plan of Implementation

The major objectives of SARD<sup>2</sup> are to increase food production and enhance food security in an environmentally sound way so as to contribute to sustainable natural resource management. It noted that food security - although a policy priority for all countries -remains an unfulfilled goal. It also noted that agriculture has a special and important place in society and helps to sustain rural life and land. Yet the capacity of available resources and technologies to satisfy the demands of this growing population for food and other agricultural commodities remains uncertain. Agriculture has to meet this challenge, mainly by increasing production on land already in use and by avoiding further encroachment on land that is only marginally suitable for cultivation. Specific recommendations from WSSD support include, *inter alia*:

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<sup>1</sup> SARD is "Sustainable Development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry, and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable." This definition was adopted in 1989 by FAO, according to the *FAO Trainer's Manual*, Vol. 1, "Sustainability Issues in Agricultural and Rural Development Policies," 1995.

<sup>2</sup> Committee on Agriculture, 16<sup>th</sup> Session, Rome, 26-30 March 2001, "The Place of Agriculture in Sustainable Development - The Way Forward on SARD."

- Integrated land management and water-use plans;
- Sustainable and efficient use of land and of other natural resources, including through strengthening national research and extension services and farmer organizations;
- Enhanced participation of women in sustainable agriculture and food security; guaranteeing well-defined and enforceable land and water use rights and promotion of legal security of tenure;
- Increasing public sector finance for sustainable agriculture;
- Enhancing access to existing markets and development of new markets for value-added agricultural products; and
- Support for traditional and indigenous agricultural systems.

Major trends in globalisation, increasing environmental concerns, changes in governance, population dynamics and a number of socio-economic changes are the backdrop occurring at a fast pace where SARD must occur and these trends are increasing the challenges. A key challenge is equity – for the economically weakest may not be able to adjust fast enough - so dynamics of change may discriminate against them. The views presented within the SARD framework and also noted by the CGIAR (Box 1) are “global”.<sup>3</sup>

The World Bank’s views and policies regarding sustainable development (World Bank 2002) provide a relatively holistic livelihood view to development is expressed as: in order for people to thrive, their assets, e.g. physical, financial, human, social, and environmental, must thrive and need to be managed responsibly for sustainable development to be achieved. Institutions providing safeguards to good environmental management range from the social capital and norms to governing modern institutions as property rights, fishing quotas, and forestry agencies. When people lack security and a long term perspective soils, water, fish, and forests that benefit the poor directly can be wasted or degraded. Not only markets, property rights, and a legal framework are needed but there needs to be specific support for:

- Institutions ensuring environment (clean water, clean air, fisheries, and forests) and social assets (mutual trust, ability to network, and security of persons and property) are in place;
- Accountability and balancing of interests, where there can be win-win for different segments of society, particularly for the disenfranchised poor.

The World Bank’s strategy states that greater emphasis and associated investments should be placed on: a) identifying the vicious circles that keep the pace of growth slow and the distribution of assets unequal, b) ensuring better, more inclusive institutions and c) ensuring systematic learning that is applied to improving policies and projects. Development strategies that emphasize inclusiveness, shared growth, and better governance will make great demands on leaders and communities in developing countries, so the strategy recognizes the long-term nature and time required for change, particularly reforming education systems and managing ecosystems among others.

The World Bank recognizes the difficulty in addressing environment - “Traditionally, many natural assets have been viewed as openly available to everyone and as infinitely renewable. When assets such as forests, fisheries, or land seem inexhaustible to all potentially interested users, there may appear to be no need to assign and defend control rights to manage their use. But as economic activities become integrated nationally and globally, and the technological capability of human activity increases, even at local levels, the pressure on natural resources and their regenerative capabilities also increases. With the realization of growing scarcity, many parties compete to grab assets and assert control through occupation or through pre-emptive extraction of natural assets (timber, forestland, fisheries, urban plots, and water).” They mention three catalysts (policy principles) for improving institutions:

1. Empowerment through improved access to assets
2. Increased democratisation
3. Inclusion and participation

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<sup>3</sup> From: *Integration of CGIAR activities in Eastern and Southern Africa*, A report of the inter-centre preparatory meeting held at ILRI, Kenya, March 14-16, 2001.

**Box 1:** Future trends, opportunities and challenges (SARD and CGIAR views)

**Globalisation:** Trade liberalisation, increased freedom and speed of capital movements, speedier transfer of technological information, and increasing magnitude of the influence over markets of private-sector trans-national corporations offers enormous potential for accelerating development. However, 'trickle down' of benefits may not work, and rising competition in markets or lack of access to resources to seize opportunities may frustrate aspirations, and make avoidance of negative impacts such as environmental degradation more urgent. Agricultural growth and markets and trade will be dependent on increasing commercialisation of production. While liberalization of both input and output markets has been a principal policy over the last decade, private sector and market development has been constrained by various factors. Given the unfavourable terms of trade facing smallholder farmers and constraints on farm size, subsistence and crop diversification remain dominant farmer strategies. The challenge to increasing market participation by smallholder farmers and connecting them to global markets is large. In many countries this is leading to policies favouring larger, commercial enterprises, which in turn often marginalize smallholder agriculture.

**Governance:** Decentralization in many countries has in some cases reduced central government's role in direct economic intervention and service provision, where expectation has been for private sector and civil society actors to move into this gap. There is expectation that accountability and stakeholder involvement should increase – but with varying success. As a result investment and expenditure have not always been beneficial to the rural population. There is recognition that this takes capacity, coordination, and that central government is still needed for critical services that cannot be privatised.

**Population dynamics:** Demographic changes and their impact will continue to shape societies: the slowing in population growth rates due to ageing of societies and HIV affects is removing middle and older age groups. The continuing rapid urbanisation in most developing countries is a challenge on one hand and an opportunity on the other with creation of markets for rural development. Urbanization will continue but rural populations will continue to grow, putting increasing pressure on land and other resources, particularly in the high-density areas of East Africa and Malawi. Agricultural intensification due to population pressure without secure access to input and output markets, is putting increasing pressure on sustainable management of the natural resource base. Soil nutrient depletion is a major constraint with increasing pressure on forests and wetlands, water will become increasingly scarce already impacted by periodic droughts.

**Socio-economic change:** Changing food consumption patterns will lead to changes in production systems, rising demand for livestock products and associated feed systems, growth on non-agricultural and post-primary agricultural activities and the resulting increases in income. These trends raise the need for managing the social and environmental consequences and require better coordination between production, services and industrial sectors. Smaller farms will shift the emphasis towards more labour intensive crops; however, HIV/AIDS will provide a challenge here, with decreases in labour availability. It is expected that men will migrate to urban areas which will lead to increased feminization of agriculture – and this would require increased access of women to credit, education, and health care. Need for innovative education techniques was a principal challenge in education and technology dissemination.

**Global warming and climate change:** This will result in highly variability - more droughts and more floods which will have an impact on losses and redistribution of diversity and an increased demand for new germplasm as farmers struggle to adapt. Lags in adaptation of technology and policies can be long. Mitigation and adaptation strategies made in isolation will make little gain.

The strategies that the SARD framework put forward are supportive of the WB's principles in that what is supported should be people centred, multi-sectoral, and oriented towards building capacities at multiple levels. The following principles are highlighted:

- Building capacities and strengthening institutions - to support rural communities and other actors and their contributions to food security, social cohesion and landscape maintenance;
- Enable people to understand and manage their environment, and support or create the institutions that can guide, inform and empower them in this endeavour;
- Build capacity at all levels of society, particularly for poor and marginalised groups, to provide 'new' skills include combinations of technical, environmental and economic knowledge that enable environmental impacts to be taken into account in policy making and land-use planning and management;
- Reinforce institutional, administrative and legislative dimensions of these new partnerships and provide access to information, sharing of experiences;
- Mobilising investment to support public institutions;
- Expand funding of public sector agricultural research and extension, aimed at poor farmers in many low-income countries, possibly with expanded partnerships between the public and private sectors;
- Increased productivity in agricultural areas that are efficient and environmentally conscious without producing non-tradable surpluses of agricultural products;
- Technologies and policies for enhancing agricultural productivity and managing the natural environment;
- Provide legal instruments and management tools to NGOs and farmers' groups so they can act independently, enter into contracts, exercise financial autonomy and maintain transparency in governance;
- Strengthen institutions to ensure an optimal structure of land ownership and property rights for achieving the strategic roles of agriculture; and
- Encourage and enable resource-poor farmers in the economically, socially and ecologically diverse low-income countries, particularly in Africa, to make such a shift to sustainable intensive production.

In summary, the global sustainable development agenda supports equitable development that ensures sustainable use of the natural resource base and improves livelihoods. SARD and World Bank embrace the idea that agriculture is still the engine that will drive economic growth and that the existence of technologies and legal frameworks as well as social and institutional capacity will propel development. This said, there are global trends that are worrying and should be noted: increasing populations with a shift to urban environs; global warming and climate change that will result in greater variability; HIV-AIDS and changes in the social structures of rural peoples; increasing commercialization of production that will put more stress on the environment and continue to marginalize the less well-endowed groups; continued restructuring and decentralization that has related transaction costs and will emphasize demand-driven systems, partnerships and collective action; and a rapid change for the better in information technologies – making information accessible to a wider population.

Components of the strategies universally state that the following components are needed for success: technologies that are relevant and accessible; conducive policies and supportive institutional environment; adequate investments in capacity building, research and extension; and that there must be strong support to build a foundation of capacitated and empowered local participation including marginalized groups.

## **Success Factors Contributing To Sustainable Agriculture and Rural Development**

The experience with concepts and practice of NRM in a variety of social, ecological and institutional settings has generated rich insights into the critical factors of success. This section enumerates and synthesises these factors as a preface to the description of approaches and their critique in subsequent chapters. Broadly there are two categories of success factors:

1. "Internal" – that is what are the key elements that determine whether or not a community can be successful in achieving their livelihood and environmental management goals; and

2. “External” factors that ensure and support communities to be successful – that is from a project, service provider or support system stand-point.

## INTERNAL SUCCESS FACTORS: CAPABILITIES OF COMMUNITY ENTITIES

In a review of “community-based natural resource management” (CBNRM) projects and activities Josserand (2001) noted that there is no single factor that makes or breaks an experiment because reality is more complex and depends upon a number of factors; that there may be a minimum set of requirements or conditions; and there are always tradeoffs in any given situation. He then listed the conditions or prerequisites for a success: ...“involve a *well-educated, socially harmonious* community, armed with *detailed knowledge of local environment and resources*, applying a *well-planned and efficiently managed* effort to resources within a *clear legal and institutional framework*. Such a community should also have *access to credit, realize substantial benefits and share them equitably* with all relevant (and active) stakeholders.” Box 2 illustrates what farmers and farmer organizations would be able to do if they were successful.

**Box 2.** If farmers and farmer organizations were successful, they would be able to (AHI, 2002):

- Select options from a wide range of possibilities, to experiment, innovate and use technical options.
- Make demands and seek technologies, information and advice from service providers and support organizations.
- Initiate and develop micro-enterprises and organize themselves for input and output markets to support these enterprises.
- Demonstrate awareness of NRM issues, reinvest in NRM and manage NRM conflicts.
- Participate in farmer-to-farmer dissemination and form linkages and networks with others.
- Participate in local policies and by-laws formulation and implementation.
- Organize lobbying to influence policy makers.
- Form sustainable, inclusive, diverse, and accountable farmer groups that are able to carry out collective decision making, planning, implementation, monitoring and evaluating of their activities.
- Demonstrate increased analytical capacity and have developed / increased their confidence.

Hagmann et al (2002) summarize some of the values that are embodied in community development frameworks and approaches:

- Full ownership of the process by the community and control over their own resources;
- Self-reliance of local communities;
- Self-organization, sharing, and cooperation;
- Inclusivity of all stakeholders and groups;
- Equal partnership among farmers, researchers, and extension agents, who can all learn from each other and contribute their knowledge and skills;
- Equitable and sustainable development through negotiation of interests among these groups and by providing space for the poor and marginalized in collective decision making; and
- Natural resource conservation as part of the generation contract.

## EXTERNAL SUCCESS FACTORS: CONDITIONS, SERVICES AND SUPPORT TO ENABLE COMMUNITIES

There are a number of experiences where practitioners list the conditions or elements that need to be in place to support community actions. Josserand (2001) lists some generic “minimum” conditions: enabling or ‘permissive’ political, legal, and institutional environments; a minimum level of social cohesion within the community; control over resource(s) with substantial value (security of tenure); and some access by the community to technical, managerial and market information, and to financial resources to ‘jump-start’ the activity. F. van Bussell suggested some other critical factors: able to generate income and employment

opportunities such as existence of markets for products; importance of building capacity and continued support in relevant skills; and devolution of management responsibilities from government to the community. These factors are summarized in Box 3.

<b>Box 3. Social, economic and legal factors underlying INRM</b>	
<i>Social Factors</i>	<i>Political and Legal Factors</i>
Community cohesiveness	Authority of communities
Clear Leadership within the community	Legal framework regulating rights over local resources
Leadership responsiveness to community members	Security of Tenure
Breadth of participation	Competition over resources
Labour Mobilization	Risk of conflict
Quality of labour pool	
Training (extent, availability of)	
Experience in forms of community organization	<i>Institutional Factors</i>
Level of innovation	Decentralization
Extent of ability to negotiate	Linkage to national policy
<i>Economic Factors</i>	<i>Biophysical Factors</i>
Perceived benefit/cost of CBNRM	Resource Manageability
Distribution of benefits among stakeholders	
Infrastructure	
Financial resources	
Substitution for public investments	

In a CDCS study on “Successful Natural Resource Management in Southern Africa” and inputs from Murphee (1993) suggest the following principles and requirements for sustainable CBNRM:

- Incentives for users to govern and manage natural resources in sustainable ways
- Capitalize on local knowledge, or on an effective blend of scientific and local knowledge
- Self-governing institutions where members have a voice in NRM decision making
- Low-cost, fair mechanisms for conflict resolution are available
- Resource governance and management institutions take account of diverse, legitimate interests
- National and regional policies and institutions create an enabling environment
- Determine whether the benefits and quality of management pay off and that the benefits to the community are proportional to the size of investments

Furthermore, to enable communities to have the capacity and be responsive, external agents should:

1. Strengthen the collective capacity of local groups, institutions, and organizations for self-organization, collective action, negotiation of their interests, and conflict management, as well as their articulation and bargaining power vis-à-vis authorities, service providers, and policy makers (“local organizational development”);
2. Enhance farmers’ capacity to adapt and develop new and appropriate innovations by encouraging them to learn through experimentation, building on their own knowledge and practices and blending them with new ideas in an action learning mode. Usually these are agricultural technologies and practices, but they also address social, organizational, and economical innovations;
3. Enhance collective learning through action and social learning, facilitation of self-reflection, sharing knowledge, and networking; and
4. Negotiate the management of natural resources and related services, policies, etc., through stakeholder platforms of communities, service providers, and other key players (Hagmann et al 2002).

In summary, success factors were reviewed noting that both internal and external factors are needed to enable improved livelihoods and environmental management in the rural sector. Many of these are promoted by CBNRM projects, but it was noted that trade-offs and complexities are integral to any given situation – and these need to be dealt with rationally.

Many of the internal success factors revolve around being better able to do and control a number of aspects of rural development – the so-called “empowerment factor”. Pro-activeness, equity, local ownership, self-reliance, and general increased capacity are major cornerstones to success. External factors support the community and include: enabling policy and institutional environments, market economies, availability of information and advisory organizations, good governance, good and accountable management, and existence of platforms for discussion and exchange. Basically, any CBNRM experience wanting to succeed should aim towards ensuring these elements are addressed.

## **Review of Natural Resource Management Approaches, Strategies and Methods**

This section briefly describes current concepts and approaches used in development to enhance conservation goals, reverse natural resource degradation, and to increase agriculture productivity in the ecologically stressed regions of sub-Saharan Africa. NRM has gained tremendous significance over the past two decades in the wake of growing realization that returns from land to a population heavily dependent on it for food and income, cannot be sustained in the face of continuing resource degradation through overexploitation or lack of governance. The notion of NRM has continuously evolved since its early definitions, to where there is a strong element of participation and local ownership of NRM processes. It is now widely recognised that the three strands (e.g. technical options, social and institutional methods, and policy governance support) need to converge for investments in NRM to translate into real gains in sustainable production and increased incomes. The “Integrated Natural Resource Management” (INRM) research approach, reviewed in section 4, builds on CBNRM and livelihood concepts as well as takes elements from development approaches used in both the conservation and agricultural sectors. It clearly aims at improving livelihoods, agro-ecosystem resilience, agricultural productivity and environmental services which implies sustainably optimizing social, physical, human, natural and financial assets. (See section 4 on research approaches and INRM in particular for more details).

Even though practice on the ground still remains fairly limited to pilot and project areas, literature is rich in exploring the conceptual underpinnings of natural resource management and sustainable production approaches. Several approaches are highly context specific while there are others that are easily adapted and used in a variety of ecological and institutional settings. Some are sectoral (dominated by crop, livestock, wildlife and water), others aim to be integrated (watershed development, conservation, ecoagriculture, integrated livestock and wildlife management) while some like transboundary NRM are led by political and policy compulsions.

Community-based and livelihood approaches and concepts underpin many of the approaches coming from conservation, from agriculture or are at the interface. Some of the concepts are borne from domain of conservation (e.g. landscape, biodiversity conservation, community forest management) are targeted at preserving natural habitats and biodiversity while addressing livelihood needs, while others have been borne from the agricultural sector where there is a concern for preservation of the natural resource base within agricultural landscapes and attainment of livelihoods (e.g. INRM, integrated watershed management, Landcare, eco-agriculture). Others are at the interface (e.g. agroecosystem, ecoagriculture, integrated wildlife and livestock management). Many of the principles and lessons are generic in the sense that they can be applied to any situation where humans and environment come together.

### **COMMUNITY BASED AND LIVELIHOODS APPROACHES AS FOUNDATION**

#### *Local Institutions and Community-Based NRM Approaches*

It is widely acknowledged that organisations and institutions play a key role in making NRM R&D effective. Within NRM organisations and institutions exist at multiple levels including at the local, community level and the levels related to projects and structures of formal, state governance. The utilisation of certain resources is often beyond individual means, and only becomes possible, or at least considerably easier, when people organise and combine their potentials, often through local institutions. This often means that changes can be



identified more quickly and at lower cost at local levels, and corresponding adjustments can be speeded-up by creating local decision-making authority. This occurs when:

- Competing claims exist and often the only way to utilise a resource which others also wish to utilise is through lobbying or negotiating;
- The sustainable utilisation of common properties calls for generally accepted and enforceable regulations and strong, efficient institutions;
- Within a community, individual claims on natural resource use must be harmonised with overarching considerations, such as the well-being of future generations, social justice, environmental protection etc.;
- In many cases, sustainable NRM represents a long-term undertaking which can only succeed within the framework of social structures that remain stable for generations; and/or
- Various dynamics such as climate change, population increases, consumption increases, cause a dramatic increase in the scarcity of natural resources.

The way that organisations and institutions emerge and take shape in the context of NRM depends on the nature of the resource in question and on the nature of its intended use. Users' expertise (organisational, financial and technical) influences NRM and the sustainability of that management. When users cooperate in a stable group, which in turn has access to ecologically appropriate and institutionalised technical knowledge, as well as possessing the capabilities and resources needed to provide its inputs, then the framework for efficient (i.e. also sustainable) NRM is undoubtedly in place. This is summarized as follows:

- When there are resources whose optimum management requires a permanent and highly efficient organisation; investments made promise to yield *high returns* (for example, water management for irrigation purposes).
- When there are resources whose availability cannot be predicted with certainty, *risk minimisation and welfare* goals are the salient motives for group formation, and profit maximisation remains secondary (for example, coastal fisheries by groups).
- When resources which are generally easily accessible (for example, pasture management) options for group formation may be motivated for *protecting the resource* from other users. At the same time, they also prompt users to negotiate binding rules and institutions for the sustainable management of common properties.
- When the resource is in surplus then an open-access regime can be applied without the need for rules.

The *Community Based Natural Resource Management (CBNRM)*<sup>4</sup> approach gives explicit recognition to the role of community participation of the concerned stakeholders and institutions in the planning, implementation and monitoring of NRM initiatives. The approach is community based in that the communities managing the resources have *the legal rights, the local institutions, and the economic incentives* to take substantial responsibility for sustained use of these resources. Under the NRM plan, communities become the primary implementers, assisted and monitored by technical services.<sup>5</sup>

Communities operate within policy and legal frameworks, and can exert some influence upon it. The notion of *vertical linkages* repeatedly appears through enabling conditions and via direct and indirect effects from CBNRM. Communities can share NRM with other stakeholders at the local level (traditional authorities, local government agencies, private sector operators), so *horizontal linkages* appear in the analysis of determinants of success, and of potential impact. Determinants of success also span the macro and micro levels. Critical determinants of initiation fall into four areas: political, economic, social and biophysical. Macroeconomic events and national environmental policies, as well as political processes, such as decentralization represent a '*downward*' linkage to CBNRM. When communities undertaking CBNRM are well integrated vertically, flows

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<sup>4</sup> Documents which provided good reviews and summaries include: *Promoting, Participation and Self-Help in Natural Resource Management*, Thomas Schwedersky, Oliver Karkoschka, Wolfgang Fischer, GTZ, 2001; *Community-Based Natural Resource Management (CBNRM) In Africa – A Review*, by Henri P. Jossierand, ARD, April 2001; *CBNRM: Connecting Micro and Macro Processes and People with their Environments*, by Norman Uphoff, Cornell International Institute for Food Agriculture and Development; and *Democratic Decentralisation of Natural Resources – Institutionalising Popular Partnerships*, by Jesse Rebot, WRI.

<sup>5</sup> Adapted from Heermans and Otto (1999) and CBNRM in Africa (2001).

go in both directions - downwards and upwards. For instance, good vertical integration allows for downward communication from governments to communities on environmental policies, legislation, and technical information. Conversely, the social, political, economic and environmental results of aggregated CBNRM experiences at the national level are upward linked to national processes, often inducing incremental changes in policies and their implementation.

Key elements of CBNRM include: *joint management of resources* by a community, based on a *community strategy*, done in partnership with other legitimate stakeholders. Communities need continued support in the areas of training (organization, literacy, financial management), and for technical inputs and credit. The influence exerted by micro-level actors upon the macro processes of policy orientation and implementation is slowly growing and community advocacy for local NRM is rising. The reasons that CBNRM has come into play are several: where people have reacted to the increasing pressure on resources, and the degradation of their productive environments because they came to realize that the situation has become increasingly serious and a direct threat to their survival, and the extent to which other actors can intervene (governments, donors) was limited, compared to the scale of the problem. The second widespread reason is the growing expression of a popular desire for greater autonomy in the NRM at the local level.

Successful CBNRM implementation indicates that the economic value and benefits from natural capital are more fully realized than was previously the case. Short- and long-term returns to resource use are bound to rise in such areas. In most cases, however, the former practices of inefficient resource use have not disappeared altogether; they have just been displaced, possibly toward more marginal or environmentally fragile areas. By raising the value of resources, CBNRM raises the economic stakes and incentives for resource protection, helping fend off outside pressure. Pressure, however, remains because the population keeps growing.

### *Sustainable Livelihood Approach*<sup>6</sup>

Sustainable livelihood-based NRM is a means of rehabilitating, stabilizing and enhancing the productivity of natural resources with the purpose of achieving sustainable livelihood outcomes. NRM actions are thus strongly guided by analyzing the livelihood resources and strategies of the rural communities and tracing their relationship with the local natural resource base. The conceptual basis and practice of NRM based on sustainable livelihood has a strong focus on alleviating poverty and enhancing food security and incomes from enterprises and strategies based on local resources. While concern of conservation remains important, the main NRM focus here is on balancing this concern with overcoming production constraints thus impacting livelihoods directly.

Typically, livelihood–natural resource relationships are located on the following “use spectrum”:

Regenerative ----- Consumptive ----- Extractive ----- Exploitative

NRM initiatives with an explicit sustainable livelihood thrust thus aim to:

1. Maintain the *regenerative* links (traditional management of commons or forests or wetlands);
2. Stabilise and / or enhance the productivity of the *consumptive* links (crop and livestock production, MFP collection);
3. Reverse the impact of extractive links (land and soil degradation, groundwater extraction); and
4. Prevent exploitative links (mining, encroachment of pastures and fallows, illicit felling and wildlife poaching, etc.).

Sustainable Livelihood-based NRM approaches are operationalised as follows:

1. Assessing livelihood resources and strategies of different sections of the community;

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<sup>6</sup> Work on concepts of sustainable livelihoods by Institute of Development Studies and Overseas Development Institute is on the internet. “Sustainable Livelihoods – A Framework”, Scoones et al, IDS, 1999, lays out the sustainable livelihood framework. Also reviewed are “Applying Livelihood Approaches to Natural Resource Management: Experiences in Namibia and Kenya”, Caroline Ashby, ODI, Working Paper Series and “The Impacts of Tourism on Rural Livelihoods: Namibia’s Experience”, ODI, Working Paper 134, 2000

2. Ascertaining the impact of livelihood strategies on local natural capital – land, water and forests;
3. Assessing the impact of degradation, decline or loss of natural capital on livelihood strategies;
4. Identifying and analysing the social, institutional and technological options for strengthening the livelihood – natural capital linkages;
5. Testing and implementing options; and
6. Monitoring impact on livelihoods and on stability / productivity of natural resources.

## APPROACHES ARISING FROM THE CONSERVATION DOMAIN

### *Landscape approach*<sup>7</sup>

The landscape approach being developed by WWF and IUCN is to help conservationists work with other key stakeholders to make informed decisions about land use. The approach *aims to both define and help obtain an optimal mix of ecological, social and economic benefits from the mosaic of land-uses and habitats* within a landscape, including biodiversity conservation and livelihoods, through a process and associated methods for land-use negotiations among a wide range of stakeholders. In most cases a *landscape approach will produce a series of agreements between parties*, and while some of the plans will be legally enforceable, some will not. It takes into account land-use rights and complex tenure systems. This approach is a recent evolution from the ‘exclusion and policing’ approach used in the past where conservation visions were upheld without regard to other stakeholders – often referred to as the “tree hugger” syndrome. Conservationists are now taking cognizance of broader perspectives of more stakeholders.

The landscape approach defines a landscape as a “contiguous area, intermediate in size between an ‘ecoregion’ and a ‘site’, with a specific set of ecological, cultural and socio-economic characteristics distinct from its neighbours.” The landscape can be broken up into two types: “conservation landscapes” where biological-ecological factors are used to define the space and “cultural landscapes” that recognize the stakeholders. These can be overlapping domains and are used to design interventions, negotiations so as to maximize benefits for livelihood and conservation perspectives at local and global scales. The idea is to better balance bureaucratic, “top-down” legislation or to be entirely devolved, either by chance or design, to local communities (“bottom-up”). The landscape approach argues that many land management decisions are best made at a landscape scale, which is large enough to see the sum of a range of land uses yet small enough to reflect local conditions.

Key elements of the landscape approach are to:

- Provide a framework within which stakeholder groups can discuss their needs and interests in relation to the use and management of natural resources
- Forge agreements on land use that do not undermine either human well-being or ecological integrity
- Gain consensus on as many issues as practicable, and recognise where consensus is not feasible while ensuring that negotiations are as transparent and equitable as possible
- Secure a series of workable agreements based on informed and mutual consent

### *Making Biodiversity Conservation Work*

This approach is based around 5 key conditions<sup>8</sup> for biodiversity conservation. The Biodiversity Support Program (BSP) network<sup>9</sup> recognized that conservation is a complex process, involving many different issues, stakeholders and pressures, often operating at multiple levels. Although it is focused on biodiversity conservation it can be adapted to other integrated NRM agendas. Five conditions for successful biodiversity conservation:

1. Clarity of conservation goals and objectives
2. Equitable and effective social processes and alliances for conservation

<sup>7</sup> This section draws upon the “Landscape Approach – A Strategy”, WWF / IUCN, 2001.”

<sup>8</sup> The Biodiversity Support Program used a combination of theory and practice and overlay research questions and synthesis to derive these lessons from case studies. Refer to *Lessons from the Field: Linking Theory and Practice in Biodiversity Conservation* ([www.BSPonline.org](http://www.BSPonline.org)).

<sup>9</sup> A partnership between the World Wildlife Fund, The Nature Conservancy and the World Resources Institute ran a consortium called the “Biodiversity Support Program” funded by USAID.

3. Appropriate incentives for biodiversity valuation and conservation
4. International, national, and local policies supportive of conservation
5. Sufficient awareness, knowledge, and capacity to conserve biodiversity

Incentives for conservation might be cash benefits related to conservation enterprises, but non-cash benefits are also important such as education, community pride and land tenure. Before implementation, make a careful analysis of local incentives and what drives certain behaviours.

There are various obstacles to conservation:

- Conservation alone cannot solve the local problems that lead to resource depredation.
- Local people may distrust conservationists fearing that conservation programs diminish their traditional access to natural resources.
- Other local needs may take precedence over conservation.
- Human resources and funding may be scarce at the local and regional levels.
- Decentralization may simply be a cover for the central government's abdication of its conservation responsibilities, or, it may empower local elites rather than the grassroots.

**Box 4.** Success factors should be integrated and have methodological steps and best practices for:

***Creating effective alliances:***

- Create simple alliances – they are easier to manage.
- Have clear goals at the start and a clear idea of complementary skills.
- Allow for decision making at the appropriate levels.
- Secure strong leadership.
- Negotiate and maintain clear project goals.
- Define and maintain clear roles and responsibilities.
- Strengthen management capacity within the alliance.

***Enabling effective conservation practice:***

- Know the meaning, value, and existing rights to the natural resources for all stakeholders in a given setting, and know who benefits most and least from conservation actions.
- Identify institutional partners with authority and legitimacy.
- Identify local non-conservation goals and their relationship to conservation goals.
- Research and address underlying social factors behind environmental threats.
- Pay attention to the position any potential conservation allies hold within the local community as a whole.
- Find institutional partners with capacity.
- Where feasible, help build the capacity of existing local resource management structures instead of working to create new ones.
- When working to facilitate stakeholder participation, consider groups normally marginalized from the public arena.
- Encourage local-national linkages, and discourage mere divestment of functions and authority, to ensure mutual accountability and protect the public interest.

Policy support and an effective framework that includes various levels and coordination across levels are needed. The way policies are created is as important as the policy itself, for example, the people most affected must have access and be allowed to participate in the design, implementation, monitoring and modification. "From awareness and knowledge comes motivation; but motivation alone is not enough to conserve biodiversity. To convert ideas into action, people must have the necessary skills and capacity." It was found that capacity building is important at community level and also for NGOs, CBOs and government agencies supporting community efforts. Both individuals and institutions must be targeted, otherwise, the capacity might be lost when an individual leaves and sustainability will be compromised.

## COLLABORATIVE FOREST MANAGEMENT USING A COLLABORATIVE NRM APPROACH

Community involvement in forest management has become a major element in tropical forestry initiatives over the last 10-15 years. This is due to widespread failure of government-led attempts to manage forests in a sustained fashion and for the public benefit and resulted in forest degradation. This approach promotes collaborative management between local stakeholder groups, i.e., mainly government and private sector. The earlier timber and user-based focus that relied on technical expertise and was dominated by governments, professionals and/or private operators has shifted to a multiple goods and services orientation, using more socio-economic skills and local knowledge where different and divergent interests can be reconciled through negotiation between stakeholders.

In certain situations, the *Collaborative Natural Resource Management*<sup>10</sup> (CNRM) is seen as a viable approach to progress towards sustainable forest management. Collaboration in itself is a costly and complex undertaking and will only yield benefits if the conditions are right. However, it is argued that collaboration can lead to increased knowledge amongst stakeholders about other stakeholders, to freer information flows which can forestall many potential areas of conflict and ultimately lead to better quality of decisions. Collaboration works best when the go-it-alone alternative does not yield positive outcomes – even for the most powerful stakeholder. It attempts to give an opportunity to local (poor) communities, who have been marginalized and tend to bear the highest costs of environmental degradation, to manage forests for their benefit.

Communities themselves have to see the need for a new approach and can initiate change, perhaps facilitated and supported by extension agents. The circumstances that allow this are however few and far between. Even if the local people wish to initiate change, the final arrangement often still requires collaboration amongst several stakeholders. Alternatively, if facilitated by change agents such as the government (who is almost always a major stakeholder) or NGOs may work, but even though NGOs might be useful, the government usually is a major facilitator, especially concerning issues of macro-policy and legislation.

The approach must be flexibly designed to suite the situation, and have a high level of interactive stakeholder participation at the negotiation stage of the collaborative arrangement is vital to achieve a viable solution. Participation should not be limited to a communication exercise between communities and project staff. A process approach must be followed whereby the collaborators are aware that each step is an experiment to be reviewed, monitored and re-negotiated. The CNRM approach firmly emphasises the significance of local-level institutions and that these need to be “anchored” in institutional frameworks which provide channels of communication to higher level authorities. Bringing about CNRM requires an approach having the following characteristics:

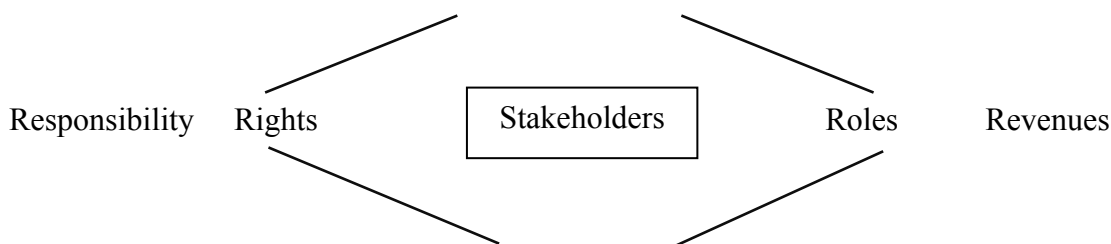
- Continuous monitoring and negotiation;
- Avoidance of “consensual consultative stagnation” and use of interim working agreements in order to proceed;
- Opportunity for monitored experimentation;
- Being flexible and iterative, following guidelines not blueprints; and
- A long time horizon (not short projects).

A useful framework is a “*4 R Framework for Collaborative Management and Conditions for Success*” that has been tested by IIED since 1995 in six African countries. This framework defines stakeholders’ roles via the balance in their respective ‘4Rs’ i.e., their Rights, Responsibilities, Returns/Revenues and their mutual Relationships. The use of the ‘4Rs’ framework has helped in teasing out issues and highlighting leverage points in relation to collaboration between stakeholders. An imbalance is not likely to lead to a stable collaborative arrangement and this tool can be used to highlight the key areas for change. One of the biggest constraints is power disparity. Whilst the focus may be on local, poor communities, this group of people are relatively

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<sup>10</sup> Concepts of joint and collaborative forest management are well explored in, “The ‘Journey’ towards Collaborative Forest Management in Africa: Lessons Learned and some ‘Navigational Aids,” published by Olivier Dubois and Janet Lowore in July, 2000 through the International Institute for Environment and Development (IIED), London.

powerless in comparison to other stakeholders. In these situations power disparities can be managed by assessing them via the ‘4Rs’ and negotiating around a particular issue, or by choosing non-collaborative forms of forest management. The ‘4Rs’ are not set in stone but evolve over time.



**Figure 2.** The ‘4Rs’ framework to define stakeholders’ roles in forest management

**Box 5.** What can be changed when the 4Rs are out of balance?

- Change government policy and government legislation if these are constraining access and rights – this can affect who can draw up rules and regulations concerning access to forest resources
- Give greater responsibility to those who are getting more benefits e.g., timber contractors to pay for re-establishment of forest
- Add value of the resource through processing or by improved management
- Legally empower one stakeholder to monitor the activities of another
- Change harvesting policy in order to promote more equitable sharing of benefits
- Alter revenue distribution and criteria for allocation

## APPROACHES SPANNING CONSERVATION – AGRICULTURAL DOMAINS

### *Agro-ecosystem approaches*<sup>11</sup>

The *agro-ecosystem* approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. The application of the ecosystem approach will help to reach a balance of the three objectives of conservation, sustainable use, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential structure, processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems and requires adaptive management to deal with the complex and dynamic nature of ecosystems and the knowledge or understanding of their functioning. Management of agro-ecosystem must be adaptive in order to be able to respond to such uncertainties and contain elements of “learning-by-doing” or research feedback. There is no single way to implement the ecosystem approach, as it depends on local, provincial, national, regional or global conditions.

Strategies for enabling agro-ecosystem based approaches include the following:

- Reduce any market distortions that adversely affect biological diversity;
- Align incentives to promote biodiversity conservation and sustainable use;

<sup>11</sup> The discussion on the agroecosystem approach is drawn from the documentation pertaining to the Convention on Biological Diversity [www.biodiv.org/](http://www.biodiv.org/), in particular Decision V/6 – Agroecosystem Approach. A good description of the concept of agroecosystem health are found in, “Management for Agroecosystem Health: The New Paradigm For Agriculture” by N. Ole Nielsen, Professor Emeritus, Department of Pathobiology of the University of Guelph. McNeely and Scherr have explored at the length the concepts and practices surrounding ecoagriculture in, “EcoAgriculture,” Future Harvest / IUCN.

- Internalize costs and benefits in the given ecosystem to the extent feasible;
- Give attention to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity;
- Users, managers, scientists and indigenous and local peoples should define operational management boundaries taking into account “connectivity” of the resources and users;
- Characterize ecosystem processes according to varying temporal scales and lag-effects;
- Utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious for making any decisions;
- Consider mitigating actions to cope with long-term changes such as climate change;
- Understand ecosystem functions and structure, the roles of the components of biological diversity in ecosystems so as to understand ecosystem resilience and the effects of biodiversity loss, the underlying causes of biodiversity loss, and the determinants of local biological diversity in management decisions;
- Build capacity of local communities who are managing biological diversity in ecosystems; and
- Use and adapt methodologies and practices to the ways in which these systems are being managed and monitored.

*Agro-ecosystem health* is similar but additionally recognises that the management of agro-ecosystems indirectly and directly affects human health in terms of the quantity and quality of food production, the influence of farming practices on the infectious disease vectors, on water use and quality, on ecological services, on poverty/prosperity levels and on trade policies. The approach aims at valuation of environmental services<sup>12</sup> in the economy; enhances the economic well being and health of poor people through policy directives, trade and non-trade tariffs, liberalized trade; and prevents environmental degradation effects of economic growth. This approach could potentially be applied to following situations:

- Revision and insurance that policies and regulations meet reasonable standards for food safety and respond to new problems;
- Ensuring that land use change does not exacerbate vector-borne diseases and their impact on humans; and
- By agencies and expertise at the level of the watershed or catchment exist that can focus on management dealing with water quality, quantity, and pollution.

### *Eco-agriculture*

Another related approach is ‘*ecoagriculture*’ which is based on the ecosystem approach as developed under the Convention on Biological Diversity (CBD) and recognises that ecosystems must be managed as a whole. Protected areas function as reservoirs of wild biodiversity within a matrix of land management that enhances habitat value and provides a range of benefits to people, from food supply and income to environmental services. Thus ecoagriculture aims to increase agriculture production and simultaneously restore biodiversity and other ecosystem functions, in a landscape or ecosystem management context.

An example of a landscape or ecoagriculture approach is that used for “*Integrated Wildlife and Livestock Management*” (IWLMM) which recognises the complex interactions between wildlife, livestock and people in the semi-arid rangelands. Competition and conflicts over land use, access to water and disease dynamics have intensified and increased as demographic pressure on rangelands and international concern for the conservation of biological diversity has provided new opportunities to address these concerns by using concepts of rangeland ecology, conservation philosophies, and incorporation of benefits to local people. Recent efforts to persuade local people to live with wildlife have generally incorporated a combination of the following strategies:

- Reduction of the costs of living with wildlife, for example, through controlled resource use in conservation areas and improved control of problem animals;
- Alternative income-generating strategies to reduce the conversion of wildlife habitat for agriculture or grazing lands, and/or reduce the unsustainable exploitation of natural resources, such as bushmeat and fuelwood;

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<sup>12</sup> Environmental services include: regulation of atmospheric composition, climate, and hydrological flows, biological control of populations, nutrient cycling, soil formation and erosion control and sediment retention, waste treatment, purification of water, and a diverse gene pool for medicine agriculture.

- Increasing the benefits of living with wildlife: for example, through revenue-sharing and support to local development projects;
- Enhancement of rural livelihood strategies through involving local communities in wildlife-related enterprises such as tourism and safari hunting;
- Increased food security due to enhanced quantity/quality of livestock and off-take of meat and milk, especially if pastoralists have better access to dry season grazing and water resources, which will be partially offset by increased wildlife/livestock interactions leading to disease and predation; and
- Sustainable natural resource use through more efficient and sustainable rangeland use, dynamics and resilience.

## APPROACHES ARISING FROM THE AGRICULTURAL SECTOR

### *Landcare Approach*<sup>13</sup>

Landcare has developed as a community-based movement to care for the land and is a community-wide program for sustainable rural development and land management balancing economic, ecological productivity, resource protection and contributing strongly to community development. The approach first started in Australia, moved to the Philippines, and is being piloted in South and Eastern Africa. Conditions that seem to foster the desire to use this approach include: diversity of land tenure (public, protected areas, private); increasing land degradation and land pressure; livelihoods that are degrading the environment (tree cutting for charcoal and large scale brewing); where political and economic reforms characterized inter-alia by decentralization, privatization, market liberalization and tax reforms that imply that government transfers to, or shares with, civil society many of its previous responsibilities and authority in decision making; and in some cases privatization of public enterprises including extension services where grassroots can demand for services. Levels of intervention where active participation is needed to curb natural resource degradation and enhance conservation and sustainable use include: (i) national level where activities include the design of supportive policies for institutionalization of NRM in all sectors, streamlining land legislature, managing cross-border NRM issues, allocation of meaningful budgets to NRM; (ii) 'regional' networking among partners; (iii) district and local governments for identification, planning/financing, management and provision of technical support of NRM concerns; (iv) with groups at catchments / watershed level where proactive seeking economic opportunities, information, working together, demanding accountability of government and service support; and (v) at household level.

Landcare has been variously described as:

1. A set of practices for appropriate land management systems.
2. An ethic and principles used to describe the judicious utilization of natural resources.
3. A development approach for rapidly and inexpensively diffuses conservation farming technologies, agroforestry practices and other natural resource management systems
4. A community-led movement of autonomous farmer-led organizations supported by local governments with backstopping from technical service providers that share knowledge about sustainable and profitable agriculture on sloping lands while conserving natural resources.

Landcare aims to:

- Protect, conserve and restore the resource-base where there is field level action research that addresses other issues on sustainable agriculture and natural resource management;
- Develop business and marketing strategies for agroforestry and environment-friendly farm products.
- Strengthen and empower local people to think, create and initiate activities that improve livelihood as well as protect the environment from degradation;
- Share technical knowledge among researchers, extension agents, local officials, farmers, students, women, professionals, business sector, civic groups and other members of the community about sustainable agriculture and natural resource management; and

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<sup>13</sup> The Landcare movement is based on the experiences in Australia where it has proved to be reasonably successful.



- Seek technical and other forms of assistance from government and non-government agencies as well as private companies.

And, in order to be successful, Landcare requires the following key elements:

- Wide community support including from industry, businesses institutions, foundations and media. It relies heavily on networking to develop productive partnerships;
- Generation of own funds from community sectors and through fund raising from corporate bodies;
- Stimulation of visionary attitudes and activities;
- Flexibility since Landcare relies on voluntarism;
- Attraction of strong central/local government commitment including financing, but not leadership roles;
- Taxation incentives to stimulate and support Landcare activities;
- Advocating for co-ownership of land so as to provide incentives for land improvement and deterrence of land sale without women's approval;
- High degree of awareness and understanding of NRM issues (by all stakeholders); and
- Effective information, education and communication strategies.

### *Integrated Watershed Development Approach<sup>14</sup>*

The integrated watershed development (IWD) approach brings into center the *watershed* as a socio-ecological unit for planning and management options where emphasis is laid on *addressing problems of land degradation and water scarcity with a livelihood focus* in a holistic manner taking into account technological, institutional and policy considerations. The watershed provides the context for working on communal (open lands, pastures, hill slopes, gullies or water bodies) resources as well as individually managed resources (farm lands, private fallows, livestock) in an integrated manner and tackles technical, policy, social and institutional dimensions and as such must draw upon inter-disciplinary strengths and skills usually found in several types of organizations. The IWD approach to increasing soil stability and water availability in a degraded area comprises a wide array of “integrated” *NRM problem identification and solutions*. The watershed serves as the ecological framework for integration to occur, put into practice and monitored and serves as a means to address issues and problems of “crop – livestock – land – forest – water” interactions. It takes cognizance of the social-institutional-policy dimensions of the biophysical issues and potential solutions. There needs to be a step-wise and iterative process put into place to ensure that there is ownership, multiple benefits and incentives, and supportive technologies and policies. Capacity building is central to the process. So, in its conceptual and practical growth the IWD approach has come to heavily emphasize participatory methods and institution building for management of resources by communities and multiple interests.

This current approach has replaced the more traditional “*ridge to valley*” watershed approach, which emphasized the need to cover all categories of land and water resources within a watershed unit under some form of conservation regime and thus are rather technology and investment intensive relying as they do on extensive mapping, characterization and planning / implementation for soil, water and vegetation conservation treatments. Investments made into soil and water conservation through technical interventions alone have had limited success: conserved areas are often not sustained over time given limited local ownership and increased productivity usually requires other treatments to realize the conservation investment.

Ingredients to make IWM R&D work include:

- High level of action and orientation on a communal, collective action basis
- Interdisciplinary, “systems” orientation to problem analysis and solving
- Public investments for work and regeneration of common pool resources
- Clearly established stake and participation in benefits from communal resources

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<sup>14</sup> The discussion on integrated watershed development draws heavily upon a series of AHI Briefing Papers contained in “Broadening Horizons - Institutional, Policy and Technical Innovations for Improving NRM and Agricultural Productivity in the African Highlands” (2002) and “Launching Phase 3” (2002).

- Availability of adaptive research output on watershed issues and functions
- Corrective policies and incentives surrounding resource use
- Capacity building of communities: diagnosis and analysis of issues; collective action, negotiation and conflict resolution; advocacy; use and maintenance of technologies; planning, adaptive learning and action management
- Capacity building of NGOs, CBOs and government agencies: soliciting participation and good facilitation skills; sourcing and managing contributions of multiple sources of expertise; monitoring and evaluation system design and use.
- Attention to equity: those with more land resources can benefit more from investments and research outputs; poor, landless or land-poor families that are resource users do not have a natural stake and are often left out; and focusing only on poor and not on others who are influencing and are part of the problem and the solution does not work either
- Cost sharing and micro-finance interventions to address credit needs

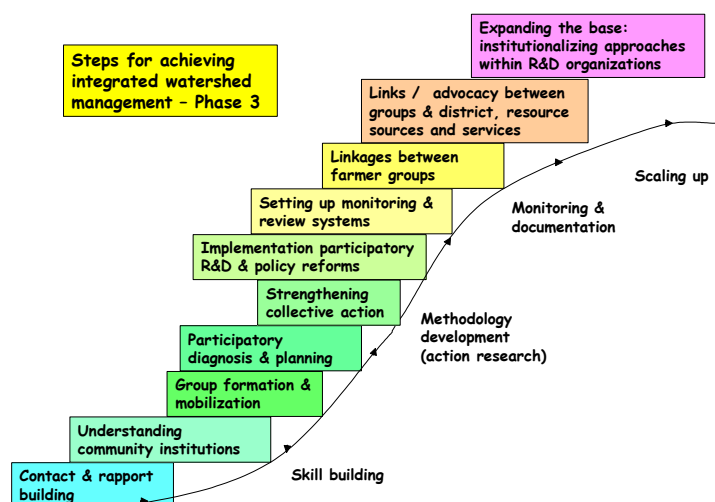


Figure 1. Typical IWM based interventions (AHI 2002)

IWD and research attend to the following sectoral components for systems improvement:

- *Treatment options for reducing degradation and increasing water availability* on arable and non-arable land including various kinds of structures, including where to locate and maintain them.
- *Forestry and agro-forestry* species, location and integration strategies.
- *Management of common lands and water resources*, including regulation on use and encroachments, local practices for management and protection, how these can be reinforced or up-scaled, the role of community institutions in conservation and regeneration of communal resources.
- *Options for integrated crop and livestock enterprise development*, including new crop varieties and commodities are possible for farmers' experimentation, potential for diversification for high value crops and horticulture, potential for post harvest and storage interventions, strategies for intensifying production and marketing.
- *Institutional development, community roles and responsibilities* to strengthen local groups and community institutions and the roles of different types of local structures.

Examples of tools and methods include:

- *Adapted PRA techniques and methods* to resource mapping, inventorying and analysis including social dimensions of use and ownership from farm, community (village) and wider landscape use dimensions that assist in understanding what is where, who owns and manages what and how; changes over time; future trends; location of problems, conflict areas and assets.

- *Social analysis tools* to understand stakeholder analysis around the issues, the trade-offs and cause-effect patterns of the issues and potential interventions among social groups.
- *Institutional profiling* to assist in finding out about local institutions, their roles and domains, who belongs and who doesn't, and potential roles in action plans.
- *Biophysical measurements* of soil and water run off, silt loads, groundwater levels and recharge, surface flows, crop and livestock production, drought mitigation, pest and disease pressures on crops, livestock and humans, yield levels, soil fertility levels, estimations of fuel wood needs and supplies, among many other aspects.

## Evolution of NRM Research for Sustainable Development

This section provides an overview of INRM research and its current status that has evolved out of the development approaches described in section 3 above and from various research approaches that have added dimensions over time, where the aim is to improve NRM so as to attain economic growth, well being, and sustainable environment. This evolutionary review covers farming systems research (FSR), participatory technology development (PTD), into INRM itself. Development strategies that incorporate participation, agro-ecosystem analysis, and landscape approaches, as well as integration of policy, technologies and institutions are evident in INRM. There is general information presented on who are the actors, what are they doing and how are they organized. There is analysis made on various aspects of implementation: integration, interdisciplinary teamwork, institutional and social aspects, institutional arrangements and partnerships, and comparison of sectoral versus ecoregional approaches. First the INRM research for development approach will be elaborated and then its research roots explained.

### INTEGRATED NATURAL RESOURCE MANAGEMENT RESEARCH APPROACH (INRM)

INRM is an inclusive and generic approach to R&D which aims at integrating concerns for sustainable NRM, of overall productivity of agricultural systems, and has a livelihood focus. INRM, as a relatively new approach, has emerged from researcher analysis of the reasons for general failure of reductionist, more technology-driven research approaches. The CGIAR has fostered an INRM community of practice group to promote sharing of experiences, the Sub-Saharan Africa Challenge Program is going to use INRM as an underpinning for implementing IAR4D, and AHI's mandate is to develop and test this approach and to contribute to institutionalisation of it in NARIs. Its development came as researchers asked: "Why has there been limited impact and adoption of land improving technologies?" The analysis of shortcomings led to the decision that "we need to change our way of doing business" and to particular additions to the more traditional research processes. It brought in a number of concepts and methods from more development-oriented reviewed in section 3 and from the evolution of research approaches presented below. This logic has propelled researchers and their organizations to develop, test and promote an approach, now terms "INRM" to see improve impacts more holistically. The analysis is briefly presented in Table 1 (AHI 2000).

The INRM approach incorporates and builds upon participation of all those stakeholders having a 'stake' in the resources, their activities in this respect, and their relationships linking across various scales (farm-landscape-watershed) and levels (households-community-district-national) depending upon commonly agreed need-based issues. INRM values and incorporates perspectives and expertise from various quarters, e.g. research disciplines, government decision makers, community members and leadership, and from the development actors including extension, NGOs, and CBOs. The approach is focused on solving a complex of poverty-livelihood-environmental issues in practical ways; e.g. by focusing on key causal elements, assets, and their interactions. It deals with these efficiently and effectively using a more holistic approach, but starting with most limiting factors and important felt needs (entry points). This requires the integration of various experts, levels and perspectives, and aspires to:

- Empower relevant stakeholders, applying organizational development and change principles, to strengthen collective and individual decision making, analysis, planning and implementation, lobbying, negotiation and conflict management;
- Use a participatory social and experiential learning paradigm to guide the operational process (in contrast to a prescriptive or blueprint approach);

**Table 1.** Evolution of the INRM approach through experience

<b>Before: Necessary but not sufficient</b>	<b>Response: Filling the gaps</b>
Component research generated NRM technologies from a reductionist perspective that did not target systems, niches and needs.	An integrated systems approach to sustainably intensify and diversify farms building on local assets.
End users were involved at the end of the technology generation process, rather than throughout.	Foster community innovation and adaptation by increasing local participation in this process.
Farm level issues tackled through technologies. Common property and other farm-to-farm interactions (landscape issues) not addressed.	Use collective management for landscape issues including management of common property and addressing cross-farm boundary issues.
Social- policy aspects not dealt with: institutional arrangements, local governance and conflict resolution over resource management issues and inclusion issues.	Understand and improve local governance and collective decision making taking resource endowment levels, diversity and gender into account.
NRM technologies often have long-term payoff that limits adoption because they do not strategically link to short term gains.	Use strategies to address farmer short term perspectives and get them engaged in longer-term NRM such as linking NRM to income generating enterprises and innovative credit systems.
Policy research divorced from technical research and dialogue does not feature for follow up.	Identify policy-led investment incentives to encourage NRM improvements that have longer term payoffs.
Technical research done by individuals in relative isolation. Research results are passed over to extension and on to farmers. Partnerships usually with other research organizations.	Look into new institutional arrangements and partnerships to improve links between R&D, between communities and local government, and between private and public interests.
Institutions usually restructure according to donor and government requirements. New methods usually piloted with small teams with little thought towards scaling up.	Promote institutional change where needed by working on M&E systems, new methods and approaches, and developing new skills needed for the new way of doing business.

- Improve innovation and adaptive management capacity so as to generate and make use of a wide range of technological options successfully applied to different niches;
- Improve facilitation, coordination, and management of partnerships and institutional arrangements;
- Ensure that multiple level perspectives are considered using participatory, analytical tools or models to improve decision making and selection of options;
- Ensure research is aimed at solving development problems or addressing opportunities by integrating disciplinary perspectives and tools, developing and using new participatory research methods, and providing feedback to guide research on components;
- Promote the use of integrated, holistic farm and landscape systems management principles and work on interactions at the systems level (e.g. water x soil/land x pest/disease/weeds x genetic resources);
- Provide advice on scenarios that have inherent trade-offs between goals of productivity, sustainability, resilience and profitability which implies takes cognisance of multiple stakeholders that interact and operate at multiple levels and scales AND involve the perspectives of disciplines and actors required to find solutions; and
- Consider scaling up pathways and chains of partners throughout so as to identify and have early inclusion of stakeholders and their institutions.

Some INRM tools and methods worth noting include:

- *Process-oriented and analytical tools* that facilitate knowledge-based exchanges and consensus building. They require neither advanced modelling skills nor large investments in time, data collection and analysis, but do facilitate necessary mutual understanding and shared visions that are inputs into designing a set of coherent and interlinked sectoral initiatives.
- *Better information and analytical tools for policy change* that help INRM institutions/programs more clearly perceive aspects of an environmental policy that can help fulfil their own objectives, can be used by interest groups so as to ‘democratize’ the policy analysis process, and is able to “promote a more open debate on resource management issues and the adoption of local resource management techniques.” by other groups, (university researchers, NGOs, trade, professional and even producers’ associations). This can help to pressure for better integration and coherence between various disconnected institutions (e.g. ministries that handle various aspects of NR) and put pressures on government structures to support local initiatives using better modalities.
- *Multiple stakeholders and inputs* using a multiple stakeholder and partner approach to avoid domination by researchers on one hand, and to foster a collaborative R&D program where contributions can provide a more holistic approach; for example, NGOs often have the capacity to address some of the more difficult socio-economic problems. Researchers, extensionists, and farmers are recognized as joint partners in the process of technology development and dissemination even though each partner has specific roles. It fosters a close researcher-farmer partnership in that it is implemented by a research team. It is based on complementarity of R&D skills rather than being top-down and one-way, and there are no methodological blueprints or strict guidelines. Research is conducted using multidisciplinary teams to efficiently utilize financial resources and facilitate research synergies between team members and disciplines.
- *Participatory research (PR) methods* to foster innovation and adaptive management by farmers, where optimally researchers facilitate multiple farmer-led experiments, augmented with some researcher controlled experiments, and analyze these to understand technology performance in more numerous context-specific, diverse situations. The development and evaluation of innovations that are more compatible with farmers’ circumstances, actual farming systems, goals and preferences is a shared process. There is recognition of the importance of ITK, perspectives and experiences of farmers, of social differentiation, as well as landscape and resource differentiation. The emphasis is on improving local capacity to solve problems in whatever way seems to work. It is “learning together by doing together”. Stakeholders, particularly the farming communities, are encouraged to share, examine, expand, and analyze their own knowledge of their own conditions, needs, and problems and to suggest community-based solutions. The primary criteria for success are adoption of technologies and behavioural change by farmers.

PR methods have helped researchers revise their opinions to reflect that farmers’ grasp of complexity is more realistic resulting in more successful adaptation and application of solutions than if solely researcher driven. Farmers’ experimentation has contributed to the generation of innovations and to researcher’s understanding of what works well in what circumstances. Given that the PR process empowers farmers to be innovators, it has helped to change the research agenda – bringing in new technologies to test, better targeting of technologies developed by research, and identified new problems to work on. The PR toolbox encompasses gender and stakeholder analyses, agro-ecosystem analyses, inclusion and group forming and strengthening, farmer experimentation, assessment and monitoring, and dissemination.

Steps in PR include:

1. *Characterization and Diagnosis*: Characterize the agroecosystem, diagnose the strengths and weakness of the resource base, identify and analyse the major problems/constraints with farmers, and prioritize problems to be addressed in the research action plan. A PRA toolkit is utilized and farmer research groups are formed to enable farmers to gradually assume increasing responsibilities for the research action planning and activities.
2. *Planning and Experimentation*: Based on the information gathered in stage one, farmers, researchers and other stakeholders collectively develop a Research Action Plan for the coming season/year. All stakeholders are also encouraged to innovate, experiment with research design, and support or develop ‘non-conventional’ activities that include indigenous technical knowledge and farmers’ traditional experimental approaches.

3. *Monitoring and Evaluation:* Stakeholders are encouraged to develop both formal and informal monitoring and evaluation frameworks when developing their action plans. Monitoring and evaluation is meant to assess the progress of both the technical aspects of the research plan, the process issues, and other important social or economic aspects.
4. *Information and Technology Dissemination:* Once technologies or methods have been developed, refined and tested and deemed suitable for wider dissemination then diffusion and dissemination channels are identified. Provision of information, material or technology for dissemination is facilitated.
5. *Analysis of Experiences:* Analysis of experiences takes place at the end of a season and at the end of a project phase. An assessment is made on whether the objectives have been met and includes an overall analysis by all stakeholders. Lessons generated would be incorporated into the planning and implementation of new projects. (AHI 2000)
6. *Agro-ecosystem management:* Agroecosystem management embodies both participatory research and agro-ecosystem concepts. It is strongly driven by the farmers' agenda and values the combination of indigenous and scientific knowledge. It is not extractive, externally controlled nor prescriptive, but orients research to solve real problems while empowering farmers to solve their own problems. Its orientation is on sustainable management of agro-ecosystems with more or less equal distribution of benefits. Integrated research based on systems analysis and improved systems management where the interrelationships of farm subsystems, landscape units and their interaction are considered. Interrelationships are manifested by flows within the system (labour, capital, nutrients), interactions within the system (livestock and crop management; communal and private lands, etc.), flows and interactions from outside the system (off-farm income, borrowing and trading), management and decision making at various levels and in certain contexts that influence the flows and interactions (household, gender, collective), and finally external factors that influence management (policies impacting on inputs and output marketing, social values and norms, security, governance).
7. *Action research:* Action research is a relatively recent evolution of PR. It is both a research and a development approach that focuses on immediate outcomes and focuses research directly on development goals. Its potential is that it allows researchers to intervene in an agroecosystem, study the effects of interventions, and quickly apply this understanding to the next intervention. It is useful in NRM research because it considers the social, institutional and biophysical contexts. If used correctly, it heightens the local stakeholder involvement and hands over, at least some if not most, responsibility to them for taking action. It has a 'learning' mechanism built in, so that after each major action there is reflection and possibility for redesign in the next round of action, given the analysis of what happened in the previous actions. The research stream must be flexible and process oriented and keeps the desired outcome in sight. Action research does not produce "silver bullets", but findings are derived from analysis of cross-site experiences are often context specific-driven patterns of 'what' has worked well, 'where' and 'why'. Its focus is on the "how" as a means to find ways to change rather than on the 'what', which is a more common research means of seeking understanding.

## HISTORY AND EVOLUTION OF INRM RESEARCH APPROACH

African colonial governments expanded the national agriculture research stations in the 1930's to emphasize cash crops of their interest. The NARS priorities were inherited by African governments (around 1960s) which later added food crops to the agenda to address small farmer needs; but small farmers' research result uptake was disappointing. This led to alternative research approaches - farming systems research (FSR) (Stroud and Kirkby 2000). In the meantime, the CGIAR focused heavily on agricultural productivity and efficiency for its mandate crops (rice, wheat, maize, beans, potatoes, cassava, etc) with emphasis on genetic improvement focusing on yield maximization under fairly uniform, well-managed experimental conditions. Research also worked on pest and disease resistance, nutrients, adaptability to various environments, stress tolerance and water distribution networks and on crop adaptation to water stress. Reduction of environmental impact was an objective of much of this work (CGIAR 2001). During this era, a commodity approach in the classical reductionist tradition was used and still strongly dominates most IARC and NARI research today. Many characteristics of classical experimental methods used on research stations were very dissimilar from situations faced by small farmers, so recommendations were not useful, particularly for: labour requirements, land preparation methods, cash for inputs, etc. Assessment methods did not include farmers' criteria and priorities, or other production factors like returns to labour and land, risk avoidance, or links to other enterprises that were

competing for scarce resources. The FSR approach and on-farm experimentation evolved to address the issue of non-adoption and relevance to farmer conditions and objectives. (Stroud and Kirkby 2000; Collinson 2000) FSR was an approach embraced by some NARIs in Africa, particularly when donor supported, while in the CGIAR, a cropping/farming systems concentrating on mandate crops, multi-locational testing, and IPM was added to the research agenda. These efforts broadened the crops within the CGIAR research mandates and farmer participatory research (FPR) methods eventually became central to that work, as most was conducted on-farm with farmer input. FSR was seen as downstream and therefore fitting more into NARIS. CIMMYT operated a large FSR training support program in ESA for a number of years, although the trained team members often remained as an enclave given that FSR was not fully accepted. This was due to a number of factors: the way in which research was structured; barriers to the acceptance by more conventionally trained researchers; and lack of a strategy developed around institutional change. There were also performance issues: FSR could not keep pace with new emerging methods, the difficulty in understanding and applying new concepts and tools, and lack of organized learning from experiences.

Even though there were no real FSR revolutions, a number of elements have been taken forward: involvement of farmers, appreciation of diversity and need for multi-disciplines and team work, start of systems analysis, among other tools and methods. But, donors and governments were and still are looking for alternative cost-effective approaches that make an impact on the big issues – poverty and environmental degradation. Even though the Green Revolution was successful by largely building on technologies that maximize biological uniformity, there were deficit impacts on these two areas (Ashby, J. A. 2001; Folke et al. 1998; Fowler 1990, Pimentel et al. 1992, Constanza et al. 1997) and the resulting analysis resulted in remarkable changes in its research direction, agenda and policy.

In the late 1980's, environmental goods such as clean water, flood protection, healthy soil, wildlife habitats, and biodiversity started to be valued, for conservation as well as maintenance and resilience to shocks and disasters and a direct link was made between resource degradation and poverty. "Critics of mainstream agricultural science find the research establishment '... incapable of delivering social equity, economic efficiency, and ecological integrity in response to the decline of rural society and deepening crises in the depletion and degradation of water, soils, flora and fauna ...'" (Campbell 1998:232-233). Röling and Jiggins (1998:297) state that "... the old role of developing technologies FOR farmers seems to clash with the logic of ecologically sound farming, while a new role [for research] ... seems not to have clearly emerged." The concept of "sustainability" (related to the NRM base on which all agricultural production depends) entered the CGIAR language in 1987. "Sustainable agriculture should involve the successful management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the quality of the environment and conserving natural resources." Realization had finally occurred that issues of land degradation and water management required concepts and methods that went beyond FSR: landscape and integrated watershed management, social dynamics, stakeholder analysis and conflict resolution, links with policy, to name a few. Working on water issues for example, solutions may be found that compromise farm level performance but benefit stakeholders with wider interests within the watershed. Research at wider scales had to deal with spatial aggregation, wider stakeholder diversity and even national interests, none of which are directly within the operational scope of FSR, which was more focused on products for farm-level improvement. Researchers, therefore, started to realize the deficits of the FSR approach and recognized that they had a responsibility to deal with other wider scale issues – such as livelihoods, NRM, and market orientation.

The other main shift from a scientist-directed FSR approach in the mid-1980's was movement towards greater farmer and community "participation" and links to empowerment. The goal of empowerment started to become more fundamental and politically laden than trying to improve the farming system. The movement into Participatory Technology Development (PTD) and Farmer Participatory Research (FPR) are departures from FSR, but met with similar barriers faced by FSR. PTD is less extractive for adaptive research focused on developing rather than just testing station-proven technologies with farmers. It was the root of recognizing that local knowledge was valuable and recognized that PTD was a joint (rather than extractive) learning process. PTD was hindered by lagging experimental methods that were more attuned for formal analyses. Some researchers abandoned statistical analysis and gave greater emphasis to farmer assessment methods. PTD was important in NRM research because management is determined by local circumstances; therefore, one very much needs to work with science principles together with local knowledge for finding solutions. This has been most successfully applied to integrated soil fertility management, IPM and IDM (AHI 2000).

FPR is an evolution of PTD, but broader in that it goes beyond “studying” the situation leading to provision of expert opinion for improvement, by attempting to solicit full participation of farmers in all stages of research although it still has a research focus rather than an empowering focus. From the paradigm of FPR, it is seen as a fairly externally-led process when looking at effects on local social institutions. For example, researchers may enter the community and establish research groups rather than understanding community dynamics and building upon this, etc. There may be skewed participation, where marginalized farmers fail to volunteer to participate, and do not get many of the benefits. Social science contributions have been minimal, but due to wider exposure of researchers to community situations are becoming more appreciated. Social scientists are better equipped to understand and manage dynamics of change, upscaling, and collective action useful to NRM.

In the PTD-FPR era (which is still ongoing), the participatory learning and action research (PLAR) methodology was borne. PLAR attempts to combine both R&D objectives and rationalizes that if the research is indeed adding value, one will see the on-the-ground changes and impact as proof. Another concept borne from this work, was the “research to development continuum” where different types of research were placed along a continuum with loops feeding iteratively from one to another – basic to strategic to applied to adaptive. Now, researchers are realizing that they can do strategic research on development processes, and that there should be more iterative learning between the “types” of research and their links to development. This concept has a bearing on the research contributions discussed later on more recent evolutions with INRM. At this stage various agroecological and agroecosystems research approaches came to the fore, and the ecoregional approach was borne. These approaches took remnants from FSR, scaled these up and some added this to FPR. Thinking was stimulated by Conway’s landmark paper (1987) where he described the principles, strategies and links of agroecosystems, that are modified by human beings to produce various products and that their dynamic and complex nature arises from the interactions between socio-economic and ecological processes, to performance of agricultural development programs. Conway’s ideas were used by modellers and by those working on NRM issues. Modelling techniques helped to handle multiple factors and interactions, but were limited due to heavy data demands and limited practical application. The agroecosystems approach allowed FPR farmers to design their system taking into account the multiple parameters using non-quantified diagrams (Lightfoot).

Later, with nutrient flow analysis (an example of PLAR), combined farmer diagrams with scientific quantification (Defoer et al 2000). Systems mapping and analysis (usually at farm-level) could lead to discussions and decisions regarding what changes could be tried using options at hand. Using PLAR methods farmers tested, chose and incorporated a number of changes simultaneously into their system, exploring ways to exploit niches. This methodology can help deal with different “types” of farm households determined by resource endowment levels, grouping these into “typologies” to understand diversity of natural and human led processes. Research became more efficient in dealing with diversity on one hand, but the method was very intensive and expensive.

In 1989, the CGIAR added several IARCs dealing with forestry, agroforestry, water management, livestock and fisheries, broadening the focus. It was at this time, that the ecoregional approach was borne which broadened the mandate beyond geographical, commodity delineated areas to those delineated by non-commodity factors. This allowed the spatial juxtaposition of climate, soils, topography, water and forests, human and livestock populations, market conditions, and current agricultural activities that provided the context and framed the major issues requiring research. It was thought that “by aggregating into agroecological zones, research on common agricultural problems in those zones would be facilitated, and linkages to NARS could be facilitated.” The ecoregional approach “built on CGIAR experience, recognising the need to integrate NRM and productivity concerns; marry human and technical dimensions; adopt an integrated systems approach; and link policy formulation to technology development” [TAC 1991]. Various shortcomings of CG operations in terms of use of partnerships and complementary roles included: limited global responsibility for strategic research on NRM; problems in targeting commodity improvement; limited coordination of capacity building efforts, decentralization and broadening of the IARC agenda; and overburdening, but limiting interaction and voice of NARS in CGIAR affairs. This led to identification of key cornerstones of the ecoregional approach:

- To embrace the complexity of *sustainable improvement of productivity* through the integration of NRM and productivity concerns;



- To emphasize *human decisions as causal factors* that impact biophysical processes such as land degradation;
- To use *multi-level hierarchical approaches* encompassing site-level to wider systems and recognizing *human decisions at different levels*, from farm household to local to national and even global levels;
- To link research with externalities such as policy and development actors incorporating these elements into the approach;
- To highlight the *role of the social sciences* in understanding the social and policy dimensions to sustainable agricultural development and the balance needed between social and biophysical sciences in ecoregional research;
- To pursue *working relationships (e.g. multi-disciplinary teams)* that could enhance the examination of a number of resource management themes - such as soil water relationships, soil fertility and plant protection and pursue the *complementarity of institutional skills* across IARCs, NARIs, Universities, NGO's and farmers organisations as a rationale for increasing partnerships; and
- To use a more *holistic, systems approach as well as a research to development continuum* to reflect a scientific sequence of characterization and diagnosis, technology development and extrapolation of successful solutions.

It was through the ecoregional programs and the NRM centres that the INRM approach started to emerge where there is an explicit recognition of the importance of the environment and the sustainability of the natural resource base on which all food production depends. Some new dimensions included:

- Explicit involvement and capacity building of resource managers and users recognizing that change and development required specific adaptations under their control (see Box 6);
- Increased level of dialogue and deliberation among stakeholders and improve the interaction of research within the system;
- Dealing with high levels of uncertainty, non-linearity and time lags, multiple scales of interaction and response, with multiple stakeholders having contrasting objectives and activities; and
- Incorporation and facilitation of social learning processes for various actors and their organizations, including community and research entities.

**Box 6.** What should researchers and research organisations be doing for INRM to be successful?

AHI stakeholders (2001) visualized what researchers and research organizations should be doing to ensure effective farmers and farmer organizations who would better manage their resources and reach their livelihood goals. The following list of issues emerged:

- Catalyse policy change
- Apply a system-based approach and use scale integration in the research agenda
- Develop methods to facilitate local community organization and operate as “change agents”
- Provide information and decision-support “tools”
- Use a participatory planning process, actively involve farmers in the research process and build on and integrate farmers knowledge
- Catalyze linkages and research partnerships and respect and have flexibility in partnerships
- Work in and manage multi-disciplinary teams who are sharing important tasks
- Carry out problem-driven research within a problem-oriented organizational structure

Research institutions would need to support this process by:

- Having motivation through intrinsic and extrinsic (i.e. incentive system) factors
- Building capacity in NRM
- Internalising the INRM paradigm
- Managing their own institutional dynamics and challenges
- Providing policies and guidelines in INRM

In conclusion, these approaches have each made their contributions and although they have been around for 15-20 years, still have uses: PTD and FPR are efficient for developing technologies and have been used to strengthen plant breeding using participatory methods (PPB) and local seed systems as enterprises (CIAT

annual reports 1999 through 2002). Many of these FPR applications have led to new methods of experimentation and analysis, anchoring the approach in science. Impact assessment methods have been developed and guides produced. This said, researchers and their organizations are still trying to find ways that research can better impact development and contribute to poverty alleviation, economic growth and environmental management. Unfortunately, it seems to take considerable time to develop and apply concepts. The tendency has been to continue to add levels, actors, institutional arrangements and dimensions. It is becoming more and more challenging for research organizations to sort out where to work, who to work with, and what to work on. There is a general trend in all research organizations to be demand-led and client-oriented, impact oriented and answer to many expectations and many needs of multiple stakeholders. New thrusts and skills are called for faster than research and higher-learning organizations can adjust and incorporate, particularly those publicly funded.

Research organizations are grappling with their roles and focus related to INRM. In the past, research on natural resources has been fragmented and has concentrated on the natural resources themselves as problems rather than integrated management within certain contexts that incorporate the human dimension. However, more and more NRM problems are recognized as multidimensional, with physical, economic, social, and cultural dimensions and that are linked to policy and economies. The integration is no longer just focusing on soil, water and vegetation, but on interactions between NRM, enterprise development, collective action, and policy support.

There has been a major paradigm shift in agricultural sciences over time and it is still occurring: from classical agronomy to ecological sciences; from analytical research to systems dynamics; from top-down to participatory approaches; and from factor-oriented management to integrated natural resource management. The shift towards process-oriented research implies understanding inter-relationships across time and across environmental gradients, and away from site-specific component trials. The challenge is to operationalize this agenda and the necessary institutional arrangements required. This pre-supposes that not only research needs to change and shift its paradigms, but others as well.

## Discussion and Conclusions

### CROSS ANALYSIS OF APPROACHES

The literature review and our review of approaches has led to distillation of *FIVE KEY FACTORS that lead to sustainable development and natural resource management*, as summarized here:

1. Policy environment that favours local participation and institutional involvement – e.g. not restrictive, but inclusive, able to manage multiple interests (vis a vis use of resources) and enhancing land tenure security (entitlements, access, usufruct, rights);
2. Investments have to pay – benefits need to be fairly immediate and express themselves in better food security and improved incomes;
3. Processes need to strengthen and favour local institution-building, factoring in conflict resolution, collective action and addressing disparities (power, gender, pro-poor);
4. Economies, generally, need to diversify so as to absorb and provide other kinds of employment; and
5. R&D institutional arrangements, roles, and responsibilities and outputs add up, e.g. synergies emerge among relevant technological innovations, communication and information strategies, efficient planning and networking, among others.

*Cross cutting features* of the approaches and concepts presented in Section 3 include:

- Varying degrees of participation, but overall recognition that ownership, access and control are inherently very important to support;
- Integration of diverse interventions (i.e. biophysical, social, institutional, ecological). Even if approaches are led by a certain component, these do not dominate the approach; rather, they try to adjust to accommodate and integrate various components;
- Reconciliation of different interests with an equity goal, even though there are trade-offs;
- Recognition of a hierarchy of use and decision-making;

- Acknowledgement of the necessity of vertical links between policy, markets and other external factors with community development; and
- Assume a high degree of coordination, networking, facilitation and capability – the NRM approach is highly dependent on some sort of organizational (often project) entity that brings different components (stakeholders, expertise, knowledge) together.

Most notable is the congruence of most approaches on the success factors and key features presented. Also notable is that we see continuous thinking and evolution overtime. This is healthy, and should continue in future, with perhaps a more robust periodic analysis of the global picture that is fed-back or made available to the various interests. There is a *continuum of approaches* on which they are clustered: at one end are those guided by environmental and conservation sentiments – where natural assets and infrastructure should be kept intact (e.g. landscape, agro-ecosystem). At the other end is a cluster that gives primacy to sustainable livelihoods and use of resources within this context (livelihood, watershed). In the middle are those approaches that try to bridge conservation and development objectives (eco-agriculture, IWLM, INRM).

Although all of these approaches have NRM as their backdrop, they have *varying points of departure*: some are anchored in research, conservation, community development or empowerment or policy. These points of departure are due to different driving forces of different “interest” groups who have different mandates or different organizational affiliation. Some of the approaches are *anchored to varying degrees in the community itself versus in external organizations*, for example, Landcare are more strongly rooted in the grassroots whereas CBNRM and IWLM are examples that are externally driven although taking place largely at community level. INRM and eco-agriculture are two approaches that depend more heavily on scientific inputs given their complexity.

The literature suggests that *research has made limited contributions to most of these approaches*. Development agencies and projects do not seem to solicit research inputs, nor have research entities sufficiently linked to assist in the development and assessment of the various approaches. Landcare is the exception to this. INRM has come into the research agenda within the last 5 years, and has emerged directly out of the CGIAR. There has been a lot of conceptual approach development work and this is *evolving through intellectual deliberations*, often through analysis and discussion in donor and implementer circles, *rather than being linked to lessons learned on the ground* and discussed locally. The literature review where concepts and approaches are described are not matched with descriptions of methods and well-described examples, so that it is difficult to assess how these have played out in real life. Documentation of lessons learned is often very general and are not contextualized. Experiences are small, de-linked islands from which the lessons are “drawn”.

The *speed of generation of new concepts and approaches is fast* and does not allow practitioners time to internalise, test and reflect on how these can be implemented, their validity in terms of their contribution and efficiency. This alienation from practice is partly because the *source of conceptual thinking is usually not local*, it is mainly done in universities in north (UK and US) with benevolent co-authorship. The concepts are also donor-driven, where both northern and southern institutions align themselves with donors, particularly where donor regulations require that north is involved (e.g USAID’s RAISE and FRAME programs; DFID’s ODI, IIED and NRI portfolios). Selected donors are either working in consultation with (IDRC), sponsoring e-consultations (SDC), or are starting to hold stakeholder consultation sessions to formulate their concepts and their implementation (USAID). Africa is at a particular disadvantage because of the dearth of in-country funding to research and higher levels of dependency on donor funds as well as few trained professionals heightening the reliance on expatriates. There is actually a *large capacity deficit in both research and development spheres* for implementation. This deficit is not recognized strongly by the literature.

*Donors seem to drive changes through concepts* and do not realize that time is needed on the ground to figure out how to implement these. Before one gets started, there is a new approach. Donors seem to be under high pressure to show impact to their governments, while developing country public institutions remain fairly traditional and unable to innovate, accountability is often weak, and incentives for employees are minimal.

## RESEARCH CHALLENGES AND NEEDS

More real-time documentation and assessment of examples to *contextualize lessons, practices and impacts* is required. These generalizations would be based on experience rather than on speculation, so that concepts and operational modalities can be fashioned accordingly. As part of this work, impact studies need to provide an overview of the efficiency, effectiveness and relevance of a wide range of “experiments”. It is important to understand their contributions to environmental integrity, livelihoods, equity and the economy.

Understanding the *contributions that natural resources are making to livelihoods and poverty alleviation as well as its contribution to the overall economy* is essential. It is assumed that NRM makes significant contributions, but there is evidence that livelihoods are diversifying away from agriculture towards urban economies, however, there is still high dependency on the natural resource base. There is need to have better strategies that overtly links NRM with income generation and increased food supplies, as an incentive to get engaged in NRM. The hypothesis is that systems integration and NRM at the landscape level is not sufficient, rather investments to NRM must be linked to public investments in other sectors, such as in markets, infrastructure,

There are *technical areas* requiring further research relating to the natural resources themselves and their links into sustainable intensified systems in different ecologies. There is further need to develop efficient, integrated management systems and to prevent degradation, such as IPM, INM, crop-livestock production systems, water quality and quantity, integration of agroforestry taking cognisance of multiple demands on land and water and social, economic and environmental impacts; to better understand the processes underlying the long-term, less obvious forms of soil and water degradation and their rates and impact of change; and how to get more effective generation and implementation of existing knowledge for improved INRM.

At the landscape and farm level, *integration and systems management* is still poorly researched. This cannot be understood through modelling which merely describes how systems work without the actors, but rather an approach is needed, such as action research, where there is iterative learning / action with inputs from research that are translated in a way that is usable by local stakeholders.

There are major research gaps in the areas of *social and institutional dimensions of INRM* related to: (i) how these elements are integrated with solving biophysical issues; (ii) how to better influence institutional and behavioural change of various actors and stakeholders; (iii) how to build upon indigenous knowledge, strategies and structures; and (iv) how to improve the linkages and relationships between different decision making levels and perceptions. These methodological developments are needed to further the vision embodied in INRM and sustainable development.

Given that the *policy environment* must favour local participation and institution involvement and provide land tenure security an emphasis should be placed on providing evidence to policy makers; however, this needs to be done in a form that is understandable and linked to dialogue. In this realm, NGOs need more inputs from research for making their advocacy more informed. Research can also find ways to empower resource users (farmers, communities, etc) in expressing their priorities and needs to government, private sector and other service providers.

*Institutional change* is another major issue. There are visionary strategies presented by WB, WSSD and SARD; for example, that governments are not implementing due to limitations in their structures, investment allocations, and accepted practices. This is also the case for research and development organizations. Research can highlight best practices and policy directions using an iterative learning / action with inputs from research that are translated in a way that is usable by local stakeholders.

### *Challenges to Improving NRM in Africa*

Synthesizing NRM experiences in a multi country study a recent discussion paper by Barret et al, (2001) draws together important lessons on how governments and donors might stimulate further improvements. These are very similar to the five success factors listed at the start of this chapter. The authors argue that four supporting

“ins” are critical for NRM investment: incentives, information, inputs, and institutions. The authors propose that the only feasible path forward requires concerted public investment in providing necessary incentives, information, inputs and institutions. It is their necessary integration into a whole, as a foundation for broad-based investment in improved NRM that is new, as well as urgent. The four “in” strategy rests upon several core interrelated principles that emerge from the study. An abridged version of the principles enunciated in the discussion paper is presented here, as a conclusion to this report:

*Knowledge-Intensive Integrated Natural Resource Management:* This principle carries several implications for policy priorities and practices. First, the agricultural community needs to move more vigorously toward integrated natural resource management that tackles the simultaneous problem of soil, water and biomass management, as distinct from promotion of individual practices or technologies. Second, and related, it is time to end the artificial conflict between so-called “modern” methods based on chemical fertilizers, irrigation, and improved cultivars, and “traditional” or “agro-ecological” methods based on intercropping, rotations, cover crops, and organic nutrient supplements. Third, information flow must improve between and within national agricultural research and extension systems (including universities), rural communities, NGOs, private traders, and individual farmers. Fourth, knowledge-intensity places a premium on education, not just for literacy or numeracy, but also for analytical, observational and communications skills.

*Farmer-Centered Policy and Research Design:* Three policy priorities emerge from this second core principle. First, the establishment of effective local governance complemented by competent, specialized central government agencies must be made a priority. Second, and related, civil strife impedes the effective functioning of government and extra-governmental institutions responsible for coordinating resource use and policy. There is at best limited potential for progress in stimulating improved NRM, agricultural intensification and rural economic growth and poverty alleviation if governments and donors fail to effectively address widespread problems of uncivil society and violations of the rule of law. Third, and perhaps paradoxically, a farmer-centered approach to NRM in agriculture must transcend traditional sectoral specificity in order to take seriously the broader livelihood objectives of rural Africans. Priority must be placed on developing the rural non-farm economy along with agriculture.

*Improved Natural Resource Management Must Pay:* Widespread uptake of improved NRM practices depends on commercially viable agriculture or significant subsidies. Improved NRM consistently appears among high-value cash crops. Farmers see the return to the quite tangible costs of investing in improving productivity (and sustaining improved productivity) when they get an obvious payout from the market. If the returns to agriculture cannot compete with those from other activities, the empirical evidence clearly indicates that farmers do not invest scarce investment resources in natural capital.

*An Enabling Market Environment* relates to the institutional setting, or the rules of conduct necessary for individuals to contract with confidence and to feel secure in their claims to durable assets such as land, livestock and water. This includes security against seizure by invaders, by the state, or by powerful individuals, which can include husbands and brothers who prey upon women’s relative powerlessness in resource control in some cultures. Establishing or restoring the rule of contract law in agricultural markets can substantially extend the reach of commercially viable agriculture in rural Africa. Rural financial systems are notoriously underdeveloped throughout Africa. Insufficient credit, insurance and savings impede investment in improved NRM, just as in other forms of productive capital, and thereby trap rural Africans in longstanding cycles of poverty and vulnerability. The final priority area concerns organization for collective action, echoing a point made in the previous subsection with respect to farmer-centered approaches to agricultural development.

## References and Resource Materials

- Abbot, J and I Guijt, 1998, "Changing Views on Change: Participatory Approaches to Monitoring the Environment" SARL Discussion Paper 2, 96pp, IIED, UK
- AHI 2002 Operationalizing INRM Research in AHI Phase 3, October 2002, Moshi Tanzania, proceeding of a workshop.
- AHI 2002. Broadening Horizons - Institutional, Policy and Technical Innovations for Improving NRM and Agricultural Productivity in the African Highlands, AHI, Kampala, Uganda.
- Alsop, R, E Gilbert, J Farrington, R Khandelwal 2000. Coalitions of Interest: Partnerships for Processes of Agricultural Change. ODI Sage Publications.
- Ashley C 2000. Applying livelihood approaches to Natural Resource Management Initiatives: Experiences in Namibia and Kenya. [www.livelihoods.org/cgi-bin/dbtcgi.exe](http://www.livelihoods.org/cgi-bin/dbtcgi.exe)
- Ashby C, 2000 Overseas Development Institute, Working Paper Series and "The Impacts of Tourism on Rural Livelihoods: Namibia's Experience", ODI, Working Paper 134.
- Ashby JA 2001 Integrating research on food and the environment: an exit strategy from the rational fool syndrome in agricultural science. *Conservation Ecology* 5(2): 20. [online] URL: <http://www.consecol.org/vol5/iss2/art20>
- Barrett CB, J Lynam, F Place, T Reardon and AA Aboud, 2001. Toward Natural Resource Management in African Agriculture, Natural Resource Problems, Priorities and Policies Programme Discussion Paper 2001 – 7. International Centre for Research in Agroforestry, Nairobi, Kenya.
- Biggs, SD, 1989, Resource-poor farmer participation in research: A synthesis of experiences from Nine National Agricultural Research Systems, Special Series on the Organization and Mangement of On-Farm Client Oriented Research, (OFCOR) – Comparative Study Paper no. 3, ISNAR, The Netherlands.
- Biodiversity Support Program, 2000, Making Conservation Work: Lessons from the Field; Linking Theory and Practice in Biodiversity Conservation. [www.BSPonline.org](http://www.BSPonline.org)
- Biodiversity Support Program. 2000 Making Conservation work: Lessons from the Field - Who Should Be Making Decisions? [www.BSPonline.org](http://www.BSPonline.org)
- Boyd C with Roger Blench, David Bourn, Liz Drake and Peter Stevenson, Natural Resource Perspectives Reconciling Interests among Wildlife, Livestock and People in Eastern Africa: A Sustainable livelihoods approach", ODI.
- Byers, B, 2000, Understanding and Influencing Behaviours – A Guide, Biodiversity Support Program, WDC, USA [www.BSPonline.org](http://www.BSPonline.org)
- Campbell, B, JA Sayer, P Frost, S Vermeulen, M Ruiz Pérez, A Cunningham, and R Prabhu, 2001, Assessing the performance of natural resource systems. *Conservation Ecology* 5(2): 22. [online] URL: <http://www.consecol.org/vol5/iss2/art22>
- CGIAR Center Director's Task Force on INRM, 2001, Integrated Management for Sustainable Agriculture, Forestry and Fisheries. Proceedings of 2001 INRM Workshop held in Cali, Colombia, August 28-31, 2001.
- Collinson M, 2000, My FSR Origins and FSR in Technology Choice and Development.
- Collinson M and C Lightfoot, 2000, The Future of Farming Systems Research, In: A History of Farming Systems Research, ed by M Collinson, FAO and CABI.
- Consultative Group on International Agricultural Research (CGIAR)/Technical Advisory Committee 2001. NRM research in the CGIAR: A framework for programme design and evaluation, TAC Secretariat, Food and Agriculture Organization of the United Nations.
- Convention on Biological Diversity [www.biodiv.org/](http://www.biodiv.org/) in particular, Decision V/6 Agroecosystem Approach.
- Conway GR, 1987, The Properties of Agroecosystems, *Agric Syst* 24: 95-117.
- De Breeds, Matthijs, 1996, Identification of Land Degradation Levels at Grassroots: Experience and perspectives from Eastern and Southern Africa, IDRC.
- Defoer T, A Budelman, C Toulmin, SE Carter 2000, Building common knowledge. Participatory learning and action research (Part 1) In: Defoer T, Budelman A (eds) *Managing Soil Fertility in the Tropics. A Resource Guide for participatory learning and action research*, Amsterdam, the Netherlands: Royal Tropical Institute.
- Dubois O and J Lowore 2000, The 'Journey' towards Collaborative Forest Management in Africa: Lessons Learned and Some 'Navigational Aids': An Overview", International Institute for Environment and Development (IIED), UK.

- Edmunds, D and E Wollenberg, 2002, Disadvantaged Groups in Multistakeholder Negotiations, CIFOR Program Paper, CIFOR, Bogor, Indonesia.
- Eghenter C. 2000, Mapping People's Forests: The Role of Mapping in Planning Community-Based Management of Conservation Areas in Indonesia. Peoples, Forests and Reefs (PeFOR) Program, Discussion Paper Series, Biodiversity Support Program, WDC. [www.BSPonline.org](http://www.BSPonline.org)
- FAO 1995. Understanding Farmers' Communication Networks: An experience in the Philippines, Communication for Development Case Study No 14, FAO Communication for Development Research, Extension and Training Division.
- FAO, 2001 The place of agriculture in sustainable development: The way forward on SARD, Committee on Agriculture, 16<sup>th</sup> Session, 26-30 March 2001, Rome.
- Ford R, Kabutha C, Mageto N, Manneh K, 1992. Sustaining Development Through Community Mobilization: A Case Study of Participatory Rural Appraisal in the Gambia, published by Program for International Development, Clark University, in association with Action Aid/The Gambia with support from Action Aid. October 1992.
- Gambill D 1999. Intentionally Sustainable: How Community-Based Resource Management enables and encourages the sustainable use of resources, USAID Office of Women for development, WIDSTRAT Project.
- Gebremedhin B, J Pender, and G Tesfay, 2002, Nature and determinants of collective action for woodlot management in northern Ethiopia, Socio-Economics and Policy Research Working Paper 40, ILRI.
- Gebremedhin, B, J Pender, G Tesfay, 2002, Collective action for grazing land management in mixed crop-livestock systems in the highlands of northern Ethiopia, Socio-economics and Policy Research Working Paper 42, ILRI.
- Hagmann, JR, E Chuma, K Murwira, M Connolly, and P Ficarelli. 2002. Success factors in integrated natural resource management R&D: lessons from practice. Conservation Ecology 5(2): 29. <http://www.consecol.org/vol5/iss2/art29>
- ICRAF, 2001, Integration of CGIAR activities in Eastern and Southern Africa Report of the inter-centre preparatory meeting held at ILRI, Kenya, March 14-16, 2001.
- ILEIA, 2000, Monocultures towards sustainability, LEISA Magazine 16(4). [www.ileia.org](http://www.ileia.org)
- ILEIA, 2001, Coping with disaster, LEISA Magazine 18(2). [www.ileia.org](http://www.ileia.org)
- ILEIA, 2002, Livestock: Which way?, LEISA Magazine 18(1). [www.ileia.org](http://www.ileia.org)
- ILEIA, 2002, Changing information flows, LEISA Magazine 18(2). [www.ileia.org](http://www.ileia.org)
- International Institute for Environment and Development (IIED), 2002, Local Government and participation, Participatory Learning and Action (PLA) Notes, no 44, pub by IIED, 3 Endsleigh Street, London, England
- Josserand, H, 2001, Community-Based Natural Resource Management (CBNRM) In Africa – A Review, ARD, April, 2001.
- Kerr, JM, 2002, Watershed development projects in India: an evaluation, in collaboration with Ganesh Pangare and Vasudha Lokur Pangare, Research report 127, IFPRI, WDC, USA.
- Landon S 1998. Community-Based Natural Resource Management: Readings and Resources for Researchers. Vol. 2. for the Community-Based Natural Resource Management Program Initiative, IDRC, CRDI, CIID Canada.
- WWF / IUCN (2001) Landscape Approach – A Strategy.
- McNeely JA, and SJ Scherr, 2003, "Ecoagriculture: Strategies to Feed the World and Save Wild Biodiversity", Future Harvest / IUCN, Island Press, London.
- Natural Resources Support Program, 2002, Scaling –up and communication: Guidelines for enhancing the developmental impact of natural resources systems research. DFID-NRSP, UK.
- OIKIS and IIRR, 2000, Social and Institutional Issues in Watershed Management in India, OIKIS, India and International Institute of Rural Reconstruction, YC James Yen Center, Silang, Cavite, Philippines.
- Ole Nielsen N, 1998, "Management for Agroecosystem Health: The New Paradigm For Agriculture", Department of Pathobiology, University of Guelph, Canada, In: R. Blair, R. Rajamahendran, L.S. Stephens, M.Y. Yang (eds), New Directions in Animal Production Systems. Proceedings of the Annual Meeting of the Canadian Society of Animal Science, July 5-8, 1998, Vancouver, British Columbia, Canada.
- Perez, C and H Tschinkel, 2003, Improving Watershed Management in Developing Countries: A Framework for Prioritizing Sites and Practices, Network Paper No 129, Agriculture Research and Extension Network (AGREN), ODI, UK.
- Peters, CM, 2000, Sustainable Harvest of Non-timber Plant Resources in Tropical Moist Forest: An Ecological Primer, from A Primer on Ecological Sustainability, Biodiversity Support Program, [www.bsponline.org](http://www.bsponline.org)

- Poole, P, 1995, Indigenous Peoples, Mapping & Biodiversity Conservation: An analysis of current activities and opportunities for applying Geomatics technologies. Biodiversity Support Program People and Forests Discussion Paper Series, Biodiversity Support Program, Printed by Corporate Press, Landover, MD.
- Probst, K and J Hagmann, 2003, Understanding participatory research in the context of natural resource management – paradigms, approaches and typologies, with contributions from M Fernandez and JA Ashby, Network Paper No 130, AGREN, ODI, UK.
- Rebot, J, 2002 Democratic Decentralisation of Natural Resources - Institutionalising Popular Participation”, World Resources Institute, WDC, USA.
- Russell, D and C Harshbrger, 2003, Groundwork for Community-based Conservation: Strategies for Social Research, AltaMira Press, a division of Rowman and Littlefield Pub Inc, Walnut Creek California USA
- Schwedersky T, O Karkoschka, W Fischer, Promoting, 2001, Participation and Self-Help in Natural Resource Management”, GTZ.
- Scoones I et al, 1999, Sustainable Livelihoods – A Framework.
- Srinivasan L., Tools for Community Participation. A Manual for Training Trainers in Participatory Techniques. PROWWESS/UNDP Technical Series Involving Women in Water and Sanitation.
- Stroud A and R Kirkby, 2000, Technology Choice and Development, In: A History of Farming Systems Research, ed by M Collinson, FAO and CABI.
- Uphoff, N., CBNRM: Connecting Micro and Macro Processes and People with their Environments”, Cornell International Institute for Food Agriculture and Development.
- Veit P, A Mascarenhas and O Ampadu-Agyei, 1995, Lessons from the Ground up: African Development that Works, World Resources Institute, WDC.
- World Bank, 2002, Sustainable Development in a Dynamic World, Overview, World Development Report 2003, WDC.
- WSSD Plan of Implementation, para. 40.
- World Wildlife Foundation, 1995, “Local Knowledge and Social Organization: Foundations for Biodiversity Conservation”, Workshop II of the Integrated Conservation and Development Projects (ICDP) Review (draft report), Nov 12-18 1995, Puerto Princesa, The Philippines.



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