# Integrated Agricultural Research for Development (IAR4D)

A Concept Paper for the

Forum for Agricultural Research in Africa (FARA)

Sub-Saharan Africa Challenge Programme (SSA CP)

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**Sub-Saharan Africa Challenge Programme (SSA CP)**


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# Foreword

Agriculture is the largest employer of labour in Africa, and has an enormous role to play in the development of the continent. Despite the fact that most people in Sub-Saharan Africa (SSA) are engaged in agriculture, its productivity has stagnated for several years across the whole sub-region. Numerous reasons have been advanced for this stagnation, including inadequate returns from investments in agricultural research and development efforts. Although agricultural research has generated several kinds of technology with high potential, the impact of the technology on farmers' productivity, livelihood and quality of life have not matched its potential. This situation has its roots in the way research is being conducted, mainly because it did not adopt inputs from the non-research sector.

The Forum for Agricultural Research in Africa (FARA) proposed the Integrated Agricultural Research for Development (IAR4D) as an innovation system framework that should form the base upon which transformation of agricultural research in SSA should be considered. The IAR4D concept aims to deviate from the traditional linear configuration of ARD by encouraging the engagement of multiple actors along the commodity value chain for the promotion of the process of innovation in the agricultural system. In IAR4D, innovation evolves through continuous interaction among players, utilisation of feedback, analysis and incorporation of lessons learned between different processes. This essentially draws on the knowledge of relevant actors at each stage. The framework creates a network that considers the technical, social, and institutional constraints in an environment that facilitates learning with the ultimate aim of generating innovation rather than mere research products or technologies. IAR4D cannot but be complex, and would certainly require fundamental changes in the wider institutional and policy environment in order for it to promote the process of innovation.

The success of this emerging paradigm relies much on its acceptance, premised on a reasonable understanding and a willingness to change. There must be a change in the perception and way of working on the part of all partners in innovation, which must now include both traditional and non-traditional partners of research. An important indicator of success for IAR4D, besides the promotion of innovation, is its ability to influence partners to undertake partnership in a different way. The institutional and policy environment for agricultural research and development must also change. This means that the IAR4D concept needs to be prominent on the agenda of ongoing debates on agricultural development issues within the policy, academic and operational communities.

In the light of the foregoing, FARA facilitated the development of this "White Paper" as a working document on the IAR4D concept. It is meant to stimulate discussion on the subject matter to promote the understanding of the concept.

IAR4D is an evolving concept. But the White Paper has attempted a description of the concept, traced its evolution and enumerated some of its key descriptive principles, each of which was explained and

rooted in theory and praxis. The authors thereafter attempted to indicate how each principle could be incorporated in the development practice and further illustrated the principles through 13 case studies.

I thank our partners in the International Centre for development oriented Research in Agriculture (ICRA) and the Royal Tropical Institute, both in the Netherlands, for their financial and intellectual contribution to this Paper. They worked closely with FARA in developing this paper, and the process was coordinated by Dr Adewale Adekunle, the SSA CP Coordinator.

The "White Paper" is therefore, a tool to promote discussions among all stakeholders who I would like to refer to as 'new partners in the innovation process'. These include all stakeholders along the commodity chain including research, extension, farmers, policy, processors, input and output market, transporters, and agricultural financing agencies.

**Monty Jones**
Executive Director FARA

## Summary

This paper is intended to contribute towards an understanding of 'Integrated Agricultural Research for Development' (IAR4D).

We first review four 'defining principles' of IAR4D, the theories and experiences that have contributed to the formulation of these principles, and actions that can contribute to putting these principles into practice. We then summarize the individual, organizational and institutional capacity that is needed to create the enabling environment for IAR4D. Finally, we look at 13 case studies, and review how they reflect the principles and capacity-development challenges described.

The 'defining principles' of IAR4D we propose are:

1. **IAR4D integrates the perspectives, knowledge and actions of different stakeholders around a common theme**. The theme or 'entry point' represents a research and development 'challenge', identified by one or more stakeholders who recognize that a broader working alliance is needed to achieve the desired development impact. The interests and actions of the different stakeholders go beyond information and technology to include business, politics, finance, organization, management, etc., and the links between these.
2. **IAR4D integrates the learning that stakeholders achieve through working together**. Beyond simply a concerted *action* process, IAR4D is a social *learning* process, with stakeholders learning from the experience of working together. This learning focuses primarily on the processes of stakeholder interaction themselves, rather than on the specific solutions to the research and development 'challenge'. This learning takes place at the individual, organizational and institutional levels.
3. **IAR4D integrates analysis, action and change across the different (environmental, social, economic) 'dimensions' of development.** The general and current concepts of 'sustainable development' and 'multi-functional agriculture' emphasize the interlinked 'dimensions' of such development. These include economic growth (linking farmers to markets), conservation of natural resources (soil fertility, biodiversity, limited carbon-dioxide production, etc.), social inclusion and equity ('pro-poor development'), as well as food security.
4. **IAR4D integrates analysis, action and change at different levels of spatial, economic and social organization.** Agricultural innovation is an emergent property of the broader 'innovation system'. To be effective at promoting innovation, IAR4D therefore needs to promote change and enhance learning throughout the broad innovation system at all levels of organization. These include 'spatial' levels (field, farm, watershed, etc.), economic levels (product, firm, value chain, business cluster, etc.), and social levels (individual, group, community, organization, innovation system, etc.)

Over and above these principles, however, we argue that IAR4D requires a set of *individual, organizational and institutional capacities* that enables these activities in practice.

At an *individual level*, competencies need strengthening in *meta-disciplines* (systems thinking, knowledge management, strategic planning, knowing how to learn, effective writing, use of information and communications technology, etc.), in *social skills* (communication, teamwork, networking, facilitation, etc.), and in *mindsets* (empathy, self-awareness, self-regulation, self-motivation, social awareness, etc.).

At an *organizational level*, structures and processes need to provide the *performance and incentives systems* that encourage inter-disciplinary teamwork, partnerships with other stakeholders, an emphasis on mutual learning, and effective knowledge management that promotes change. Also needed are approaches to *impact assessment* that go beyond economic returns to include and encourage a broader view of human development.

At an *institutional or system-wide level*, capacity needs to be developed to allow different stakeholders—individuals and organizations, from public and private sectors—to come together on a 'level playing field'. Currently, there is often an institutional vacuum in this regard, although innovation intermediaries and competitive-funding committees are mechanisms that can convene and articulate stakeholders to fill this vacuum. Finding an appropriate way to manage and finance inter-institutional space and the needed intermediaries is crucial, as is ensuring the neutrality of these intermediaries. It is also vital to build trust between the intermediaries and the different stakeholders, as well as among the stakeholders themselves.

We therefore present *IAR4D as a set of 'good practices'* or actions that synergistically add value to existing research and development processes. We do not see IAR4D as a particular research and development 'approach' or even a 'framework'. Nor do we see IAR4D as '*a* process', but rather *about* (the quality of) processes. We regard development as being about behaviour and capacity, not outputs, and we therefore see IAR4D as focusing on improving behavioural processes and capacities as *outcomes,* rather than on just technology or policy *outputs.*

This view of IAR4D might be seen as an unobtainable ideal, and too broad to be practical. However, we acknowledge that there are a number of experiences and research and development approaches or frameworks that go a long way towards incorporating these IAR4D principles, as well as recognizing the need for individual, organizational and institutional change that we regard as fundamental to IAR4D. Many of these concepts, methods, approaches and frameworks are reviewed in this paper and have shaped the result. It is not our intention in this paper to try to supersede them by proposing a 'state of the art' or definitive 'IAR4D approach'. IAR4D is evolving, and needs to fit the circumstances.

In our view, implementing IAR4D is more a matter of creating and continually developing these individual competencies, the organizational norms and culture, and the conditions and mechanisms for inter-institutional linkages, than of simply following IAR4D principles through particular actions. The creation of favourable organizational and institutional environments is critical, and lack of progress in this regard is the main reason why IAR4D has remained largely at the level of 'pilot projects', in spite of widespread agreement on IAR4D principles in policy documents. Organizations that aspire to IAR4D need to examine the implications for their governance structures, management and leadership, resources, procedures and overall culture, if IAR4D is to become part of mainstream research and development (R&D) practice.

# 1 Introduction

This paper is intended to promote discussion around the concept of 'Integrated Agricultural Research for Development' (IAR4D) and contribute to the understanding of the concept by all actors involved in agricultural research and development.[1] That said, the concepts and experiences discussed—and the 'vision' of IAR4D given here—are inevitably based on our own viewpoints, knowledge and experience. Given the evolving nature of research and development approaches, our intention is to stimulate further discussion and experimentation with processes, rather than offer a definitive account of an IAR4D process or method.

We take as our starting point the dissatisfaction that many stakeholders in agricultural research and development feel with 'business as usual'. By this, we mean the adherence—consciously or not—to the 'generation, transfer and adoption of technology' model, in which research is seen as the prime source of new knowledge that, when 'transferred' to farmers, is the main driver of agricultural change. We are convinced that this dissatisfaction is leading to the search for ways of improving and integrating the actions of all stakeholders—production and marketing, research, advisory services, policy, funding, etc.

IAR4D is evolving and brings together a number of trends and ideas.[2] In general terms, we see IAR4D as being about a broad set of processes that through their interaction lead to the generation and use of knowledge, with the following features:

- IAR4D is about change or innovation[3] as an outcome, not just about information, knowledge or technology as a product;
- IAR4D places 'research' as one of the components contributing to the development process, rather than its pivotal point;
- IAR4D focuses on processes and performance rather than just products (technologies, policies); or, to put it another way, improved processes *are* the product.

It is perhaps easier to say what we think IAR4D is *not.* We do not see it as a fixed method, approach or specific process that can be easily applied as an alternative to 'conventional' research and development—unfortunately, it is not that simple. To achieve the desired outcomes described, the conceptualization and practice of IAR4D needs to go beyond methods or approaches to include changes of personal skills, mindsets and attitudes, organizational practices and culture, and the ways in which organizations interact as part of the wider 'innovation system'.

The concept of an agricultural innovation system (which is explored more fully in section 2.1.2) provides the framework for our understanding of IAR4D. We find that there is thus much overlap between our concept of IAR4D and that of facilitating 'rural innovation' processes as promoted by the United Nations University—Maastricht Economic and social Research training centre on Innovation and Technology

(UNU-MERIT),[4] the former International Service for National Agricultural Research (ISNAR),[5] the World Bank,[6] IFAD,[7] the Royal Tropical Institute (KIT) and the Technical Centre for Agricultural Research and Rural Cooperation (CTA),[8] among others,[9] the concept of 'Agricultural Research for Development' or 'ARD' (as used by ICRA and partners in countries such as South Africa,[10] as well as by the European Initiative for Agricultural Research for Development[11]), and with approaches such as 'Integrated Natural Resources Management' and 'Enabling Rural Innovation' practised by CGIAR centres and their partners in Africa and elsewhere. These similarities are further explored in this paper, as well as other concepts and research approaches that have influenced recent thinking.

We suggest four 'defining principles' that map out the contours of what we regard as IAR4D:

1. IAR4D integrates the perspectives, knowledge and actions of different stakeholders around a common theme;
2. IAR4D integrates the learning that stakeholders achieve through working together;
3. IAR4D integrates analysis, action and change across the different (environmental, social, economic) 'dimensions' of development;
4. IAR4D integrates analysis, action and change at different levels of spatial, economic and social organization.

Even then, we believe that it is not so much these individual principles *per se* that define IAR4D as the interaction between them and overall outcome resulting from this interaction. We are therefore hesitant to offer a one-sentence definition of IAR4D, but, in response to several requests for such a statement, we would say that: '*IAR4D comprises a set of individual and organizational behaviours that promote the integration of stakeholder concerns, knowledge, action and learning around a theme of mutual interest*'.[12]

The four 'defining principles' of IAR4D described above are explored in more detail in section 2 of this paper, where we explore what we mean by these principles, give a brief account of some of the theory and experience that support these principles, and how the principles are reflected in research and development practice. We then go on to discuss the implications of these principles in terms of change for individuals, organizations and institutional relationships in section 3, and lessons learned from selected case studies in section 4. The case studies themselves are appended at the end of the paper.

# 2 Defining Principles of IAR4D

The four 'principles' of IAR4D that we describe in this section could undoubtedly have been packaged differently; there is considerable overlap between them.[13] The theories and experiences described for each principle also undoubtedly reflect our own personal trajectories—those ideas that have resulted in our own personal 'constructs' of IAR4D. Others may well have included additional theories or interpreted the experiences in a slightly different way. Our intention is not to be comprehensive, but to explore some of the background to our way of thinking.

Equally, it is not our intention to be definitive—to show IAR4D as the inevitable culmination of a process of evolution in research and development ideas leading to a 'fully constructed' framework. New ideas and experiences will undoubtedly result in a richer appreciation of IAR4D in the future. Prominent among these experiences is the extensive work being carried out by the Sub-Saharan Africa Challenge Programme (SSA CP) at three 'Pilot Learning Sites' spread over eight countries in West, East, Central and Southern Africa.[14] The SSA CP notes that the IAR4D 'approach will be a set of generic principles applicable in different agro-ecological, economic, social and institutional environments. As structured learning in collaborating groups underpins the approach, it is explicitly expected and desirable that these principles will always be subject to revision and updating even within project cycles'.[15]

These caveats notwithstanding, we hope that our discussion of what we mean by each of the four defining principles, the ideas and experiences behind these, and the identification of some of the practical ways in which these principles are reflected in research and development practice, will provide a coherent vision of IAR4D that can guide others in developing their own research and development procedures according to their own specific circumstances.

## 2.1. IAR4D integrates the perspectives, knowledge and actions of different stakeholders around a common theme

### 2.1.1. What do we mean by this principle?

The focus or 'entry point' for IAR4D is a complex problem/opportunity in rural development—what we refer to here as a 'research and development (R&D) challenge', or 'theme'. Initially identified by one or more persons or organizations, the challenge can be regarded as 'complex' because there are different ideas about what should be done, and because no single person or organization acting alone can tackle the issue effectively. Complex problems require a working alliance or partnership among various stakeholders.[16]

As these stakeholders are identified and become involved, they bring different perspectives of the problem or opportunity, different or conflicting interests and multiple sources of knowledge.[17] These

differences need to be explored, confronted, reconciled and negotiated into a common understanding of the (redefined) challenge and shared objectives. Achieving this common understanding and establishing shared objectives is a key part of the IAR4D process (and commonly done only superficially or even not at all in 'business as usual'). Only when joint objectives are agreed can concerted action then be planned and implemented. This does not imply that all stakeholders need to be involved in all actions, but rather that the specific roles of the different stakeholders in taking complementary and coordinated measures to tackle the issue are recognized by all.

The interests of the different stakeholders go beyond simply information and technology to include business, politics, finance, organization, management and—more importantly—the links between these. The differences in interests also mean that the costs and benefits of working together will not fall evenly to all stakeholders, and the priorities for action will be higher for some than for others.

Although these different interests contribute to its complexity, the problem must nevertheless be manageable, defined and concrete. If it is too general, 'the problem of small-holder development in region *x*', for example, there will be insufficient focus for effective collaboration and action. Typical themes for IAR4D are centred, for example, on product value chains, or a natural-resource management problem, in a defined geographical area.

Creating any successful partnership requires mutual understanding and trust. In the multi-stakeholder partnerships of IAR4D, such relationships are not always easy to create where there are considerable differences in social status, income levels, etc., which are typical between government professionals, rural households, businesspeople, etc.

### 2.1.2. What theory and experience support this principle?

#### *Positivism and constructivism*

Positivism holds that there exists a true knowledge of 'reality', that this reality is universal and unchanging, and that it can be gradually revealed by the scientific method. Science, it is thought, must limit itself to what is observable and measurable ('empiricism')—it is a way of getting at the true nature of things. The assumption is that the universe is governed by laws, which science must understand in order to predict and control. This view of reality influences the way scientists approach concepts and methods: systems, problems and solutions are seen as objective truth—which is assumed to be 'value free' or independent of the values of the different observers or interested parties. From a positivist viewpoint, the problem to be solved, the opportunity to be exploited, or the development action needed in a particular situation, are assumed to be characteristics that can be precisely and unequivocally determined.

Constructivism is interpreted in many ways,[18] although when used in an epistemological[19] sense and contrasted to positivism, its main thrust is to assume that knowledge is a function of how the individual 'constructs' meaning from his or her experience. 'Reality' is therefore not independent of our perception: different people may interpret the same phenomenon in different ways, and knowledge is deconstructed and then reconstructed during its transfer from one person to another. Under this view, technology, policy and development actions are not independent from people's perceptions. Their perceptions of a particular problem are different. Thus, an optimal solution is one which is acceptable to most people. Following this constructivist perspective, data are often less important than the processes activated during their collection, and the role of the expert is to facilitate processes of communication between diverse interests and come to a common understanding and agreed action.

While this summary represents an oversimplified dichotomy between positivism and constructivism, it does underlie much of the discussion about IAR4D. A purely positivist view of science and development, we argue, is responsible for many of the difficulties scientists have in communicating with other stakeholders, in understanding the interaction between stakeholders, and in integrating their knowledge and actions with those of other stakeholders—all important features of IAR4D.

### *Indigenous knowledge, farmer innovation*

One of the results of the positivist outlook of researchers and scientists has been the undervaluing of the knowledge of farmers (as well as other stakeholders). While the capabilities of these farmers have long been recognized,[20] these capacities tended to be overlooked in the era of modernization and the establishment of formal agricultural research and extension organizations. In the 1980s, agricultural professionals began to take more interest in 'indigenous knowledge' and 'farmer innovation',[21] and the growing recognition of the knowledge and capacities of farmers led to an explosion of interest in the ways in which professional agricultural researchers could better work with farmers (rather than just 'for' them).[22] There have since been a number of approaches such as 'participatory technology development' (PTD), or 'participatory innovation and development' (PID) as it was then, have increasingly recognized that development requires more than just technology.[23] These approaches emphasize joint working between villagers, researchers and advisory services to analyse problems and opportunities; identify things to try; trying them out in the community; analyse and share results; and improve local organization and linkages with other actors in R&D.

The importance of these experiences for the development of IAR4D was the recognition that innovation in farming does not always—or even usually—start with (formal) agricultural research. They have also contributed to a growing appreciation of what 'participation' and 'innovation' actually mean in practice.

### *Participation and participatory research*

'Participation' has been a major concept in development for the last 30 years, based on the belief that the use of local knowledge, capacities and priorities contributes to a greater diversity, effectiveness and equity in meeting people's needs and sustaining the environment. Increasing participation has been at the forefront in academic discourse,[24] as well as in new approaches and methods for development programmes and projects,[25] including 'farmer participatory research'.[26]

Initial efforts to increase participation often focused on the tools and methods, such as those used in 'rapid rural appraisal' (RRA) or 'participatory rural appraisal' (PRA).[27] These methods generally emphasized working with groups (rather than individuals), and techniques that allowed effective communication between development professionals and less formally educated villagers (often using qualitative or semi-quantitative tools and visual methods such as matrix ranking and mapping). However, critics have noted that the deployment of these 'toolkits', which focus on tools and techniques, often became an end in itself, with the 'professionals' treating the 'data' obtained much as they might in a more conventional research process, generally reluctant to cede control of the process, and with a continued focus on technical solutions to what are essentially social or political problems.[28]

More recently, the focus has shifted on how to go beyond such 'functional participation', towards a more 'empowering' or 'emancipatory participation', which is meant to develop beneficiaries' capacity to conduct or control their own affairs, be it research, extension, project development, evaluation, etc. Moving in this direction, however, requires professionals to reassess their roles, ways of working and status, and organizations to reassess their mandates, processes and products, internal structures,

incentives, etc. 'Scaling up' participation, from the community level to higher levels of organization also implies the reassessment of political power held by managers, 'decision-makers' and powerful organizations, and redressing the power imbalance that inevitably exists between donors and recipients (those who want somebody to change and those who they want to change).

### *Stakeholder analysis*

During the 1980s and 1990s, a number of donors began to require 'stakeholder analysis' to support the design, implementation and evaluation of (proposed) projects.[29] This involves the drawing up of matrices or checklists to show the interests of the stakeholders and what they can contribute to the project, as well as identifying risks for successful project implementation due to conflicts between stakeholder interests and the project interest. Based on these risks and assumptions, the desired type of stakeholder participation in the various stages of the project cycle is identified, as well as strategies for consensus building.

Others have since emphasized a more participatory approach to stakeholder analysis—where stakeholders themselves do the analysis of their respective interests, perceptions, relationships, knowledge and experience. This, it is argued, facilitates dialogue and negotiation, reduces conflict, and develops commitment for collective action among stakeholders.[30] One such approach is 'rapid appraisal of agricultural knowledge systems' or RAAKS,[31] which consists of looking at the process of innovation from the various perspectives of the different stakeholders. These perspectives are examined at the three major phases of problem definition, analysis of constraints and opportunities, and planning strategies and actions. At each phase, a number of tools are used to facilitate stakeholder interaction and mutual analysis of the innovation process in which they are involved.

Approaches such as RAAKS are often considered 'soft systems' approaches. Soft-systems thinkers[32] argue that positivist ('mechanical' or 'hard systems'[33]) thinking is of limited use in complex 'real world' situations, when human perceptions, behaviour or action seem to be dominating factors, and where goals, objectives and even the interpretation of events are all problematic. They consider soft systems to be negotiable social constructs, which only exist to the extent that people agree on their goals, boundaries, membership and usefulness. Soft-systems methodologies promote learning among stakeholders by comparing the current situation (the existing 'what') and the future vision (the ideal 'what'), as a basis for discussing how things can be improved. One of the important features of soft-systems methodology (SSM) is its focus on repeated cycles of learning to arrive at new and better appreciations of complex situations.

### *Agricultural knowledge and information systems*

As its name implies, RAAKS is based on the concept of the 'agricultural knowledge and information system' (AKIS).[34] The AKIS concept recognized that there were multiple sources of information and innovation. The demand for innovation, the information needed to support innovation, and actions to support (or undermine) innovation can originate from any stakeholder (e.g. producer, processor, policy-maker, consumer). In other words, research is recognized as just one function within the broader system of knowledge and information delivery. It is not always, or even often, the main source of knowledge and information, or the 'driver' of the system, as is often assumed (implicitly or tacitly) in a more 'pipeline' or 'transfer of technology' model.[35] Nevertheless, this pipeline model still underlies much of the 'national agricultural research system' (NARS) framework[36] for organizing and managing research in Africa, and remains the basis for much individual thinking, education and research management on the continent.[37]

The development of the AKIS concept therefore brought to IAR4D the importance of integrating research in such a way that it responds to the demand for knowledge and information, and complements existing knowledge flows rather than replaces them.

***Innovation systems***

The experiences with participatory, multi-stakeholder processes referred to above, and comparison with the experience in developed countries, has led to the current emphasis on 'innovation' and 'innovation systems' as ways of rethinking agricultural research and development.[38] One definition of an innovation system is '*networks of organisations or actors, together with the institutions and policies that affect their innovative behaviour and performance, that bring new products, new processes and new forms of organisation into economic use*'.[39] The focus is thus on innovation as the application of knowledge (rather than the knowledge itself), on the process (rather than the product), and on the interactive learning between actors and the institutional and policy context that influences their innovative behaviour and performance. This view of innovation recognizes that institutions—the habits, practices, rules, laws and policies that regulate the relations and interactions between individuals and groups—influence innovation and need to be addressed when improving innovation and innovation systems. It also recognizes the conclusion above that the introduction of more participatory approaches to research is often ineffective unless the habits, practices and incentives of scientists are also changed.[40]

### 2.1.3. How can this principle be incorporated in development practice?

IAR4D integrates the perspectives, knowledge and actions of different stakeholders around a common theme. Important actions that contribute to this principle are listed here.

***Actions to facilitate interaction***

- Partnerships between stakeholders are organized around specific and jointly agreed development issues (sometimes referred to as stakeholder 'platforms'). These partnerships exhibit frequent joint meetings, visits or consultations, and have joint objectives, norms, working procedures and conflict-resolution mechanisms that are recognized by all partners (even if not documented).
- New forms of social organization (steering groups, committees, farmer associations, etc.) are created to manage stakeholder interaction.
- A jointly recognized mechanism exists for facilitating the interaction of stakeholders around specific research and development themes. This may be achieved by one stakeholder being recognized by others as the 'convenor' or 'facilitator', or it may involve an outside or neutral actor or organization.
- Staff are appointed with responsibilities for the facilitation of interaction between stakeholders, focused on joint learning (e.g. for creating and managing platforms).

***Actions to establish common ground***

- Research and development activities are initiated in response to a need for innovation, identified by one or more stakeholders who represent the users of research and advisory services.
- Strategy papers, medium-term and annual work plans are formulated with the active participation of other stakeholders.
- Multiple stakeholders jointly analyse the innovation system, identifying constraints, needs and opportunities.

- Stakeholders jointly agree on integrated action plans, which outline the shared vision and objectives of stakeholder partnerships, the problem/opportunity analysed from the different viewpoints, actions that need to be taken, and respective roles and responsibilities.
- Results are validated by other stakeholders and disseminated in easily accessible and suitable formats (magazine/newspaper articles, radio/television programmes, websites, advisory bulletins, field days, etc.), as well as in professional journals.
- Research endeavours and progress are communicated to stakeholders on issues of their interest.
- Organizations have designated contact persons or a 'front desk' that is easily accessible to outsiders, and can be contacted to get further information on progress of this research.
- Differences in perceptions, knowledge, interests and power between stakeholders are documented. These differences provide a basis for collaborative management, planning, monitoring and evaluation.

***Actions to create an environment conducive for interaction***

- National and local rural innovation policies are formulated to address priority needs and opportunities identified through recognized multi-stakeholder interaction mechanisms.
- Research proposals are formulated within the broader context of integrated development plans developed by stakeholder partnerships, and clearly outline how research results will be used or taken up by research partners.
- Projects are funded by other stakeholders, or are developed with active support from these stakeholders in terms of preparation of research proposals and lobbying for funds for these proposals.
- Public–private partnerships for innovation are consolidated through written agreements (e.g. Memoranda of Understanding, contracts).
- Professional incentive structures value and encourage linkages, communication and feedback from other stakeholders within recognized partnerships.

## 2.2. IAR4D integrates the learning that stakeholders achieve through working together

### 2.2.1. What do we mean by this principle?

All stakeholders in an innovation system have relevant knowledge based on their roles in the system. This includes both codified (or explicit) knowledge and tacit (implicit) knowledge. The tacit knowledge in particular can only be tapped into and made available to others through interactive learning and joint action.

Beyond simply a concerted *action* process, we see IAR4D as a mutual and interactive *learning* process, with stakeholders learning from each other and from their joint experience. For this combined social and experiential learning[41] to be effective, it requires a conscious and interactive process of planning, action and reflection, re-planning and so on. We see this 'learning cycle' as fundamental to IAR4D.

The learning that takes place is embedded in the partnerships needed to resolve the R&D challenge. It focuses primarily on the processes of stakeholder interaction themselves, rather than just on the technology, policy options, etc. It is the processes learned that can be adapted for use in other situations, to solve other complex problems, rather than the technical results or outputs.

This learning takes place at several levels:

- At the *individual* level, where individuals learn about their own interaction with others, and how their own personalities, attitudes and 'mindsets' affect this interaction;
- At the *organizational* level, where members of organizations collectively learn how their administrative and management practices, incentive structures, etc., affect or limit the interaction between individuals within the organization and between the organization and other stakeholders.
- At the *institutional* level, where individuals and organizations collectively learn how they interact to facilitate innovation. In other words, learning how to collectively create the 'enabling environment' that encourages this interaction, and how to share information and manage knowledge across such networks. In addition, local systems need to learn from other local systems (e.g. through national learning platforms), and national innovation systems need to learn through international platforms.

### 2.2.2. What theory and experience support this principle?

#### *Adult and experiential learning theory*

In 1970, Malcolm Knowles revived the term 'andragogy' as 'the art and science of helping adults learn'.[42] Andragogy recognizes that adult learners are independent (they learn what they need to), and that they learn mainly from experience. Constructivist learning approaches also assume that much knowledge is socially constructed through dialogue and consideration of multiple perspectives, rather than being something external (e.g. given by a knowledgeable 'authority' or 'teacher' to a student), as is assumed by more instructivist approaches.[43]

David Kolb developed in more detail a model of learning from experience or 'experiential learning'.[44] He postulated four different but linked sub-processes that interact in a cyclical process over a period of time (which may be minutes or months). In this cycle, direct experience is followed by reflection on what happened, the formulation of a general rule or conclusion from this reflection, followed by more experimentation that gives rise to new experience, and so on. Others have gone on to suggest that individual people tend to favour one or other of these learning stages and hence have different learning styles.[45] Kolb and his colleagues also related his learning cycle and learning styles to different and contrasting types of thinking ('divergent' v. 'convergent'; 'inductive' v. 'deductive') and types of discipline or profession associated with these.

Kolb's model and these associated linkages between actions, types of thinking or knowledge and disciplines represent considerable generalizations. Kolb's model indicates that there are different ways of thinking that complement each other in the experiential learning process, and that different disciplines (professions) tend to be stronger in one or other of these types of thinking. The inclusion of different disciplines within a collaborative and social learning process such as IAR4D therefore improves overall and joint learning, as the different disciplines (and their associated ways of thinking) each contribute more strongly at different points of the learning cycle.

#### *Knowledge management*

Knowledge management is widely accepted to consist of four key processes: knowledge creation, knowledge storage and retrieval, knowledge distribution, and knowledge application. It thus involves the planning, organizing, directing and controlling of knowledge assets. It includes processes of identifying, creating, capturing, conserving, organizing, transforming, transferring and delivering the compiled 'know-what' and 'know-how' of the organization or system. It provides for finding or getting the right

information to the right person or stakeholder at the right time in a user-friendly manner, and greatly contributes to an organizational or system-wide memory defined here as *the means by which knowledge from past experience influences present activities*. Incorporating these processes into the structures and perhaps more importantly the 'culture' of an organization or organizations will enhance their learning abilities.[46]

For IAR4D, one of the most important elements of knowledge management is the promotion of knowledge sharing between individuals and organizations so as to enhance their performance and the performance of teams and partnerships. For this, one has to distinguish between implicit ('tacit') and explicit ('codified') knowledge. Implicit knowledge is contained, and is owned by individuals. Explicit knowledge is essentially factual, and hence potentially available to all. The challenge for knowledge sharing is to make all knowledge explicit and openly available. For this, it is key to understand that knowledge is created in dialogue and hence the knowledge available to a community increases via sharing and decreases if hoarded.

Knowledge management can thus be said to be the art and skill of fostering and sharing the results of dialogue, whereby knowledge is both transferred from individuals to groups and from groups to organizations and partnerships of organizations. Teams, organizations and partnerships that effectively share their knowledge become more knowledgeable and perform better than those that do not, as their knowledge is greater than the sum of the knowledge of individual members. For effective knowledge management in IAR4D, it is essential to have a source of knowledge and to provide time and space for interaction and sharing among stakeholders.

### *Action-research*

Action-research (AR) emerged as a means for researchers to engage with and practically solve important social problems.[47] The main objective is to effect change (the action) and learn from that change (the research), not just generate new information. It therefore contrasts with conventional research, its objectives, institutions, methods and principles.

AR is based on a cycle of planning–action–observation–reflection by stakeholders. Reflection is the crux of the methodology, with participating stakeholders engaged in AR analysing the outcomes of their actions, their own behaviour and the processes in which they are involved. This analysis leads to adjustments in plans, commitment to joint decisions, and a general improvement in competencies. The process is iterative, systematically testing the concepts, methods and interpretations developed in the early cycles, allowing fine-tuning and improvement.

The core principles of AR, and the cycle of planning–action–observation–reflection form the basis for IAR4D thinking. The African Highlands Initiative, working at several sites in Eastern Africa provides a good example of how AR has been combined with more conventional research in a broader context of agricultural research and development.[48] AR principles have also been adapted as part of the 'Participatory Learning and Action Research' (PLAR) approach, which was originally developed to promote integrated soil-fertility management in Africa, then adapted by the Africa Rice Center (WARDA) for use with integrated rice management, and later still adopted by the Aga Khan Foundation for its programmes in Tanzania and Madagascar. Using the PLAR approach, farmer groups reflect on their experience, decide themselves on things to try out, and then learn from each other's tryouts in successive seasons.[49]

### *Farmer Field Schools*

A similar learning and empowerment approach is the 'Farmer Field School' (FFS). The general FFS approach is based on the principles that farmers are experts, they 'learn-by-doing', they carry out field

studies when they want to learn, they learn in groups, they generate their own learning materials, and they are supported by extension workers as facilitators—not teachers. Originally developed in Indonesia in the 1980s to promote integrated pest management as an alternative to intensive pesticide use in rice[50] (and consequent devastating losses to brown plant hopper), the FFS approach has since been extended to other agricultural contexts, including soil-fertility management, livestock production and forestry in Africa.[51] It has also been developed beyond the original natural-resource management perspective (as in 'Farmer Business Schools'), and adapted for use in other sectors such as health.

***Learning cycles***

ICRA has been offering learning programmes in 'development-oriented research in agriculture' since 1981.[52] These programmes have been based on combinations of 'knowledge acquisition' in workshops, and practical fieldwork that is conducted by teams of research and development professionals around real-world challenges identified by partner organizations.

Learning in inter-disciplinary and multi-stakeholder teams is seen as vital. First, because social learning in small groups is seen as being more effective for most people than learning alone. Second, because the skill to participate in and also lead effective teams is seen as a vital skill in IAR4D. And third, because the confrontation of one's own discipline and organizational perspective with those of other stakeholders is considered to be at the heart of IAR4D.

Since 2004, ICRA has adapted its strategy to further 'embed' learning within ongoing R&D programmes and local institutional contexts. This is seen as crucial, as not even the 'case study' approach within classrooms can replicate the complexities encountered where the interests of different stakeholders are in play. Learning to facilitate the interaction between stakeholders can only happen through experience. These learning programmes are therefore based on the action-research learning cycles described above, consisting of planning, doing and reflecting. The fieldwork has usually followed three stages:

- Forming partnerships with other organizations or individuals who share an interest in a common 'development challenge';
- Achieving a common understanding of this challenge—synthesizing the perspectives of different stakeholders, understanding the wider context of the challenge, negotiating and defining the changes that these stakeholders want to see in the 'system';
- Screening and evaluating the different options ('*ex ante*') or activities carried out ('*ex post*') to improve technology, service delivery to rural people, and policy and institutional changes that further enable innovation and the improvement of rural livelihoods.

These learning programmes have been particularly successful at the individual and team levels, and several projects developed within the context of the learning cycle have had success in initiating and facilitating multi-stakeholder interaction. However, sustaining this interaction, and 'mainstreaming' IAR4D processes have remained a challenge, showing the need to give more emphasis to organizational and institutional aspects.

***Learning alliances***

A similar but broader approach to multi-stakeholder learning is represented by the 'Learning Alliances' established by the Rural Agro-enterprise Development Project at the International Center for Tropical Agriculture (CIAT), mainly in Latin America but with some experience in Africa. These Learning Alliances seek to: (a) build links between rural people, researchers, donor and development agencies, the

public sector and private enterprise to achieve more effective processes of rural enterprise development; (b) establish an innovation system that matches the supply of new ideas with demand at the field or policy level; (c) open communication channels between diverse organizations with relevant experiences; and (d) design and test tools and methods for analysis and documentation that facilitate collective learning within and between organizations. Actions are organized in three phases:

- 'Reviewing our framework', where partners in the alliance identify any problems that are limiting the success of their interventions, try to view the issues from different perspectives and reflect critically on existing practice;
- 'Implementing strategic actions', where partners incorporate, validate and adapt selected strategies within ongoing development projects, and organize related capacity-building efforts;
- 'Documenting and analysing results', through a variety of workshops, reflection sessions and virtual platforms.

Such broad-based learning alliances can contribute to institutional and policy change.

However, as the proponents of the approach admit, 'documenting, analysing and sharing learning from diverse partner agencies at the micro, meso and macro scales is very demanding for all participants, while drawing out key livelihood and policy implications from such a wide range of experiences takes a good deal of thought and time'.[53]

### 2.2.3. How can this principle be incorporated in development practice?

IAR4D integrates the learning that stakeholders achieve through working together. Important actions that contribute to this principle include the following.

***Actions to create time and space for learning***

- Organizations make time and space available for their staff to reflect on and exchange experiences, both formally through technical and administrative meetings, and informally through mechanisms such as joint coffee times, open-plan offices, and open doors.
- Project proposals, work plans and budgets allow for flexibility and modification, to reflect ongoing lessons learned and new 'good practices'.
- Budgets create opportunities for dialogue and alliances within projects and between projects, to maximize resource use efficiency through synergies and collaboration.
- Monitoring and evaluation procedures are designed to encourage learning as well as accountability, and are recognized by all stakeholders as a means to promote joint reflection, learning and continued improvement.
- Incentive structures and managers encourage organizations and individual staff to try out new ways of working, to continually try to improve their own performance, and to assume added responsibilities.
- Incentive structures and managers encourage risk taking—staff are allowed to fail occasionally (as long as lessons are learned).[54]
- Incentive and reward structures attribute credit to teams and partnerships, as well as to individuals.
- Staff are trained in reflective learning processes.

***Actions to organize reflective learning***

- Organizations and stakeholders jointly organize feedback and reflection sessions to review experience and lessons learned around themes of common interest.

- Learning teams within and across organizations that are organized around specific development issues.
- Learning is explicitly facilitated, and not expected to happen spontaneously. Where necessary, third-party professionals are employed to facilitate the interactive and joint learning between stakeholders who differ in perspectives, types of knowledge and power.

***Actions to document and capitalize learning***

- Lessons learned on intra- and inter-organizational processes are documented. This documentation includes informal and subjective opinions about personal and inter-organizational relationships and outcomes, in addition to more objectively verifiable outputs such as technical research results.
- Organizations have explicit knowledge-management procedures in place. Staff responsibilities go beyond recording and circulating information to allow and encourage the exchange between staff within and between organizations.
- Participatory research practices and processes, as well as innovation outcomes, are adapted to best fit the specific circumstances of the different stakeholders and reflect the interactive learning between these stakeholders.

## 2.3. IAR4D integrates analysis, action and change across the different dimensions of development

### 2.3.1. What do we mean by this principle?

As well as integrating the actions and learning of different stakeholders, IAR4D takes into account the different outcomes that these stakeholders, and society in general, regard as constituting 'development'.

In the middle part of the 20th century, the efforts of agricultural development (in both 'developed' and 'developing' countries) were largely directed to increasing productivity, to face the perceived challenge of feeding increasing populations. However, the latter part of the century showed that the impact of these efforts on food security and rural poverty was often disappointing, and it became clear that 'sustainable development' needs to address the interlinked 'dimensions' of such development—economic growth, careful management of natural resources, social inclusion and equity, as well as food security.

To achieve impact in terms of poverty and pro-poor development, therefore, IAR4D needs to integrate analysis, action and change across these different dimensions.

### 2.3.2. What theory and experience support this principle?

***Rural livelihoods***

In everyday language, a 'livelihood' is often taken as a means of 'making a living' or generating income. For IAR4D, it is important to recognize that agricultural production is often only one sub-set of activities within the broader set of livelihood activities. Rural households often have ways of making a living in addition to their agricultural activities—as labourers, artisans, processors, traders, money-lenders, etc. In addition, remittances of money from relatives in town or abroad, or from the rent of land or houses, may be important sources of income.[55] In such cases, (potential) investments may be preferentially and more productively channelled to non-agricultural activities rather than to fertilizers or seed, for example.

In development terms, the concept of 'livelihood' encompasses the capabilities, and how the different types of capital or assets (physical, natural, human, social and financial capital) are used to provide a means of living. A livelihood is considered 'sustainable' when it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural-resource base. Improving livelihood outcomes therefore goes beyond the everyday meaning of generating income to include the broader human objectives of assuring food security and health, providing a home, reducing vulnerability to climatic, economic or political shocks, and increasing the ability to control one's own destiny (power). To improve livelihoods, therefore, IAR4D needs to consider agriculture within this broader context, rather than in the narrower terms of only production or income generation.

The sustainable rural livelihoods (SRL) approach or framework has been championed since the mid-1990s by the UK Department for International Development (DFID), the United Nations Development Programme (UNDP) and international non-governmental organizations (NGOs). It has been used by these organizations in planning and management, as a way of identifying and analysing the many factors that affect the livelihoods of the poor, and the interactions between these. Livelihoods analysis focuses on how the different assets are deployed within the context of external factors such as policies, regulations, processes and institutions, and how this deployment affects vulnerability. This analysis then allows the development of livelihood strategies that can maximize desired outcomes (food security, reduced risk and vulnerability, more income, more autonomy and power), including new or modified activities at the household level as well as policy and institutional measures that support the livelihoods of the poor.[56]

To contribute to sustainable and pro-poor development, therefore, IAR4D needs to address the different capital assets of the rural poor in a balanced way, as well as consider the 'external' policy, legal and institutional environment. Research and development agencies need to understand how different types of rural household use their different resource sets to achieve different strategies, and refine their knowledge products to ensure the appropriate criteria are met.

***Integrated natural-resources management***

'Integrated natural-resource management' (INRM) has been developed during the last two decades as 'an approach to research that aims at improving livelihoods' by the international agricultural research centres of the CGIAR, as it became clear that solving the complex problems of agricultural communities required strategies that enhance natural and social resources to gain the benefits of improved crop varieties and animal breeds. Based on this more holistic understanding, INRM has been defined as '*an approach that integrates research on different types of natural resources into stakeholder-driven processes of adaptive management and innovation to improve livelihoods, agro-ecosystem resilience, agricultural productivity and environmental services at community, eco-regional and global scales of intervention and impact*'.[57] As an approach, INRM therefore seeks to empower relevant stakeholders and resolve their conflicting interests, foster adaptive management capacity, deal with complexity by focusing on key causal elements, integrate levels of analysis, merge disciplinary perspectives, make use of a wide range of available technologies, guide research on component technologies, and generate policy, technological and institutional alternatives.

INRM practitioners in Africa realized that developing and testing new approaches through pilot-site research and learning with communities, development actors and policy-makers, needs accompanying institutional innovations and reforms to enable more widespread support and utilization of these approaches. In 1995, for example, the African Highlands Initiative (AHI) established a collaborative

initiative on self-directed management of organizational change with national research organizations in Ethiopia, Kenya, Madagascar, Tanzania and Uganda. This initiative followed three main phases: assessing the need for change (through a regional workshop); reviewing the value and nature of participatory research through experience with pilot projects in each country; and learning how to integrate INRM with organizational practices and culture through a series of planning–reflection workshops with researchers and research managers.[58]

Another recent programme focusing on natural-resources management (NRM) is that of 'Competing Claims on Natural Resources', coordinated by Wageningen University, in collaboration with universities in Botswana, Mozambique, South Africa and Zimbabwe. The programme recognizes that many participatory approaches have failed to appreciate the dynamics of power, conflict and politics, have under-rated processes of self-organization, and have focused too much on the 'local' level while ignoring higher-level constraints. A central premise of the Competing Claims conceptual framework is that, in order to contribute to societal change, scientists must actively contribute to negotiation processes between stakeholders operating at different scales—local, national, regional and global. The programme therefore attempts not only to describe and explain resource use dynamics and competing claims, but also to promote such negotiation processes, explore more sustainable and equitable uses of natural resources, and design new technical options as well as institutional arrangements.[59]

The NRM approaches described emphasize that problems such as natural-resource, soil-fertility and pest management, cannot be resolved from a mono-disciplinary, sectoral or even a purely technical approach, or action at just one level of organization. The integration of disciplinary and stakeholder perspectives, and adult-learning mechanisms that treat farmers as co-equals in the learning process are needed if technical solutions are to be applied to solve these problems.[60]

***Value chains—linking farmers to markets***

The shifting emphasis from food production to the broader issue of poverty alleviation in the second half of the last century, together with increasing liberalization and globalization of markets, and the growing importance of supermarkets,[61] has led many policy-makers to stress the need for farmers to be more integrated with these markets.

A number of research and development approaches have been developed that stress the development of agro-enterprise in groups of small-scale farmers, and linkages between actors in the 'value chain' that connects the producer to the consumer (or 'farm to fork'), with value being added to the product at each step.

Among these approaches is the Enabling Rural Innovation (ERI) initiative promoted by CIAT together with research and extension services and NGOs, which emerged from CIAT's experiences with participatory research, rural agro-enterprise development and NRM. ERI stresses a 'resource to consumption' conceptual framework, participatory research approaches and the development of partnerships for innovation (including public–private). The aim is to create an entrepreneurial culture in rural communities, where farmers 'produce what they can market rather than trying to market what they produce'. Key stages in the approach include participatory diagnosis to assess community assets, strengthening the capacity of farmer research and market research groups, participatory market analysis to identify market opportunities for competitive products, and experiments by farmer research groups. Experience with ERI in countries such as Uganda led CIAT to conclude that the approach can raise incomes of farmer groups, but that these benefits did not usually accrue to the poorer women farmers, and did not necessarily result in investment in NRM.[62]

Another 'agri-business' approach is the 'Competitive Agricultural Systems and Enterprises' (CASE) approach developed by the then International Fertilizer Development Center (IFDC) and its partner organizations in the Integrated Soil Fertility Management (ISFM) Project in West Africa.[63] IFDC concluded that ISFM options by themselves were not enough to improve incomes of farmers beyond a very short time horizon, and that strengthening of both the input supply chains and market or value chains was also needed. The CASE approach therefore focuses on strengthening the competencies and strategies of local, national and, in some cases, international stakeholders to develop and support local 'agri-business clusters'.[64] These clusters comprise farms, firms, business development and financial services, and are targeted at specific commodities and market 'segments'.

A third approach that is centred on value chains is the 'Chain Empowerment' approach developed in a workshop sponsored by KIT, Faida MaLi and the International Institute of Rural Reconstruction (IIRR) in 2005. Participants at the workshop looked specifically at four progressive strategies for strengthening the position of farmers within the value chain: upgrading as a chain actor, developing chain partnerships, adding value through vertical integration, and developing co-ownership over the chain.[65]

More recently, the role of traditional 'middlemen' or petty traders as key stakeholders in value-chain development and rural innovation systems has also been highlighted. Often regarded with suspicion by other stakeholders, they have the potential to develop markets, add value to products, invest in new businesses, and improve the efficiency of the food distribution system.[66]

Many other 'value chain' approaches could be described. While each has its own emphasis, what they all have in common—and relevant for IAR4D—is the conviction that efforts to improve the livelihoods of small-holders cannot be considered in isolation from the actors that directly link these farmers to the eventual consumers of farm products, other actors who offer services at various points along the value chain, and yet other actors who determine the external (regulatory and policy) environment for these agri-businesses. It is the combined efforts of these actors, the linkages between them and their interactive learning—their synergy—that determine the competitiveness and, hence, the success of the agribusiness in which they are all stakeholders.

### *Social equity and gender frameworks*

By 'social equity', we refer here to the fair distribution of the benefits and costs of development between different social groups, which are determined by changing social norms and institutions. It is rare that development benefits all social groups equally. Differences of wealth, gender, ethnic group, etc., typically affect the power and control that these different social groups have to exercise in determining what is 'fair'. At the very least, development practitioners should be aware of, and make explicit to all stakeholders, the distribution of benefits from change and innovation.

During the last few decades, efforts have been made to recognize the way that gender roles and cultural norms affect the position of women in society, and improve the benefits that accrue to them from development actions.[67] The 'Harvard Framework' was developed in the 1980s to facilitate the integration of a gender perspective in the analysis of projects.[68] The framework includes analysis of the activities of men and women (and boys and girls) who have access to and control of the various resources (assets) and the factors that determine this access/control, and an analysis of how the project can be modified at the identification, design and implementation phases to improve its benefits, especially those accruing to women. The Harvard Framework thus tends to improve the efficiency of projects within established power structures and gender relations. Other frameworks, such as the 'Women's Empowerment Framework',[69] seek to analyse or screen a project from the perspective of women's development needs,

whether a project will strengthen or weaken the position of women relative to that of men, and thus—ultimately—to change attitudes and 'empower' women.

Ultimately, the decision about who should gain most from research and development activities, and whether or not to favour or 'target' specific social groups, is a political decision. The job of research and development professionals is to make the options and likely social outcomes clear, and where possible to bring this political decision-making within IAR4D processes. What has become clear from the experience of the last few decades is that technology, policy, processes and innovation are rarely socially neutral, and IAR4D cannot ignore this.

### *Inter-disciplinary research and development*

The increasing field of human knowledge has led to increasing specialization within disciplines, with consequent worries about the separation and lack of integration of disciplines. Efforts to promote inter-disciplinary interaction go back many decades, but the history of agricultural research and development appears to show little improvement in this respect.[70]

By 'inter-disciplinary' R&D, we mean a systematic and systemic process by which professionals of different disciplines organize their analyses, synthesize their findings, and organize their actions around a common problem.[71] The constraints to inter-disciplinary action are many: we educate, train and usually evaluate professionals as specialized individuals, and we have developed disciplinary paradigms that are reflected in specialist jargon, and research methods which focus on particular levels of organization and differ in their approach to quantification, validity, etc. And yet we expect development to satisfy criteria that go way beyond the confines of any one discipline.

For IAR4D to address the different dimensions of development, it needs to adopt an inter-disciplinary approach. By this we are not advocating that agricultural scientists and development professionals should be generalists, but rather that disciplinary competence needs complementing with 'meta-disciplinary' competence (such as systems analysis, planning skills, adult learning skills), and 'social and personal skills' (communication, facilitation, leadership, etc.), so that individual disciplinary skills can be integrated with other disciplines in a problem-solving approach. Unfortunately, the university training of most professionals—especially agricultural researchers—is still extensively disciplinary, meaning that for the researcher to be effective in IAR4D, additional competency development (individual change) is needed. Allowing individuals of different disciplines to interact also usually requires changes at an organizational level, especially the creation of 'time and space' (referred to above under 'Knowledge management'), as well as the use of incentive and performance evaluation methods that encourage such interaction.

### *Agricultural development goals*

In the middle of the 20th century (1950s and 1960s), development was defined largely in terms of growth in average per-capita output and hence the dominant discipline of development was economics.[72]

In the 1980s, there was increasing concern that current land use and development practices were damaging the quality of the environment and natural resources, threatening the possibility that these developments could be sustained in the long term. A prominent recognition of this was the report of the Brundtland Commission to the United Nations.[73] The Commission recognized that the environmental, socio-political and economic dimensions of development are all closely inter-related, and called for a new type of economic development that 'meets the needs of the present generation without compromising the ability of future generations to meet their own needs'. More generally, this goal became known as

*sustainable development*, with many practitioners emphasizing the three dimensions or constituent parts of *environmental sustainability* (development that does not degrade the natural resources needed for future production), *economic sustainability* (development that allows continued, long-term economic growth) and *socio-political sustainability* (development that benefits all social sectors, especially the poor).[74]

Another response to the predominant emphasis on economic growth in national development was re-direction of the focus towards 'human development', defined by UNDP as '*a development paradigm that is about much more than the rise or fall of national incomes. It is about creating an environment in which people can develop their full potential and lead productive, creative lives in accord with their needs and interests*'. To counter the emphasis on GDP as a predominant and all-encompassing measure of national development, UNDP started its *Human Development Report* in 1990, with national tables according to a 'human development index', based on levels of health, education and other standards of living'.[75]

The current broad-based view of development is best illustrated by the Millennium Development Goals (MDGs) adopted by 189 nations and signed by 147 heads of state and governments during the UN Millennium Summit in September 2000. The eight main MDGs are defined in terms of positive changes in poverty and hunger, primary education, gender equality, child mortality, maternal health, HIV/AIDS, malaria and other diseases, environmental sustainability and development of a 'global partnership for development'.[76] The influential 2000/2001 World Development Report also recognized that poverty is not only a lack of income, but also lack of access to basic services such as education and health, as well as a lack of voice, power and good governance.[77]

In 2002, the World Bank and the Food and Agriculture Organization of the United Nations (FAO) initiated a global consultative process that became the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). In broad terms, the development and sustainability goals endorsed by IAASTD are consistent with the concept of sustainability and the MDGs described above. The IAASTD emphasized the *multi-functionality* of agriculture, a concept that recognizes agriculture as '*a multi-output activity producing not only commodities (food, feed, fibers, agrofuels, medicinal products and ornamentals), but also non-commodity outputs such as ecosystem functions, landscape amenities and cultural heritages*'.[78] The IAASTD noted that 'non-commodity outputs may exhibit the characteristics of externalities or public goods, such that markets for these goods function poorly or are non-existent'.

Twenty years after Brundtland, the prevailing models of agricultural development continue to focus on economic growth and market mechanisms, with less attention to the 'unintended' social and environmental outcomes. As the IAASTD concludes, successfully meeting development and sustainability goals requires a fundamental shift in agricultural knowledge, science and technology (AKST), in terms of policies, institutions, capacity development and investment.

As its name suggests, IAR4D is intended to contribute to development. It cannot therefore focus simply on adjustments in research approaches and methods without addressing these underlying issues of AKST policy, institutions, and capacity development. Nor can it realistically claim to address poverty without addressing the issue of the relative power of impoverished stakeholders.

#### 2.3.3. How can this principle be incorporated in development practice?

IAR4D integrates analysis, action and change across the different dimensions of development. Important actions that contribute to this principle include the following.

***Actions to create a conducive environment***

- Organizational (R&D) mandates, governance mechanisms, policies and programmes acknowledge the multi-dimensional nature of agricultural development.
- Integrated action plans or activities by stakeholder partnerships are aligned with economic, environmental and social policies.
- Professionals are organized in broad inter-disciplinary teams to tackle research questions related to specific development issues, and these teams function within the context of multi-stakeholder partnerships.
- Agreed impact-analysis frameworks go beyond simply assessing economic returns. More participatory methods include subjective evaluation of behaviour, organizational change and relationships, as well as social and environmental outcomes.

***Actions to incorporate a broad assessment of outcomes***

Innovations are evaluated for economic, social and environmental implications, as well as productivity.

- Integrated action plans or activities by stakeholder partnerships explicitly recognize the tradeoffs between desired economic, social and environmental outcomes, with recognition of:
  - The social groups, actors, organizations and/or stakeholders that will most benefit—or be adversely affected—in terms of economic advantage, power, vulnerability, etc., especially with reference to poor or currently disadvantaged groups;
  - The impact on natural resources, in terms of soil fertility and conservation, water availability and quality downstream, biodiversity, pollution, etc.;
  - The profitability of the different actors in the value chain, and the overall competitiveness of the business cluster compared to other regions and/or countries.
- Analytical frameworks take into consideration the need to develop all five forms of rural livelihood capital, and assess implications for vulnerability and risk of key stakeholders when assessing innovation.

## 2.4. IAR4D integrates analysis, action and change at different levels of spatial and social organization

### 2.4.1. What do we mean by this principle?

Using an agricultural innovation systems (AIS) perspective implies that research is not the prime driver of development, as was implied in the NARS perspective, or even has the central role that was still implied in the wider AKIS perspective.[79] Rather, the AIS perspective sees research as only one of the sub-processes of an agricultural innovation system that encompasses the value chain and the knowledge and information system, as well as policies and institutions that determine the interaction between all the components.

To be effective, IAR4D therefore needs to be cognisant of, and active throughout, these wider systems. It needs to enhance learning between actors at different levels within the system, as well as change in the wider factors that lead to the sustainability and extension of newly developed innovations in pilot programmes. These different levels can be considered in terms of spatial, economic and social organization.

The different 'spatial' levels (and typical interventions) include:

- The *field* (improving fertility, pest management, integration of different crops in rotation, etc.);
- The *farm* (improving integration of crops and livestock, etc.);
- *Communal lands* (management of these, including the required social organization);
- The *watershed* (improving soil and water conservation, etc.);
- The *district* or *region* (improving infrastructure such as roads, communications, etc.).

The different 'economic levels' (and typical interventions) include:

- The *firm* (productivity, cost reduction, quality improvement, profitability, marketing, etc.);
- The *value chain* (vertical and horizontal integration between actors in the value chain—producers, processors, truckers, wholesalers and retailers, etc.);
- The regional or national '*business cluster*' (improving technical, administrative, legal and business services, to improve overall competitiveness, etc.).

The different 'human' or 'social levels' (and typical interventions) include:

- The *individual* (learning about technical, managerial, administrative issues, etc.);
- The *group, cooperative or community* (sharing, exchanging information, equipment, infrastructure, animals, land, labour and credit; organizing learning groups, marketing, managing communal lands, watersheds, etc.);
- The *organization* (improving the capacity of human and financial resources; coordination and linkages with other organizations; planning, monitoring, evaluation and institutional learning, etc.);
- The *innovation system* (improving information flow, linkages between organizations, stakeholders, etc.).

These spatial, economic and social levels overlap and interact. Focus on only one level is unlikely to have a significant impact on rural livelihoods and sustainable development.

### 2.4.2. What theory and experience support this principle?

#### *Systems*

A 'system' can be considered as an arrangement of components related in such a way that they act as a whole, where the properties of the whole arise from the relationships between the component parts, and where this whole is considered to have a purpose by someone.

Systems are often described in terms of their characteristics:

- *Components*, boundaries or limits;[80]
- *The environment* (factors external to the system as defined);
- *Inputs and outputs*, interactions between components, and between the system as a whole and its environment;
- *Hierarchy* (where systems are themselves components of larger systems; e.g. a cropping system being part of a farm system, which is part of a village or watershed system, etc.[81]);
- *Feedback* (changes in one component affecting others, positively or negatively);

- *Emergent properties* (behaviour of the whole system that cannot be predicted from studying the individual components).

Because of this last property of emergence, systems thinking (or 'systemic' thinking) is thinking about the whole instead of the parts, and focusing on relationships between the components rather studying them in isolation. Systems thinking also means taking into account the context, circumstances or environment that surrounds the particular system being studied; systems thinking is thus contextual thinking—understanding the system within the context of a larger whole.

Innovation requires a mix of technical, organizational and institutional change, and at different hierarchical levels within the 'larger whole'. The innovation system has sub-components of NRM systems (from organism to watershed), economic systems (from production to consumption), and social systems (from individual to nation). Understanding how these systems function and interact is key to IAR4D.

***Farming systems research, client-oriented approaches***

Farming systems research (FSR) developed during the 1970s and 1980s in response to the disappointing adoption by resource-poor small-scale farmers of crop and livestock technology developed in research stations. This led to a realization of the inter-related nature of farm activities and the need for a more holistic or systems view of the farm and farm outputs. As well as farmer participation in the research process, FSR therefore emphasized inter-disciplinary analysis, and the integration of technical, economic and social aspects and evaluation of new technology. It also emphasized research in farmers' fields ('on-farm' research), as opposed to only on research stations where both physical and economic conditions are often very different from those under which resource-poor farmers operate.[82] A further concept that was developed as an integral part of FSR was that of 'typology'—grouping rural households into relatively homogeneous 'domains' for the purposes of targeting research and research results.[83]

As the FSR 'movement' developed, the emphasis on farmer participation led to a progressive recognition that decision-making in farming and innovation is often more dependent on and integrated with higher levels of social organization than the 'farm', and hence the importance of working with farmer groups and communities, rather than individual farmers. The emphasis on integrating research with development also led to the need to consider other actors in addition to researchers, extensionists and farmers. The focus of FSR and related 'client-oriented research' approaches thus broadened from the farm, to integrate additional levels of spatial, social and economic scale.

The recognition that participatory approaches practised by agricultural research centres were often not institutionalized, led to a conviction that more comprehensive research-management approaches were also needed in order to achieve the necessary organizational change for enhanced client-orientation. One such approach is the 'Client-Oriented Research Management Approach' (CORMA) developed by the Institut d'Economie Rurale (IER) in Mali and the Department of Research and Training (DRT) in Tanzania, in collaboration with the Royal Tropical Institute (KIT) in the Netherlands. While embracing the participatory and systems approaches to research, it went beyond these research approaches to focus on the organizational and institutional change required to sustain the new approach to research. The client-orientation of research was institutionalized by addressing the five main research-management areas: human-resource development and management; financial management; development and enhancement of linkages, stakeholder participation and networks; planning, coordination, monitoring and evaluation; and output production and information management. The CORMA framework for enhancement of the corresponding management capacities therefore provides a tool for the participatory assessment of the level of client-orientation by researchers and other stakeholders.[84]

### *Integrated rural development*

The need to integrate analysis, action and change at different levels of spatial and social organization was well recognized in Integrated Rural Development (IRD) projects that were especially in vogue in the 1970s and 1980s. IRD has been defined as being about organizations and people with a vested interest in a particular rural community working in partnership, to achieve shared aspirations and objectives through practical action. IRD projects were thus seen as a practical expression of 'joined-up thinking' by funding bodies who saw potential advantages from this broad multi-sector approach. IRD was also based on four principles sometimes known as 'the 4 I's' that needed to be applied if the initiative was to succeed:

- Integration of policy
- Individuality of local circumstances
- Involvement of local communities
- Investment in social, economic and environmental capital.

IRD projects tended to run for a long period of time and were shown to be more successful when there was a readiness of the core partners (whether public, private or NGOs) to participate in initiatives that adopted the 4 Is principles. IRD was seen as a fundamental change in policy objectives and framework, towards a more holistic approach to rurality. This was seen as an alternative to over-dependence on agriculture alone for improving income and livelihoods, with improvement of inter-relationships between sectors considered as being more likely to deliver wide-ranging benefits. Many evaluations have shown that the benefits of IRD projects were less than expected, with problems such as insufficient understanding of key aspects of livelihoods, insufficient focus, and insufficient strengthening of existing institutions. IRD also did not foster participation of key stakeholders, and did not focus on multi-stakeholder learning, being mainly public-sector oriented and driven by national governments and/or donors.[85] IAR4D thus differs from IRD by having a much narrower focus or entry point, explicitly focusing on institutional capacity strengthening, and hence has the potential to better engage stakeholders in a sustainable manner.

### *Scaling up and scaling out*

The problems of 'scaling up' and 'scaling out'[86] become increasingly acute the narrower the focus of the initial intervention. Many of these problems arise from not including key stakeholders and considering them as external to the specific theme being addressed. IAR4D aims to greatly reduce, although not eliminate, these problems through adhering to its principles of integrating the perspectives of different stakeholders, integrating actions across the different dimensions of a common development theme, and integrating interventions at different levels of spatial and social organization.

For example, at both national and local level, IAR4D aims to engage policy-makers fully into the multi-stakeholder partnerships and thus to consider policy adjustments as an integral (not external) element of interventions. Similarly, by adhering to the learning principle, IAR4D aims at deriving 'good practices' and documenting the conditions under which the particular practice performed well. This involves identifying the factors that contributed either positively or negatively to this good practice, so that these can be taken into account during efforts to scale up and/or scale out the selected practices, be they processes or technologies.[87]

### *Agricultural sector policies and strategies*

National agricultural science, technology and innovation strategies are increasingly part and parcel of overall agricultural-sector development policies, strategies and plans. Agricultural innovation policies

are strongly influenced by good practices of particular agricultural innovation systems, such as a local value chains or NRM themes. These local cases contribute to national policies on resource allocation, and can identify where there is a need to change legislation to allow different actors to play their role (e.g. private sector and farmer organizations). While no blueprints exist, and local innovation systems can only be developed by local stakeholders themselves, an enabling context and policy environment is also a key ingredient of innovation. Policy change is therefore part and parcel of innovation system development.

The challenge for IAR4D is to provide a proper analysis and recommendations that can lead to evidence-based policy-making. It can best do this is if policy- and decision-makers are involved early in the innovation process, and if policy change is integrated with technical and organizational change. Recognizing this, a number of initiatives have recently emphasized ways in which researchers and other (often marginalized) stakeholders can influence policy.[88]

***New Institutional Economics***

'New Institutional Economics' (NIE) focuses on the role of institutions—the formal and informal rules of conduct that govern and facilitate relationships between individuals or groups—in economic, social and political spheres. NIE combines economics, business and organizational theory, sociology and law, though its primary language is economics.[89] Its origins can be traced back to an influential essay published in 1937 that introduced the concept of transaction costs to explain the existence of organizations (firms), instead of a multitude of independent self-employed people contracting which each other.[90] Branches of NIE now include new economic history, public choice and political economy, new social economics, transaction costs economics, economics of information, theory of collective action, and law and economics.

NIE is of particular relevance to agricultural development and policy research in developing economies where transaction costs—and risks—are high. To understand and overcome market failures, NIE points to the importance of understanding institutions at both the micro level (i.e. the institutional arrangements—markets, formal and informal contracts—that directly govern specific transactions) and the macro level (i.e. the institutional context as embodied in laws and socio-cultural 'ground rules').

Some institutional economists argue that as a consequence of structural adjustment policies, the few existing coordination mechanisms in Sub-Saharan Africa (SSA) have come under severe stress.[91] Liberalization and privatization programmes have led to the withdrawal of public organizations that managed or coordinated economic sectors and commodity value chains.[92] Though the failures of state-owned marketing boards are well documented, the private sector has not been able to improve coordination beyond limited areas and for very specific value chains. Trade in agricultural products and investment in value-adding remains limited in SSA, because of a lack of coordination and inefficient competition on incomplete markets. Farmers are locked into a system of *ad-hoc* sales and cautious partial integration in markets. Traders have limited incentives to compete on scattered spot markets, and try to do business within well-defined areas with relatively well-known producers and producer groups.

Innovative institutional arrangements that foster mutual learning and coordination are therefore a crucial component of IAR4D, if this is to improve rural livelihoods and enable rural populations to profit from market-driven development. The roles of both government and private-sector agents need to be defined and integrated to encourage pro-poor agricultural growth. However, institutional change can be empowering and increase inequity. Ideal solutions do not exist, because of the complex interaction

between institutions and individual and group behaviour, and the path dependency of institutional change and economic development.

### 2.4.3. How can this principle be incorporated in development practice?

IAR4D integrates analysis, action and change at different levels of spatial and social organization. Important actions that contribute to this principle include the following.

***Actions to organize stakeholder interaction at different levels***

- The formation of new forms of social organization to manage natural resources at different systems levels (e.g. group, village, watershed, region).
- The formation of partnerships or operational linkages between research groups or organizations working at the local level, and those working at the more national or regional level.
- The formation of linkages between innovation partnerships at local level and other partnerships or organizations operating at regional and national levels.
- The secondment or co-option of staff from other organizations to fill in gaps where expertise is needed but lacking.

***Actions to integrate interventions at different levels***

- The identification of specific needs of defined geographical areas, agro-ecological zones, social groups and value chains, and the development of measures to satisfy those needs.
- The development of a coherent set of integrated technological, institutional and evidence-based policy changes that jointly enable and promote innovation.
- The scaling up and scaling out (including adaptation) of innovations that are piloted at local level.
- The implementation of agreed and coordinated measures by the different actors in the value chain (individual farms, firms, service providers, etc.) working in partnership.
- Measures to improve in support services (input supply, production and marketing information, business development and administrative services) to all actors in the value chain or partnership (producers, transporters, processors, traders, etc.).

# 3 Strengthening Capacity for IAR4D

From the review of IAR4D principles given in section 2, it is clear that implementing IAR4D requires strengthened capacity for this 'new way of doing business'.[93] One of the principles of IAR4D discussed above is that it integrates analysis, action and change at different levels of spatial and social organization, and the modern concept of capacity-building recognizes that this goes beyond simple training to include development at individual, organizational and institutional ('network' or 'system') levels.[94]

## 3.1. IAR4D requires change in individual capacity

Most higher education in agriculture and rural development is based on a sound disciplinary competence.[95] However, the competent IAR4D practitioner needs competencies that go beyond traditional disciplines, to include what we call here 'meta-disciplines', and social skills, as well as the personal attitudes, behaviour and values that allow the social interaction necessary for working with others.

By '*meta-disciplines*', we mean competencies that go beyond the 'traditional' disciplines and which allow professionals to use and integrate these traditional disciplines within the broader IAR4D context. Among these 'meta-disciplinary' competencies are systems thinking, knowledge management, strategic planning, knowing how to learn, effective writing, and use of ICT.

In '*social skills*', we include those skills and competencies that allow people to work together: listening and communication, the ability to work within and lead teams, organization, networking, facilitation, negotiation, conflict resolution, etc.

In '*personal attitudes, behaviour and values*', we include qualities that are commonly called 'emotional intelligence',[96] including empathy, self-awareness, self-regulation, self-motivation and social awareness. IAR4D is about change and change processes—to initiate change there must be a dissatisfaction with the status quo, a sense of urgency, willingness and flexibility to change and, ultimately, an understanding that change must start with oneself and not with others.

Together with social skills, these attitudes, behaviour and values are often referred to as 'soft skills', to distinguish them from the quantitative, disciplinary-based, scientific or 'hard skills'.

## 3.2. IAR4D requires change in organizational capacity

IAR4D requires the normal resources for general operation: infrastructure, finance, equipment, staffing levels, support services, etc. It also requires the development of organizational processes that facilitate interaction, and these processes should be assessed according to the satisfaction of clients and other stakeholders, not only on self- and organizational-performance assessment. As with individual change,

organizational change often requires dissatisfaction with current organizational performance and is often precipitated by crises (such as funding threats, loss of income), which in turn often result from the 'external' pressures of other stakeholders—either directly or through their political representatives.[97]

The organizational change process requires management capacities to be addressed in four main areas: human and financial resource management, linkage management, management of interactive planning and learning cycles, and output and information management.

Some of these requirements include:

- *Programmes for continuing professional development.* As well as utilizing opportunities for formal professional development (degrees and short courses), individual competencies can be improved through induction programmes and mentoring for new staff or work teams, and embedding continued learning into ongoing projects and activities.
- *The creation of a 'learning culture' within the organization*. This involves encouraging staff to try out new things, take risks, and rewarding them for innovative practice. It requires staff to dedicate time to reflect on experience and document lessons learned, particularly in terms of relationships with other partners. It also requires an active knowledge-management policy to make sure the lessons learned are incorporated within organizational practice, and made available to other organizations.[98]
- *The facilitation of work by inter-disciplinary teams across disciplinary departments, commodity programmes, etc*. This can be achieved by organizing work teams around specific development themes (R&D challenges), but it is critical not to ignore simple measures for creating the time and space needed for both formal and informal interaction, such as 'open doors' of managers, joint coffee rooms, open-plan offices, and regular discussion sessions.
- *The improvement of communications, linkages, knowledge sharing and working partnerships with other stakeholders on themes of joint interest.* This involves dedicating resources (time, budget) to joint activities. It also means producing information (written, audio, video) for partners, clients and users, rather than publications written for peers. It also implies improving their general openness and 'approachability', through simple measures such as welcoming visitors, and security measures that do not turn people away.
- *Measures to facilitate partnerships with other organizations.* This involves joint decision-making procedures,[99] negotiation of shared objectives and respective roles, joint monitoring and evaluation activities, sharing of credit for outputs and outcomes. It also involves actively undertaking activities to build mutual trust, a ceding of organizational power over agenda and activities (e.g. through reciprocal representation on governance structures), as well as sharing of resources.[100]
- *Monitoring, reporting, learning, evaluation, performance-assessment (incentives) and impact-assessment systems that value multi-disciplinary and multi-stakeholder interaction, improved processes and outcomes*. This requires systems that value change outcomes in the development practice of partners and stakeholders, rather than just knowledge products. It also requires a change of thinking, from systematic cause–effect attribution logic, to a more systemic way of monitoring and evaluating behavioural outcomes. This change can be supported by the use of more systemic tools such as the 'outcome mapping' approach,[101] rather than the almost universally used 'logical frameworks'[102] that reinforce systematic and linear cause–effect logic.
- *Broadening of impact-assessment criteria from the predominant emphasis on economic return.* Many researchers have experimented with more open-ended case studies, impact pathways, institutional or innovation histories and other participatory tools that assess broader livelihood outcomes, changes

in practice, social networks, relationships, attitudes, etc. However, these do not yet form part of mainstream practice, where economic rate-of-return studies often remain the institutionalized standard.[103]

- *Linking research to policy formulation, in addition to the normal technology focus.*[104] Evidence-based policy development can be encouraged though early involvement of policy-makers in the analysis of the innovation system and the existing enabling environment. In this way, lessons from individual programmes and pilots can lead to policy change through interactive learning at national and regional platforms.[105]
- *Changing the curricula of higher-education institutes, to produce graduates more suited to the demands of multi-stakeholder working and innovation systems*. As well as including new topics within these curricula (such as the 'meta-disciplines' referred to above), this also involves changing teaching and research practice to allow the development of the social skills and personal attitudes required. More fundamentally, it requires the more active involvement of stakeholders and potential employers in the curriculum-development process itself—that is, change in the very processes that bring about change in curricula.[106]

Prominent proponents of an innovation-systems approach have noted that an increased understanding of what actions are required—as described above and elsewhere—has not yet resulted in widespread IAR4D practice.[107] They note that the fundamental institutional and policy environment for international and national agricultural research is still not conducive for IAR4D. The predominant organizational 'culture' within most national and international research organizations is still focused on knowledge, technology delivery and accountability, rather than on learning, capacity strengthening and improvement. Influential stakeholders in international agricultural research appear to be reluctant to accept the broader organizational implications of IAR4D.[108] Prominent among these implications is the need to broaden both performance assessment and impact assessment—the main tools that ultimately drive the direction of agricultural research.[109]

## 3.3. IAR4D requires change in institutional capacity

As well as individual and organizational change, IAR4D requires strengthening capacity at the 'system-wide' or 'network' level. This involves factors that influence the management of organizations, and in particular the interaction between these organizations and other stakeholders. These factors create the 'enabling environment' for organizations and individuals to improve their own capacity and to contribute optimally to IAR4D.

Our main contention in this paper is that innovation is the emergent property of an innovation system—and hence depends more on the interaction between the actors in the system (trying to innovate or change in response to a challenge) than on any one of those actors. It is the management of these interactions that provides the greatest challenges for IAR4D.

One of these challenges is the organization of mechanisms to bring stakeholders together and facilitate their interaction. In mainland Europe, farmer, producer and consumer organizations are strong, and often play a key role not only in articulating the voice of those they represent, but also in bringing together other actors within the broader innovation system.[110] Their power is often based on financial clout, as farmer organizations often play a key role in financing services such as research and technical services.

In Africa, farmer, producer and consumer organizations tend not to have the same power. At a local level, African farmer organizations are often active in service provision. However, at intermediate

(e.g. value-chain or business-cluster) and national levels, their role is often less well developed. Often organizations lack mechanisms to ensure legitimate representation from the lower levels. At a national level, farmer and producer organizations have limited power to influence the use of public resources for research and advisory services, as these are still mostly financed and influenced by external funding agencies.

The clash of 'cultures' between the private and public sectors is also undoubtedly an institutional limitation in Africa, and coordination problems between stakeholders have been exacerbated in recent years by liberalization and privatization policies. The widespread use of outsourcing mechanisms at the district level for advisory services and increasingly also research services is one way of bringing in new ideas and approaches from the private sector and civil society.[111] Nevertheless, increasing the mutual understanding between these private and public cultures remains an important challenge.

The recent trend towards competitive funding mechanisms has the potential to alleviate these problems, by creating local or thematic committees to manage these funds. For such innovative funding mechanisms to work, however, far-reaching capacity improvement needs to take place, such as enhancing client control over priorities and resources, expanding the range and skills of service providers, and making organizational changes in all stakeholder organizations, whether public sector, private sector or farmer organizations.[112]

Other mechanisms for stakeholder articulation include the 'inter-professions' originally developed in France and increasingly playing a role in SSA. These are organizations within a given sector or commodity chain that coordinate the different actors, stimulate exchange of information, assist in fine-tuning demand and supply for specific regions or markets, and generally assist producer and business organizations to align investments and to identify markets. They are governed by representatives of the different interested parties and are sometimes regarded as 'organisations in the private domain that use public sector methods'.[113] A similar function is provided by the 'innovation intermediaries', organizations that have emerged in the Netherlands to assist agricultural entrepreneurs to articulate demand, forge linkages with those that can provide innovation support services, and manage innovation processes.[114] The challenges faced by intermediaries include carefully clarifying and delimiting their mandates, ensuring neutrality and trust among the different stakeholders, and securing adequate finance from private or public sectors.

For agricultural research organizations interested in strengthening their capacity for IAR4D, the question often arises whether to act as a convenor or facilitator for a multi-stakeholder platform. Some research organizations (and managers) prefer to 'stay out of the development business', focusing more on what they regard as their 'core business' of generating new technology. Others recognize that, for research to contribute to development, research organizations sometimes need to step into this inter-institutional vacuum and accept the role of what has been called a 'boundary organization'.[115] This role is not to be taken lightly: it requires significant investment in communication and partnership development, which inevitably is regarded by some managers as diverting resources from the 'core business'.

These debates reflect that IAR4D, as conceived in this paper, is essentially a 'boundary' activity. It does not—perhaps cannot—'sit' squarely within the mandate of any particular organizational type (research, extension, farmer organization, etc.). Each and all of these organizational types involved in IAR4D partnerships need to devote efforts and resources to linking with others across their boundaries—taking the lead within stakeholder partnerships as and when needed—if their own roles within the broader innovation system are to be effective.

# 4 Putting IAR4D into Action and Strengthening Capacity—Lessons Learned from Selected Case Studies

To illustrate some of the issues described in this paper, we selected 13 case studies (see appendices and Table 1).[116] These case studies were not chosen as ideal examples of IAR4D, but to illustrate how some of the IAR4D principles have been put into practice, and to derive useful lessons.

## 4.1. Illustrations of the defining principles of IAR4D

***Principle 1: Integration of perspectives, knowledge and actions of different stakeholders around a common theme***

Most of the case studies describe how different stakeholders have come together around a specific theme or 'entry point'. These themes include both commodity-focused themes (e.g. durum wheat in Ethiopia, potato in Uganda, tomato in Togo, rice in Madagascar) and natural-resource themes (e.g. soil fertility in Ethiopia, water harvesting in Kenya, ground-water management in the Netherlands). One case (Client-Oriented Research and Development Management Approach in Tanzania) focuses more on organizational and research management issues. The mainstreaming IAR4D case in Uganda shows how the principle of organizing innovation platforms can form the basis for organizing research at a system-wide level.

It is a specific topic that provides the context for working together. In our experience, stakeholders that are brought together on the basis of a more abstract or general need to collaborate are less effective. In the case of water harvesting in Kitui, Kenya, for example, the general mechanisms for agency coordination at district level appeared to be largely ineffective in articulating specific actions to improve water harvesting and use. In the case of the Ghana 'cassava innovation system', the 'theme' appeared to be too wide-ranging to lead to practical multi-stakeholder interaction.

In some of the cases described, the original stimulus for the multi-stakeholder cooperation was provided *mainly* by a research institute (durum wheat in Ethiopia, rice in Uganda); in others, it came from the farmers themselves (e.g. potato in Uganda), an NGO (tomato in Togo), a specific project coordinated by an external/international agency (soil conservation in Ethiopia, rice in Madagascar), or by a provincial government (water management in the Netherlands). We say 'mainly', because in most cases it is when two or more stakeholders begin to interact and explore common interests that the themes take shape. Nevertheless, the diversity shows that any stakeholder can initiate a process of working together to promote innovation.

The nature of the research and development challenge often changed significantly during the course of the process in the different cases. The emphasis changed from crop protection to marketing in the case of the farmer group producing potatoes in Uganda, from a 'top-down' demonstration of soil-fertility measures to group learning in Madagascar, and from crop production to product quality and marketing of tomatoes in Togo. In the 'problem' of unsustainable groundwater use in the Netherlands, the initial

**Table 1. Case study overview**

| Case study; context | IAR4D principles illustrated | Lessons learned | Questions/issues raised |
|---|---|---|---|
| 1. Commercialization of durum wheat in Ethiopia; research-led initiative. | Integration of research, farmer organizations, extension, private processors and NGOs through executive and technical committees. | Importance in linking research to demand from private sector, as well as the interests of the producers' organizations. | How to use evidence and experience of pilots in influencing research and innovation policy? How to ensure articulation of the complete innovation system? |
| 2. Linking potato farmers to niche markets in Uganda; farmer group-led initiative. | Integration of support services (research, extension) and value-chain actors by the farmer group. Action at field, group and national levels. Evaluation of gender and natural-resource outcomes, and farmer income. | Importance of: strong leadership of the farmer group; continued support to the same group of farmers; enthusiasm in R&D organizations for integration of social and technical science and development. | How to replicate this success? Investments were long term and specific to the circumstances. |
| 3. Tomato 'business cluster' in Togo; facilitated by external project. | Facilitation of stakeholder interaction and strengthening of producer organizations. Integration of production and marketing aspects. | Importance of a wide array of input, technical and business-development services to improve competitiveness of local business cluster. | Who can take up the role of facilitating interaction among the different stakeholders in the cluster (after assistance from external project ends)? |
| 4. Innovation in the cassava sector, Ghana; mostly led by entrepreneurs. | Innovation at industry level remains limited when limited stakeholder linkages exist mainly at bilateral level. | Need for facilitation across entire value chain to improve sector. Importance of including industrial sector and related services. | Who can organize and finance facilitation and learning across the value chain? Should this be a government role? |
| 5. The floriculture industry in Kenya; as analysed and facilitated by a specific study team. | Stakeholder linkages and facilitation of the flower 'innovation system' is currently weak in Kenya. There is poor information flow and limited joint learning. | Importance of integrated action at all levels, from local to international, if industry is to be internationally competitive. | How to move beyond analysis of the innovation system, to facilitate joint action and learning across the system to exploit opportunities that have been identified? How to improve the capacities of research organizations for IAR4D? |
| 6. Cocoa pest and disease management in Ghana; as analysed and facilitated by an external agent. | Innovation requires integration of social, technical and political dimensions. | Adoption and adaptation of research results depends on the institutional and socio- economic context, rather than on the technical merits of the technology. | How to institutionalize the role of 'innovation coach', as provided in this case by a PhD student? |
| 7. Rice innovation in Madagascar; facilitated by an international foundation. | Joint learning, based on participatory learning and action, leading to innovation tuned to individual farmer circumstances. | A more open-ended process of farmer group learning provides for greater innovation than pre-packaged recommendations from research and extension organizations. | How to formalize 'regional platforms' that bring all stakeholders together? |

| Case study; context | IAR4D principles illustrated | Lessons learned | Questions/issues raised |
|---|---|---|---|
| 8. Soil conservation in Ethiopia; facilitated by an international–national research consortium. | Participatory action-research at local and district levels integrated with 'empirical' research. Evaluation of different dimensions of development. | Compromises are sometimes necessary between desirable natural-resources sustainability and social outcomes. The need to build on existing social capital. | How to ensure a 'fair' representation of different interest groups on communal decision-making bodies? How to promote the necessary changes needed to operationalize IAR4D in research organizations? |
| 9. Water harvesting in Kenya; facilitated by a national learning team. | Community- and district-level stakeholders' interaction facilitated by external IAR4D (learning) team. | Given initial facilitation, community-level organizations can effectively demand services from district providers. Mechanisms for coordinating district-level services are weak in practice. | How to institutionalize the stakeholder interaction at community and district levels? How to 'formalize' the learning that occurs through this interaction? |
| 10. Upland rice in Uganda; research-led programme initiated by zonal research institute learning team. | Research linkages beyond the 'normal' government sector to include the private sector (traders, processors, stockists). | Pilot projects conducted as part of capacity-development programmes can be instrumental in leading to both individual and organizational change (better 'vision' of innovation system, effective intra-institutional teamwork, improved linkages). | How to 'embed' capacity-strengthening activities within ongoing programmes, work plans and budgets across multiple partners? How to document learning in terms of individual, organizational and institutional processes? |
| 11. Client-Oriented Research and Development Management Approach (CORDEMA) in Tanzania; NARS led. | At zonal level, stakeholder linkages encouraged by competitive R&D funds managed by zonal committees. At national level, organizational change being implemented through NARS programme and capacity-strengthening activities. | Importance of improving organizational management (of human and financial resources) and institutional management (planning, M&E, knowledge management—dissemination and communication) to support/enable IAR4D. | How to effectively scale-up pilot experiences? How to ensure the policy support and change needed, including making resources available (human and financial)? How to change attitudes in key organizations? |
| 12. Water management in the Netherlands; led by 'agricultural innovation bureau'. | Joint action and learning among diverse stakeholders (farmers, research, extension, private sector, etc.) at different levels (farm, district, province). | Close cooperation among diverse stakeholders can lead to joint learning and compromise policies, technology use leading to innovation in NRM and production technology. | How can the success of the 'agricultural innovation bureau' be replicated in other situations? |
| 13. Mainstreaming IAR4D in Uganda; NARS led. | Research organized around local and national innovation platforms.<br>Organizational change in the research system in response to system analysis. | IAR4D training can have impact at organizational, as well as individual level.<br>Competitive grant schemes can provide basis for organizing research and development around IAR4D principles. | How best to organize the strengthening of IAR4D competencies throughout the R&D system? |

emphasis on policy measures identified by the provincial government—banning irrigation—changed more to the technical solution of decision-support systems to enable irrigation to be made much more efficient and hence less environmentally damaging.

In many successful cases (e.g. potato in Uganda, rice in Madagascar) there is little evidence that formalizing the cooperation was necessary for success. The stakeholder partnerships were in some cases supported through formal mechanisms such as memoranda of understanding (e.g. wheat in Ethiopia), informal associations (such as the 'initiative' in the case of rice in Uganda), or through the technical committees of specific liaison organizations (such as that of the Agricultural Innovation Bureau in Brabant, the Netherlands).

***Principle 2: Integration of learning that stakeholders achieve through working together***

From the outset, local learning among farmers groups and/or joint learning among the different stakeholders was recognized as a principal objective of several of the cases described (rice in Uganda, water harvesting in Kenya, soil conservation in Ethiopia). Even where it was not a stated objective from the beginning, however (as in the case of the Uganda potato partnership), strengthening of capacity (or 'social capital') was recognized as a major outcome.

Facilitating learning in farmer groups is a feature in at least half of the case studies. These include the 'farmer field schools' in the case of Uganda potato, 'participatory learning and action-research' groups in Madagascar, 'farmer research groups' for soil conservation in Ethiopia, and the 'study groups' in the Netherlands. In Togo, farmers were supported to visit similar business clusters in Ghana. In the study groups in Brabant, other stakeholders (research, extension, private sector) also participated.

The main lesson demonstrated in the case studies is that 'implementation' of IAR4D and strengthening capacity for IAR4D cannot be separated. Experiential learning—learning by doing—is the only way for both individuals and organizations to strengthen their capacity for IAR4D. This means that workshops, planning and reflection sessions, documentation procedures, etc., need to be conducted with multi-stakeholder groups and teams, and not with individuals or with representatives from just one organization. While such multi-stakeholder representation in learning teams was attempted in the cases of water harvesting in Kenya and rice in Uganda, it remained difficult to formally convene learning teams across different sectors, from private and public organizations, and from groups of disparate status such as farmers and professionals. For the private sector, particularly, the opportunity costs of attending workshops, meetings, field visits, etc., are unattractive, making it difficult to include them in these events.[117]

Even where joint learning was emphasized, as in the cases noted, it remained difficult to create a learning culture—for the learning teams to reflect on and document *process* outcomes (as opposed to *technical* outcomes). Professional education generally does not include development of skills on reflection, analysis of personal behaviour, team and partnership processes, learning from unexpected (or even acknowledging negative) outcomes, etc. Consequently, most of the reports resulting from these projects tend to focus on technical issues, rather than the effectiveness of stakeholder interaction, the organizational and (especially) the institutional factors facilitating or impeding such training and uptake of technical solutions (the series of reports from the AHI is a notable exception in this regard).[118]

***Principle 3: Integration of analysis, action and change across the different dimensions of development***

The principle of IAR4D introduced in this paper that is least illustrated by the case studies is the evaluation of multi-dimensional outcomes. Case study 2 (potato in Uganda) is an exception in that one of the

research organizations involved evaluated the social distribution of the costs and benefits (particularly with regard to gender) and the impact on the natural-resource base. In other cases focused on a particular innovation, evaluation and impact assessment remained largely expressed in terms of levels of adoption (rice in Madagascar, water management in the Netherlands) or farmer income (e.g. wheat in Ethiopia). In the national-level case of Uganda (case study 13), we note the intention to include market and livelihood analysis in guidelines for screening and assessing competitive grant schemes.

The lack of a more wide-ranging, multi-dimensional impact evaluation reflects a tendency for research organizations to still focus on the component technology level, rather than on the broader change in livelihood systems that is of more interest to policy-makers. If research is to be more integrated with policy, this is one area where the capacity of research systems needs strengthening.

***Principle 4: Integration of analysis, action and change at different levels of spatial and social organization***

The case studies demonstrate that change is needed at all levels of organization if innovation is to succeed.

The case of rice in Madagascar illustrates an example of where action was successfully initiated at a local (district) level to improve production of a staple crop, but where the growing confidence and capacity of farmer groups resulted in these seeking to intervene at broader level to improve their position in national input and output markets.

The cases of wheat in Ethiopia, potato in Uganda, tomato in Togo, and rice in Uganda are examples of where local innovation was (or needs to be) closely linked from the outset to the specific demands of national markets, in terms of product quantities, quality, seasonal timing, etc.

In cases where produce or products compete in international markets, as in the cases of floriculture in Kenya and cassava in Ghana, analysis, action and change at national and even international levels may be required. A particular example is the need to provide inputs for negotiation of international trade deals in the case of Kenyan flowers, and the conclusion of the stakeholders there that the different 'communities of practice' on issues such as fungal disease, environmental safety and international market cannot continue to function separately, but need to be integrated.

The case studies that focus on resource-management issues amply demonstrate that these require intensive action at individual and communal/district (or watershed) levels, as well as requiring supporting policy measures at provincial or national level (as in the case of water management in the Netherlands). The case studies also demonstrate that NRM is not simply a question of taking action at farm and watershed levels, but that there may well be tradeoffs between these levels. In the Ethiopian soil-conservation issue, for example, some classes of individual farmers stood to lose out by communal action at the watershed level. In the case of water use for irrigation of dairy farms in the Netherlands, the local dairy sector was likely to lose out with proposed new policies at provincial level to protect the underground water table; fortunately, systems were in place that allowed for negotiation of different interests and the development of compromise measures that all actors could agree to.

## 4.2. Illustrations of individual, organizational and institutional change

***Individual change***

In only a few of the cases studied are changes at the individual level documented (beyond the change in agricultural practice by individual farmers). In three of the cases (Kenya floriculture, Ghana cassava,

Ethiopia wheat), it was noted that the attitudes of individual researchers need to change—specifically in their willingness to work with and learn from other stakeholders. In the case of rice in Uganda, where the experience formed part of a specific national initiative to build individual and organizational capacity for IAR4D, there was some indication that such attitudes had changed, although it remained difficult to document these changes. In the case of wheat in Ethiopia, it was noted that individual 'champions', who had benefited from earlier training in IAR4D, were instrumental in establishing the multi-stakeholder work on wheat. In Tanzania, it was evident that the organizational changes sought by the CORDEMA programme built upon the previous and widespread training in farming systems approaches. Similarly, the proposed changes at a system-wide level in Uganda (case study 13) were partially the result of IAR4D training focused largely on zonal agricultural research and development institutes about 5 years previously.

In general, it is perhaps not surprising that individual change is not documented. In our own direct involvement in IAR4D learning in Uganda (case study 5), we found individual researchers willing to talk informally about their own personal development (attitudes, social skills), but either unable or reluctant to describe these changes in writing. We assume that this is due to a tradition of scientific and technical writing that focuses on objective data (not subjective opinions), but the lack of organizational incentives for documenting personal change is no doubt also a factor.

***Organizational change***

As noted above, in at least half of the case studies farmer groups were organized to experiment with or facilitate the learning of new practices. It is notable that in several of these cases (e.g. Madagascar, potato in Uganda), the resulting growth in confidence of these farmer groups led to them amalgamate into larger associations with the broader objectives of negotiating with other stakeholders, storing or processing produce, seeking better access to input, credit and product markets, etc.

We note little change in research and development organizations—although the need for such change was noted in several cases. Desirable changes in research organizations included more inter-disciplinary working (Ethiopia, wheat), more incentives to work with farmers, private firms and other stakeholders (Ghana, cocoa, cassava; Ethiopia, wheat), a wider research portfolio (Kenya, floriculture), and a wider review of structures, practices, linkages and advocacy (Ethiopia, INRM).

The two case studies included that do directly address these factors are those of the national proposals for CORDEMA in Tanzania and mainstreaming IAR4D in Uganda. The Tanzania case study (11) specifically focuses on the organizational management and administration factors, incentives structures, norms, cultures, etc., that need to be changed in order to create the enabling environment that can make IAR4D feasible. In Uganda (case study 13), the appointment of IAR4D coordination units within the national research secretariat, close liaison with advisory services, the intensification of competitive funding mechanisms (with refined priority-setting mechanisms), and a heavy emphasis on further strengthening of IAR4D competencies form part of the agenda for mainstreaming IAR4D. In both Tanzania and Uganda, however, we note that these organizational changes are still largely proposals—it remains to be seen how they are actually implemented and what the implications turn out to be.

***Institutional change***

A variety of mechanisms to facilitate stakeholder interaction is evident in the case studies. These include:

- Individual facilitators (Madagascar) or 'innovation coaches' (Ghana, cocoa);
- Watershed management committees (Ethiopia);

- Inter-agency steering committees established specifically to address the R&D theme (Ethiopia, wheat; the Netherlands);
- Proposed local and national innovation platforms to mainstream IAR4D in Uganda.

In other cases (Ethiopia wheat, Kenya floriculture, Ghana cocoa and cassava, Madagascar), the need to develop broader multi-stakeholder platforms was specifically identified.

The intention in Uganda (mainstreaming IAR4D) is to focus research through the formation of such innovation platforms at local and national levels, and to use competitive grant schemes, managed by multi-stakeholder committees linked to these platforms, to introduce IAR4D principles.

Although the need for concerted action throughout the value chain was recognized in several cases, in fewer of these cases (e.g. durum wheat in Ethiopia, potato in Uganda, tomato in Togo) did this actually happen. In general, research or local extension agencies find it easier to work with local farmer groups or communities, than with the wider array of private and commercial stakeholders involved in value chains.

In the Uganda potato case, there was good interaction among stakeholders, although there appeared to be no specific mechanism to achieve this. In this case, it may be that the farmer organization had become strong enough to take on this role. The case from the Netherlands also illustrates the importance of strong and well-established farmer associations—it was their initial negotiations with the provincial government that led to the multi-stakeholder action that eventually resulted in a mutually acceptable resolution to the problem of water resources. In general, the cases reviewed suggest that while farmer organization by itself does not necessarily ensure good interaction among stakeholders, IAR4D is impossible where farmer organization is weak.

# 5 Conclusions

In this paper, we do not describe a comprehensive 'IAR4D approach' or method that can be implemented as an alternative to some 'conventional' (or 'non-IAR4D') research or R&D process.

Rather, we describe a number of principles that provide a basis for the type of research and development activities that—when integrated—can be described as IAR4D:

- Integration of the perspectives, knowledge and actions of different stakeholders around a common theme;
- Integration of the learning that stakeholders achieve through working together;
- Integration of analysis, action and change across the different (environmental, social, economic) 'dimensions' of development;
- Integration of analysis, action and change at different levels of spatial, economic and social organization.

Within these principles, IAR4D can be represented as a set of 'good fit' practices that synergistically add value to the existing R&D processes, and which improve the relevance, effectiveness and efficiency of those processes. In other words, IAR4D is not '*a* process', but is *about* the quality of processes. If we accept that development is about behaviour and capacity, then IAR4D needs to focus on improving behavioural processes and capacities as outcomes, rather than on (technology or policy) products as outputs.

Collectively, these 'good practices', and therefore IAR4D itself, represent an ideal. In the real world of human activity this ideal is never reached. We make no apologies for presenting IAR4D as a goal—something to work towards—rather than a more concrete and limited objective. We are happy to acknowledge that there are a number of experiences and R&D 'approaches' or 'frameworks' and their component methods or tools that go a long way to incorporating the various principles. Some of these methods, approaches and frameworks are reviewed in this paper and have shaped the result. We do not wish to either outdate or devalue them by proposing another 'state of the art' or definitive 'IAR4D approach'. In particular, we regard IAR4D as being an integrated set of research and development good practices within an 'innovations systems' context, the (evolving) concept of which is increasingly recognized within Africa and globally as a framework for linking agricultural knowledge, science, technology and development.

Nevertheless, these experiences with innovation-systems perspectives and IAR4D good practice are still the exception, rather than widespread practice. As we have argued in this paper, and others have argued elsewhere,[119] innovation-systems practice and IAR4D require creating the necessary individual, organizational and institutional conditions. More than implementing particular activities, IAR4D is a matter of creating and continually developing these capacities. Create the enabling environment, and IAR4D activities may take place; try to implement the actions without first creating favourable conditions, and the results will be disappointing and/or unsustainable.

Most research and development organizations have yet to come to terms with these capacity requirements. IAR4D has implications that go beyond any research method, approach or framework, and it requires individuals and organizations to reflect on whether they are prepared to make the necessary changes:

**Individuals** need to reflect on whether they have the knowledge, skills and, above all, attitudes to work with others (of different disciplines, professions, educational levels, cultures) on a basis of mutual respect and trust.

**International and national agricultural research organizations** need to individually determine to what extent IAR4D should be incorporated within their mandates, or whether they should focus on more basic ('upstream') research for technology generation and leave IAR4D to others.

**R&D organizations** that do decide to engage in IAR4D need to examine what this means for their governance structures, management, resources (including staff disciplines and competencies), procedures (including assessment procedures), and overall 'culture' (openness, learning).

**Donors** to research and development organizations need to reflect on whether their financing frameworks, impact-assessment procedures and timeframes realistically reflect and encourage the (generally broad) outcomes and impact they wish to achieve.

**All types of organizations** involved in IAR4D need to examine whether they are prepared to dedicate the resources necessary to form and manage effective partnerships. They also need to acknowledge where and when they are prepared to take the lead in convening and facilitating multi-stakeholder innovation platforms.

In conclusion, we admit that our interpretation of IAR4D is deliberately wide. Some argue that 'by including everything, IAR4D becomes nothing'. Others want to see a defined method or approach that can be contrasted with 'conventional' research. But, as we have tried to express in this paper, we believe that without a consideration of the individual, organizational and, above all, inter-institutional factors that provide the basis for IAR4D, we will continue fail to achieve the multi-faceted, sustainable, pro-poor development that Africa desires and deserves.

# Appendix 1: IAR4D Case Studies

## Case study 1:

## Commercialization of durum wheat in Ethiopia[120]

### Context

In Ethiopia, durum wheat for use in pasta products is mainly imported from Australia, Russia and Italy, even though durum wheat is indigenous to Ethiopia and estimated to be grown on 600,000 of the 1,500,000 hectares total wheat area. Local landraces are generally of mixed and/or low quality (mainly in terms of protein content) to serve the industry, and are generally used for local recipes such as *dabo* or *injera*. The challenge of reducing costly imports and also satisfying the growing national demand for pasta prompted the Debre Zeit Research Centre (DZRC) to seek partnership with the Kaliti Food Company (KFSC), the Ada'a-Lume Farmers Cooperatives Union (ALFCU), and the Ada'a District Bureau of Agriculture and Rural Development (BoARD) to develop, test and produce new varieties for use in the pasta industry.

Two new durum varieties in particular ('Ude' and 'Yerer') were considered to have qualities for pasta equal to or superior to imported varieties, as well as yields about three times higher than local varieties. These new varieties obtained a premium of 50 EB on top of the normal price of 280 EB/quintal (and compared to a price for imported durum of 340 EB/quintal), so the potential benefits to farmers and the industry were substantial. However, it was realized that farmers needed to improve post-harvest handling to ensure sufficient quality for the industry, and to produce quality seed.

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

The key stakeholders signed a memorandum of understanding clearly specifying their common objective (durum wheat varieties suitable for making pasta), their respective roles (DZRC producing new wheat varieties, KFSC providing required quality specification and testing in its laboratories, Ethiopian Farmers' Cooperative Union testing varieties on-farm through its members, and producing seed of new varieties); as well as multi-stakeholder mechanisms for interaction (executive and technical committees).

#### Integration of learning that stakeholders achieve through working together

All the stakeholders involved claimed that interaction took place, but realized that they needed to strengthen interactive learning. Although facilitation of the interaction (or coaching) officially took place through the Bureau of Agriculture (i.e. public extension), in practice research undertook the facilitating role, contributing to a perception of imbalance and top-down approaches.

#### Integration of analysis, action and change across the different dimensions of development

The collaboration focused strongly on the value chain, and on the establishment of an association of specialized durum-wheat producers. Although working through a multi-disciplinary research team and a multi-stakeholder technical team, little evidence was provided on the impact on the different dimensions of the rural livelihood systems beyond the substantial 300–400% increase in farm income noted in the pilot project.

#### Integration of analysis, action and change at different levels of spatial and social organization

The actors developed a common vision on the pilot programme and for scaling up the durum-wheat production, with extension to other regions in Ethiopia. With a view to changing gradually from import substitution to exports, this vision included the establishment of the Ethiopian Association of Durum Wheat Producers.

## Lessons learned

#### Individual change

Although individual capacity-building will rarely change the way research is done, it can create individual 'champions'. In this case, former research participants in a former ICRA–KIT capacity-development programme started working with farmer groups and private-sector stakeholders to address complaints from farmers that they could not sell their durum wheat to the local factory. These individual champions acted as innovation coaches and took the initiative to guide the process.

#### Organizational change

The main concern within research was the lack of incentive and support of the organization for research based on multi-stakeholder interaction. Availability of truly inter-disciplinary research teams was raised as another concern. The private sector's concern was on access to market information within their organization and the need to actively participate in the promotion of durum-wheat research results, while the farmer organization was particularly concerned about its capacity to interact with research and the corresponding incentives.

#### Institutional change

The establishment of multi-stakeholder committees at research-centre level greatly contributed to improved interaction with the non-public stakeholders in local innovation systems. The research agenda was, however, still largely determined by researchers, as were the resources for research. Research, the private sector and farmer organizations all put the need for effective multi-stakeholder platforms and partnership development high on the agenda. Policy changes based on cases like this one need to take place to further institutionalize multi-stakeholder interactive learning for innovation.

## Case study 2:

## Linking potato farmers to markets in Kabale district, Uganda[121]

### Context

The Nyabyumba United Farmers Group (NUFG) of Kabale in Uganda has been much referred to as an example of successful rural innovation in rural markets. The activities of the group have developed since 1998, supported by various NGOs and research organizations. During this period, the group collaborated with a private-sector partner, the restaurant chain 'Nandos', and a dedicated intermediary to set up an effective supply system of the desired quality of potatoes suitable for the restaurant in Kampala. This has resulted in increased yields and income for the participating farmers, as well as a dependable supply of quality produce for the restaurant.

It was neither a single approach, nor the efforts of a single organization that assisted NUFG; rather it was the group itself that attracted the attention of the organizations that assisted them in pursuing their objectives, improving their skills and innovating. There was, however, constant collaboration between the NGO Africare and the National Agriculture Research Organisation (NARO). The International Centre for Tropical Agriculture (CIAT), the Regional Potato and Sweet Potato Improvement Network in Eastern and Central Africa (PRAPACE) and the International Potato Centre (CIP) also gave important support, directly or through NARO. Research organizations therefore played a service-provision role and, over a longer period, engaged in capacity-building.

#### IAR4D principles illustrated

##### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

The group initially received training on potato-disease management and seed-potato multiplication, which led to an increase in production. The increase in production presented a marketing problem, and—through assistance by several organizations—contacts with a potential buyer were established, credit was obtained and farmers were given training in developing business plans. The quality requirements of the processor led to research by the group with technical support from NARO. To an extent, the success of the NUFG can be attributed to stakeholder interaction, in which research organizations, an NGO, a farmer group and a processor all played essential roles.

##### Integration of learning that stakeholders achieve through working together

The different collaborative activities between NUFG and NARO, Africare, PRAPACE, CIAT and CIP have provided these organizations with improved insight into rural innovation processes. The group was part of farmer field schools (FFSs) for late-blight and bacterial-wilt management, and experimented successfully with further farmer-to-farmer implementation of the FFS curriculum (implemented with CIP support). The experiences of the NUFG farmer group also formed an important pilot experience for the 'Enabling Rural Innovation' approach promoted by CIAT in other areas.

##### Integration of analysis, action and change across the different dimensions of development

The group managed to substantially increase incomes from the potato sales, although there was evidence that men received higher prices than women. Research also showed that there was little reinvestment of this income in NRM, indicating that additional measures are needed to address this issue.

### Integration of analysis, action and change at different levels of spatial and social organization

Elements in the success of the group were the building of group cohesion as a result of the FFS training. Specifically, the efforts of an enthusiastic farmer facilitator in bringing several FFS groups together around a common theme created the critical mass of farmers that could attract the attention of the NGO and research partners, and the bulk production required to interest the national-level buyer.

## Lessons learned

### Individual change

The success of the group is not the result of a single project, but of continued assistance over a longer time from different organizations. The group managed to remain the centre of attention of these organizations through its cohesion and progress, which made it rewarding to invest in further efforts. The development of the group's initiatives was not pre-planned, but the total interventions led to a well-skilled and cohesive group of farmers that managed to improve their livelihood through a long-term and persistent effort from their side to keep improving and innovating. Surveys indicated that farmers considered their skills in helping others address agricultural problems in general had improved, as had their ability to bargain with traders, although men showed more confidence than women.

### Organizational change

Important in the success of the group is the leadership that brought together several FFSs in a single larger farmer group (the initial 40 farmers in the NUFG has grown to 120, of whom 80 are women). NARO, at the local level, was receptive and enthusiastic regarding the integration of social and technical sciences, the intensive interaction with farmers and engagement in farmer-participatory research.

### Institutional change

Coordination of investments in interventions took place in an informal manner. There was no coordination of actions between CIAT and CIP. Both did, however, collaborate with locally well-established partners, NARO and Africare, which resulted in a natural progress in activities and a limitation of duplication of efforts.

Although action between organizations was only loosely coordinated, and a single collaborative needs assessment was lacking, the activities evolved successfully and resulted in integrated technical and marketing innovations. Apparently, the enabling environment for innovation was right. Some elements that can be identified include farmer organization, improvement of farmer technical capacity, over-production at field level leading to the need to access new markets, market demand, effective brokering between supply and demand, long-term support through different development partners, and continuity through continued involvement of the local research partner.

## Case study 3:
## The tomato business cluster in Togo[122]

### Context

The tomato 'business cluster' in this case was supported by the 'From Thousands to Millions' or '1000s+ Project', coordinated by the then International Fertilizer Development Center (IFDC). This project grew out of prior experience with integrated soil-fertility management (ISFM) projects in the region, when farmers appreciated learning how to increase productivity, but needed to resolve challenges of access to both inputs and output markets. IFDC and partners therefore promoted the CASE (Competitive Agricultural Systems and Enterprises) approach, which emphasized supporting producer groups and facilitating interaction between stakeholders in business 'clusters'.

Horticultural production was introduced in northern Togo in the mid-1990s, after the construction of a series of wells in the lowland areas, with the financial assistance of VECO (a Belgian NGO). The development of horticulture was heavily promoted by local NGO RAFIA (Recherche-Action et Formation aux Initiatives d'Autodéveloppement), among others, to stimulate young farmers to stay in the Northern Region, and provide income opportunities during the dry season. The project was based on the recognition that most of the tomatoes consumed in Lomé, the capital of Togo, came from Burkina Faso and Ghana—passing through the Northern Region en route.

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and action of different stakeholders around a common theme

The Centrales d'Autopromotion Paysanne (CAP), producer organizations in the region, selected tomatoes for production in the targeted areas around the wells. RAFIA linked with research and extension services in the region to provide technical advice to the rapidly growing number of farmers that invested in horticultural production. The advice included water harvesting, irrigation management and crop production (including fertilization). However, producers themselves quickly insisted on an even broader array of services, to enable them to access high-quality seeds, fertilizer and credit, and to secure more reliable market outlets.

#### Integration of learning that stakeholders achieve through working together

With the assistance of the IFDC-supported '1000s+ Project', producer organizations received training in communication, leadership and negotiation skills. They quickly adopted more transparent procedures, and reinforced communication and feedback to their members (including via local radio). Alternative trader networks were identified to increase bargaining power. A major learning event was a study tour organized by RAFIA and IFDC to Ghana, which made producers critically aware of their competitors, stimulated them to improve productivity and quality (e.g. through more appropriate fertilization), and change the production cycle to ensure harvest before the Ghanaian tomatoes flood the market. The project also assisted with action-research on cultivars and fertilization schemes to improve the quality of the tomatoes and reduce their water content, and provided networking services with seed suppliers. Currently, the project is appraising opportunities to expand the market within the Northern Region itself, and is also collaborating with women's associations in urban areas to evaluate small-scale and locally developed processing equipment and market-dried tomatoes.

### Integration of analysis, action and change across the different dimensions of development

The CASE approach mainly focuses on improving the competitiveness of a particular business cluster, and the project has also specifically targeted younger farmers and women's associations. To date, less attention has been paid to natural-resource issues.

### Integration of analysis, action and change at different levels of spatial and social organization

The success of the '1000s+ Project' depends on joining stakeholders at various levels in the value chain: from farm-level production, to district-level organization and provision of services, to national markets (and international markets in other business clusters). Previous experience in the region had convinced IFDC and other stakeholders that local action alone, on improving productivity, for example, was not sufficient to achieve significant impact on rural livelihoods.

## Lessons learned

### Individual change

A major point of attention for the project was the alignment of activities and investments in crop cultivation and processing to collectively ensure timely supply and adequate quality of fresh and dried tomatoes. Participatory workshops (value-chain analysis) helped dissuade individual farmers from free riding—e.g. by growing tomatoes without adequate fertilization, or by mixing supply with less fresh or otherwise lower-quality tomatoes. Women processors were assisted with business-management training, and have (among others) been strengthened to monitor financial outlays and income, and to evaluate returns on investment (in processing technology).

### Organizational change

The main issue in the tomato 'business cluster' was the organizational strengthening of the producers themselves. To develop stronger ties with trader networks, and in particular the larger traders in Lomé, a more stable supply of good-quality tomatoes was required. Organizational strengthening, and in particular coordination among producer groups from different localities, was also needed to enhance bargaining power. Innovation is an ongoing process, and arguably the most important result from this endeavour has been the awareness within the rural community (involving producers and small-scale processors) that innovation is an ever-ongoing and collective process.

### Institutional change

Although RAFIA (the local NGO) was a major driver behind this initiative, farmer groups (CAPs) have now taken over major activities of coordination. The CAPs now negotiate directly with traders in Lomé, have set up relationships with micro-finance institutions, and have become effective in supplying seeds, fertilizers and crop-protection products to their members. RAFIA remains involved in capacity-strengthening, and has triggered the establishment of an informal multi-stakeholder platform that involves producer groups, business associations (e.g. the women processors), financing institutions, several other NGOs and the public research and extension organizations. Donors participate in roundtable meetings where action plans and budgets are presented, with the aim of increasing accountability—both to the target groups and to the donor organizations (mainly small NGOs from the north of the country).

## Case study 4:

## Innovation of the cassava sector in Ghana[123]

### Context

This case study is not based on a particular R&D initiative or project, but rather on an analytical review of the cassava value chain in Ghana.

Cassava is a major staple in Ghana (production 10 million tonnes in 2007), and is also an emerging industrial crop. It has received investment from research and development since the 1930s. The study identified a variety of innovations in the value chain, including: the development of genetic resources (pest- and disease-resistant planting material); new production techniques used by farmers; new technological hardware (graters, packaging, etc.) used by cassava-processing firms; new products such as soya-bean and other protein-enriched *gari*, and cassava flour produced by food companies; new organizational innovations with cassava farmers (e.g. corporate village enterprises); and marketing innovations used by agro-industries (packages, trade fairs, mass-media adverts, etc.).

The cassava sector was analysed to assess the performance of the chain and the potentials for growth with reference to the innovations in the value chain, as triggered by the growing industrial demand. This analysis of the cassava sub-sector used a methodology involving data collection from firms in the identifiable value chain: including production (5 firms), processing (3 firms), packaging, transportation and marketing (2 firms).

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

The innovations in the value chain referred to above result, to a large extent, from initiatives from the entrepreneurs. Only in a pilot project—development of the cassava-starch value chain, supported by the President's Office—was a more multi-stakeholder approach consciously followed, with organizational and technological innovation at farm level accompanied by processing and marketing innovations in the sector. Linkages were mostly bilateral, such as contracts between farmers' associations and the Ayensu Starch Company (ASCO), and strong linkages between food-processing enterprises and organizations in business promotion and development to develop new processing and packaging technologies. Some farms had strong links with the Food Research Institute (FRI) of the Council for Scientific and Industrial Research (CSIR). Actors in the chain had to finance innovation development from their own resources, as no overarching development funds (e.g. from the Enterprise Development Investment Fund) were available.

#### Integration of learning that stakeholders achieve through working together

The pilot project under the President's Office, although innovative, has no formal multi-stakeholder platform for joint learning. However, learning is occurring mainly through the bilateral linkages described. New knowledge is often created between enterprises and the science departments of universities. Public institutions, such as the extension departments of the relevant ministries and organizations, play a rather traditional role in knowledge transmission.

### Integration of analysis, action and change across the different dimensions of development

Little evidence exists of social and environmental aspects being brought into the analysis. Nor are the implications—for the cassava food market, local food security and rural livelihoods—of developing the cassava value chain explored. The emphasis in the analysis was on market-oriented cassava farmers who were producing well above traditional levels of production and were better linked to the value chain. The involvement of small-scale farmers in the cassava value chain remains a challenge.

### Integration of analysis, action and change at different levels of spatial and social organization

Corporate village enterprises were formed as farmer associations for the mobilization of farmers and their roles in the starch value chain. These local organizations have the potential to develop into larger farmer organizations, but currently there is little organized effort to link actions at different scales.

## Lessons learned

### Individual change

New knowledge by individual actors is being obtained from business associations, business partners, trade fairs, exhibitions and mass media. Some firms are involved in the policy-formulation functions of the training institutions, but in general, firms are not satisfied with the quality of the graduates turned out by the national tertiary institutions—they would rather have graduates from polytechnics.

### Organizational change

Research and development has sought to enhance the efficiency of cassava-processing technology in terms of output and quality. The FRI has set up an integrated cassava-processing plant. The technologies on display have, however, only partly been adopted due to differential market requirements. FRI needs better links with the market. Individual actors in chains are increasingly being organized in associations—e.g. Ghana Farmers and Fishermen Council, Association of Ghana Industries. Firms made it clear that research institutes and universities did little consultation in setting their research agenda, but only contacted them on an *ad-hoc* basis. Generally, there are neither incentives for research, nor funds for the research itself. Research and development capacity needs to be strengthened in their interaction and support to commercial firms.

### Institutional change

Although interaction takes place between research and extension, and partnership development between the public and private sector in the value-chain pilot project, multi-actor interaction is generally missing. This has resulted in inappropriate technologies, processing companies that are not competitive, and the failure of research to solve emerging problems. The absence of national coordination to improve international competitiveness or meet social and environmental goals is also caused by the absence of priority for cassava as a core sector, the traditional divide between the public and private sectors, and the lack of new ways of working in research organizations. The review concluded that the government should be more active in bringing stakeholders together.

## Case study 5:

## Enhancing interaction in Kenya's floriculture industry[124]

### Context

Kenya's horticultural sector, which provides 2.5% of GDP, is dominated by floriculture, accounting for up to 60% of the total earnings of US$ 350 million (in 2004) from horticulture and 8% of the country's total export revenues. The sector directly employs 100,000 and indirectly benefits 2 million people. At present, roses are the top export commodity.

A study team from the African Technology Policy Studies Network (ATPS), led by Maurice Bolo, undertook an analysis of the Kenyan floriculture innovation system. The analytical framework used was based on policy review, stakeholder, function and learning analysis, and resulted in a multi-stakeholder action plan for innovation-system enhancement, which was endorsed by a national multi-stakeholder workshop.[125]

Key issues identified by the study team included: (1) research and development capacity, especially for breeding; (2) lack of effective extension; (3) government policies that impact negatively on the industry; (4) lack of an effective and enforced unified code of practice for the industry; and (5) negative publicity for the sector, from media reporting that it is biased towards large farms. In general, the interaction between stakeholders was not systemic, leading to insufficient learning and innovation, threatening Kenya's competitive edge in the floriculture sector.

The challenge identified was therefore to build capacity within the innovation system through: (1) providing information to assist policy-makers to better understand the strengths and weaknesses of the floriculture sub-sector, and (2) providing inputs into future negotiations between European Union and African, Caribbean and Pacific countries and trade negotiations at the World Trade Organization (WTO) that deal with science, technology and agriculture.

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

The different actors recognized that a broader working alliance is needed to address the challenges identified. Important actors include: (i) research, development and training; (ii) entrepreneurs; (iii) input suppliers; (iv) quality control and regulatory agencies; (v) trade investment and promotion agencies; and (vi) credit and finance institutions and the media. The different actors discussed and analysed the policy environment and the sub-sector, and indicated their interest to build capacity within the innovation system. This included policies, trade negotiations, finance, management and the links between these.

#### Integration of learning that stakeholders achieve through working together

The joint analysis of Kenya's floriculture sub-sector resulted in a shared understanding of the weaknesses and gaps. There was limited exchange of information between the flower growers and the local R&D system, which resulted in an over-reliance on external knowledge. Even though the intention was expressed to enhance social learning, and the first step of analysis was taken, the next steps—the interventions to strengthen the innovation system—remain to be taken; however, different stakeholders have engaged in working together and learning from each other informally.

### Integration of analysis, action and change at different levels of spatial and social organization

The analysis of the floriculture value chain emphasized the linkages between farmers and markets. Lack of access to markets is a major challenge for the floriculture sub-sector. An important issue is the newly negotiated Economic Partnership Agreements (EPAs) to enable Kenya, no longer classified as a least developed country, to continue accessing EU markets under preferential terms. The joint analysis also led to suggestions for involvement of agricultural workers as contributors to innovation in the sub-sector, as well as further involvement of small-holders in flower production.

### Integration of analysis, action and change across the different dimensions of development

The study proposed change and learning at different levels, including field, farm and economic levels. There is a need to develop local research and development capacity, especially in breeding and propagation of flower varieties. There is also a need for better interaction between research and entrepreneurs. The agricultural extension system needs to be facilitated to work more effectively, and the numerous codes of practice of the different organizations need to be harmonized in one national code of conduct. New and innovative funding mechanisms and partnerships are needed to enable small-scale flower growers to access credit.

## Lessons learned

### Individual change

One individual change that is needed is a change of attitude of researchers. To improve the position of small-scale flower growers in the market, research should better respond to their needs. Traditionally, the National Horticultural Research Centre (NHRC) has been oriented towards working with the large-scale farmers.

### Organizational change

NHRC will need to rethink its relations with both the private sector and the large-scale farmers. It is anticipated that this will require many changes in terms of organization of the research. Some of these are: international collaboration; attitude towards large-scale farmers who are innovating on the basis of research; incentives for innovation rather than publications; less bureaucracy; stronger operational capacity; and focus on quality criteria. These changes will need a change 'champion' within public research to facilitate this process.

### Institutional change

The consultation meetings—where different actors in the system exchanged views—enhanced interaction among the stakeholders and created a forum for further action. One of the key challenges is to further develop one community of practice and not a fragmented one with different sub-communities working on different things with no interaction between them. NHRC will need to demonstrate a willingness to learn from others. In addition, it needs to build farmers' trust by recognizing their knowledge. In addition, collaboration between NHRC and international research organizations would benefit the floriculture knowledge and its application for the sub-sector in Kenya. Again, NHRC needs to show openness to work with both the small- and large-scale farmers on topics such as quality and certification.

## Case study 6:

## Cocoa pest and disease management in Ghana[126]

### Context

Cocoa is the most important export commodity for Ghana, although yields are relatively low. The Cocoa Research Institute of Ghana (CRIG) carries out research on pest management, while the Ministry of Food and Agriculture disseminates the information through field extension agents. However, farmers face problems with lack of capital and access to credit, and high costs of recommended inputs like pesticides and labour, and therefore do not adopt the recommendations for cocoa production even though they are aware of them. This explains the need for innovation in integrated pest management (IPM), to meet the needs of small-holder cocoa farmers in Ghana, and a more participatory research and extension approach.

Emmanuel Dormon, a Ghanaian employed at the Ministry of Agriculture and at the same time pursuing his PhD within the Convergence of Sciences Programme at Wageningen University, acted as an innovation coach to enhance interaction among the different stakeholders involved in the cocoa innovation system in Ghana. The objectives of the IAR4D process he engaged in with stakeholders were to explore:
(1) more sustainable pest- and disease-management strategies; (2) research and extension approaches that can facilitate the development of innovations that can be used widely by farmers; and (3) how such approaches could be institutionalized.

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

The key stakeholders in the system identified low productivity as the main problem at the village level. The causes were classified into socio-economic factors (such as low producer prices, lack of amenities such as electricity leading to migration) and biological factors (such as incidence of pests and diseases). It was concluded that the causes were linked in such a way that they could not be dealt with separately. Together, the farmers proposed solutions, discussed these with the other stakeholders and developed a joint action plan.

#### Integration of learning that stakeholders achieve through working together

The innovation coach not only facilitated interactions among the different stakeholders involved in the cocoa innovation system, but also engaged in a mix of laboratory, on-station and on-farm applied research. Together with two groups of farmers, he combined a number of existing pest-management technologies into a package of IPM practices to control cocoa pests. These experiments had the overall objective to design a pest-management strategy that is environmentally friendly and can be adopted on a wide scale by farmers in a sustainable manner. The innovation coach or facilitator had a very important role, and his neutral status helped to create equal relationships and joint learning.

#### Integration of analysis, action and change at different levels of spatial and social organization

The strengthening of the innovation system deliberately included scientists and farmers, and included both technology development and the institutional context in which technical interventions could be

successful. For example, the organic pesticide neem was only sprayed when it was necessary (using the principles of agro-ecosystem analysis by the farmer field schools), when collective transport could be arranged, and when a separate grinder was developed to avoid the mill giving a bitter taste to food crops after grinding the neem. Also, it only became interesting to collect the rotten husks (which contribute to maintaining black pod disease on the farm) once these could be used in soap production.

#### Integration of analysis, action and change across the different dimensions of development

Increasing world market prices, as well as government support programmes, enhanced farmers' willingness to further invest in cocoa. Farmers received a good price for their production and as a result were ready to invest in their natural resources, the cocoa trees and the fields on which these were grown. It was also because they decided to work together that farmers were motivated to collectively maintain the natural environment and reap the joint benefits.

## Lessons learned

#### Individual change

The IPM approach resulted in farmers changing their farming practices accordingly and in increased yields. Cocoa farmers not only gained further knowledge on cocoa pest management, but also acted as innovation coaches for other villages. Researchers experienced that it is possible to do research with farmers and how this can enhance the likelihood that their proposed technologies correspond to farmers' needs.

#### Organizational change

Social capital and leadership were identified as major issues influencing the quality of learning. In particular, group organization, leadership and trust were major factors for learning. From the joint research with farmers, it was realized that they were not adopting many technologies, and that working together with farmers could be an opportunity to improve research outcomes. This requires changes in the national research organization, such as incentives and allowing researchers to use their time for field visits.

#### Institutional change

The initiated multi-stakeholder platform, which discussed the feedback of the experiments on a regular basis, greatly enhanced interaction among stakeholders. The research agenda was set jointly and this enhanced the likelihood that technologies would answer farmers' needs and result in innovation (where this means a successful mix of technology, ideas, organization and institutional setting). Yet it was concluded that the current research and extension linkages were not very favourable for the development of 'complete' innovations. There is a need to further strengthen the national innovation system and involve all relevant stakeholders to facilitate innovations suitable for the small-scale farmers. CRIG realizes the need to enhance interaction with different stakeholders.

## Case study 7:

## Integrated rice management in Madagascar[127]

### Context

Per-capita rice consumption in Madagascar is among the highest in the world; and, although production and related activities involve about 80% of the rural households and represent 12% of the national economy, the country still needs to import about 10% of its needs.

In 2005, the Aga Khan Foundation (AKF) started an integrated rural-development project in the Sofia region with the objective of improving the revenues of the rural poor by supporting rice producers and production. Based on the experiences of the Africa Rice Center (WARDA), the project adopted a 'participatory learning and action research' (PLAR) process for integrated rice management (IRM) in inland valleys, the major rice-growing ecological zone of the country. From an initial pilot in six villages with 150 farmers, the project now operates in 80 villages with about 3000 farmers.

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

Initially, there was little integration. Extension (Direction Régionale du Développement Rural, DRDR), research (Centre national de la Recherche Appliquée au Développement Rual, FOFIFA) and locally active NGOs considered that low soil fertility was the major issue, so the project was recommended to lay out demonstrations of mineral fertilizers to 'convince' farmers to adopt them. The project was also urged to apply a package of intensive rice production technologies (which required good water control and high labour inputs).[128]

#### Integration of learning that stakeholders achieve through working together

However, the project staff instead introduced the PLAR approach, based on adult learning and using the experiences of members in groups of 20–25 farmers. Facilitators encourage farmers to share their observations in these groups, reflect on these, and then try out new practices in their individual plots.[129] At the end of each crop 'learning cycle', groups identify their own learning needs and compose their own 'curriculum' for the next cycle.

Other stakeholders then learned that farmers could work out for themselves what is best for them, leading to a wide range of finely tuned adaptations (where soil fertility is often not the main issue), and have become interested in using PLAR principles more widely.

#### Integration of analysis, action and change across the different dimensions of development

Since the project started, farmers have been able to double their yields after one season, from 1.7 to more than 4 tonnes per hectare, on average, using limited external inputs. Detailed social and environmental impacts have yet to be documented in Madagascar, although in a similar PLAR project in Mali there was evidence that the PLAR groups resulted in better relationships between men and women, and between different castes.

### Integration of analysis, action and change at different levels of spatial and social organization

The PLAR process has involved analysis, action and change at various spatial and social levels: the field (with crop-management improvements), the farm (decisions on labour and capital use), and the village/community level (e.g. water management for irrigation, use for human and animal consumption). The PLAR groups are now exploring ways of grouping together at higher levels (e.g. district) to negotiate with input providers (e.g. of weeding machines), credit suppliers and rice buyers.

## Lessons learned

### Organizational change

Initially, and based on previous projects, farmers expected direct support from the project in the form of inputs and agricultural tools. However, the PLAR process of learning together—experimenting with new practices, finding solutions themselves based on experience, and reflection—led to a recognition of group strengths that went beyond rice-production aspects to include joint purchases of inputs such as improved seed and farm tools, as well as the storage and selling of rice. Different PLAR groups are now coming together to form a union at district level, with a view to negotiating with input providers and rice buyers, as well as to demand research, information and financial services.

In this case, the facilitators bringing stakeholders together are direct employees of the AKF-funded project. Increasingly, personnel from research, extension and NGOs of the Sofia region and other regions in Madagascar are becoming interested and participate in the yearly capacity-building programme for facilitators. It is perhaps too early to tell what changes this will lead to in their respective organizations, although these services are clearly looking for ways to accommodate the principles of PLAR within their current ways of working.

Also with time, the PLAR groups themselves have become better organized to negotiate with input suppliers and buyers.

### Institutional change

Based on the growing experience and confidence of the PLAR (farmer) groups, the need to 'formalize' a more regional-level platform involving all stakeholders affiliated to the project is recognized. This platform would review and reflect on lessons learned and develop a medium-term development plan.

## Case study 8:

## Natural-resource management in Areka, Ethiopia[130]

### Context

The African Highlands Initiative (AHI) is a partnership among farmers, international, national and regional research institutions, local government, agricultural colleges and NGOs, among others. It has been operational in five countries (Ethiopia, Kenya, Madagascar, Tanzania and Uganda) at eight benchmark (or pilot) sites, since 1995. The discussion in this case study mainly focuses on work at the highland Ethiopian sites in Areka (Wolaita, south–central Ethiopia) and Ginchi (Western Shewa Zone, west–central Ethiopia), although the general approach is common across sites.

The aim of AHI is 'to conduct participatory research in soil resource-based natural resource management to increase farmers' capacity to innovate in their own, to develop system compatible technologies, to improve partnerships among all stake holders and to promote scaling-up of technologies, methodologies and processes'.[131]

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

Initially, an inter-disciplinary team of international and local researchers and extension agents from five governmental and non-governmental institutions conducted a participatory rural appraisal to identify the most pressing problems of the local farming systems. In Areka, for example, which has high population density (450 people/km$^2$) and small land holdings (0.24 ha/household), a number of problems were identified which largely focused on soil fertility. To address these problems, initial interventions tried out included legume cover crops, crop-residue management, contour bunds, grasses and multi-purpose tree species, although participatory variety trials were also used as 'entry points' to stimulate individual farmers' interest.

#### Integration of learning that stakeholders achieve through working together

From the beginning, activities at the AHI pilot sites included a mixture of 'empirical' and action-research. The empirical research (a mixture of 'conventional' researcher-managed studies, but predominantly participatory, on-farm activities with farmer research groups) was intended to characterize situations, set the context and rationale for development-oriented interventions, and guide decision-making. The action-research was intended to focus more on processes and encourage reflection at all levels on technical, organizational and institutional outcomes. In particular, two levels of action-research and learning were recognized: local level, which focused on collective action in NRM through consideration of diverse views; and village or district level, where the focus was on how to support equitable collective-action processes at the local level through changes in institutional practice, policies that reflect local priorities, and negotiation support.

#### Integration of analysis, action and change across the different dimensions of development

Researchers and farmers recognized and evaluated tradeoffs between different benefits (and costs) of the resource-conservation measures. These included tradeoffs between food production and income

generation, between income generation and soil conservation, between environmental and social benefits, and the costs and benefits accruing to different social groups (farmers were grouped according to different resource endowments, and the relative benefits to men and women were explicitly investigated). AHI stakeholders recognized that 'natural resource management is inherently political, with decisions about which management goals to foster leading to unequal benefits and often favouring some groups at the expense of others'.[132]

### Integration of analysis, action and change at different levels of spatial and social organization

Activities by AHI stakeholders focused mainly on interventions at the farm and landscape (watershed) levels, although the need for organizational and policy measures at district and national levels was recognized. Stakeholders also realized that not only are some issues better tackled at farm level and others at communal or watershed level, but there are also tradeoffs between interventions at farm and landscape levels (e.g. allocations of land, labour, capital, nutrient resources at farm level versus optimization of crop, tree, livestock and water productivity at the landscape level).

## Lessons learned

### Organizational change

To facilitate research, the research institutions formed farmer research groups and focus groups. To facilitate collective action for NRM on common lands and at the watershed level, watershed management committees were formed comprising representatives of different villages (although these were not without problems of representation—it was also necessary to identify specific interest groups and incorporate their views). The need to improve social capital, building on existing forms of social organization and institutions where possible, was also recognized to conserve biodiversity and traditional knowledge, as well as improve credit and market access, etc. AHI also looked at the changes necessary in research organizations (such as the Ethiopian Agricultural Research Organization, EARO) to 'operationalize' INRM. These changes included internal changes in structures and practices, and external changes such as linkages and advocacy with key stakeholders (farmers, policy-makers, the private sector), improved resource governance or stronger farmer institutions.

## Case study 9:
## Water harvesting in Kitui, Kenya[133]

### Context

This initiative represents a pilot IAR4D learning site, established in 2006 by four Kenyan universities (University of Nairobi, Egerton University, Jomo Kenyatta University of Agriculture and Technology, and Kenyatta University), the Kenya Agricultural Research Institute (KARI), the Ministries of Agriculture and Livestock Development (MoA, MoLD, respectively), and the Kenyan National Federation of Agricultural Producers (KENFAP). A 'core team' from these participating institutions first attended the ICRA 'ARD Learning Programme' in the Netherlands, with their facilitation of stakeholder interaction at Katulani forming an integral part of this programme.[134]

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

During an initial 6-week period, the core team facilitated a series of workshops at district and community levels, and conducted stakeholder interviews to establish a common understanding of water-management issues in the District, review what was being done by the different stakeholders, and form a multi-stakeholder action plan to address the (jointly re-defined) objectives. To this end, the team also facilitated the formation of a 'Katulani Collaborative Initiative' to 'not only solve the water problem, but also any other complex problem in future'.

#### Integration of learning that stakeholders achieve through working together

As a 'pilot learning site', emphasis was on joint learning. This learning occurred principally within two forms of interaction: the 'core team' and the multi-stakeholder workshops. The team documented the outputs of these workshops, in terms of both technical and process issues, but it remains unclear how much these lessons are being internalized by the different stakeholders.

#### Integration of analysis, action and change across the different dimensions of development

The 'water problem' cut across the agriculture and health sectors, and proposed actions were prioritized for their potential impact on health, natural-resource conservation, productivity and family incomes, as well as likely financial and organizational costs.

#### Integration of analysis, action and change at different levels of spatial and social organization

The core team comprised representatives of national-level stakeholders and their interest mainly concerned multi-stakeholder action (IAR4D processes). They facilitated a forum whereby representatives from community and district levels could interact. It was clear that there were communication problems between these two levels, with community groups expressing some dissatisfaction about priorities set by district agencies and the limited involvement of local people. The plan developed included actions at individual, community, district and national levels, although follow-up actions actually implemented have been, to date, mostly at the community level with inputs from district level and national core-team members.

## Lessons learned

### Individual change

Most of the concrete achievements documented refer to improvement at the household and sub-district levels, and focus on technical issues (soil and water conservation, hygiene). Documentation of attitudinal and behavioural changes needs to be improved.

### Organizational change

Although this may be a problem of appropriate documentation, there is little evidence yet of institutional change, either at local or national level. Although members of the original core team are aware of organizational issues, and have conducted specific studies to identify the specific constraints to collaboration between their different organizations, the lessons from the pilot learning site have yet to impact on this level. Organizational change in support of IAR4D needs time.

### Institutional change

The national-level core team facilitated the stakeholder interaction during the initial 3 months, after which representatives of the MoA, MoLD and KARI played a key role. It is unclear if the 'Katulani Collaborative Initiative' has yet provided the desired self-managing local 'platform' to sustain this stakeholder interaction. Managing the inter-institutional space where few norms and rules exist is a key challenge.

# Case study 10:
# IAR4D learning in northern Uganda[135]

## Context

In Uganda, the National Agricultural Research Organisation (NARO) formed a partnership with Makerere University (MAK) and the International Centre for development oriented Research in Agriculture (ICRA) 'to strengthen human and institutional capacity to undertake IAR4D as a new way of doing business, initially in Uganda and later on a sub-regional level'. An initial key activity was the organizing of an IAR4D learning cycle, consisting of a series of five one-week 'knowledge acquisition–planning–reflection' workshops for teams comprising representatives of NARO and MAK personnel, and in some cases representatives of local government or NGOs. These workshops were designed to support intervening fieldwork around priority 'R&D Challenges' or entry points identified by NARO's Zonal Agricultural Research and Development Institutes (ZARDIs).

## IAR4D principles illustrated

### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

One of the seven teams focused on the R&D challenge identified by NARO's Ngetta ZARDI—'enhancing production, processing and marketing of upland rice for sustainable improvement of farmers' livelihood in the mid-northern agro ecological zone'. This theme was selected on the basis of rice as an important local food-security crop with good market potential, and the presence of an important Ministry Swamp Rice Irrigation project locally. Workshops were held with invited stakeholders to discuss the current situation, identify stakeholder perceptions of the rice development challenge and agree on a joint plan of action. As a result of these discussions, a 'Ngetta IAR4D Initiative Committee on Upland Rice Production' was formed, with representatives from farmers, input dealers, wholesalers, stockists, credit institutions, local government, National Agricultural Advisory Services (NAADS) and researchers.

### Integration of learning that stakeholders achieve through working together

The most intensive learning of concepts and approaches took place within the context of the core team of nine people that attended the NARO–MAK–ICRA 'learning cycle' at national level over a one-year period. This team then conducted workshops with local stakeholders to pass on some of these concepts and approaches, analyse the rice development challenge to develop a joint action plan, and reflect on this process. After the initial learning cycle, 'mentoring' visits by IAR4D facilitators continued to support learning by the team and encourage reflection on the application of IAR4D principles.

### Integration of analysis, action and change across the different dimensions of development

One of the reasons for selecting upland rice as a priority research theme was the perception that this was less damaging to the environment than swamp rice, as well as offering greater potential for food security and income. However, little potential (*ex-ante*) or actual impact has been documented on these environmental or economic outcomes, or on the costs and benefits to different social groups.

### Integration of analysis, action and change at different levels of spatial and social organization

In addition to activities at farm, community and district levels, a market-chain analysis survey was conducted. This was in order to identify constraints and opportunities and generate information on how

to improve the production and commercialization of upland rice within the districts of Apac and Lira, and in key rice markets in the national capital, Kampala.

## Lessons learned

### Individual change

As well as improvement in knowledge of IAR4D concepts and approaches, the learning cycle had a marked influence on the attitudes of individuals involved. Indigenous knowledge was identified and documented, and the resulting recognition by researchers that there are some practices of farmers that can form the basis for technology development led to farmers 'realizing that their ideas were valued by researchers'. Improved confidence and a broader vision of development and the role of research by ZARDI staff improved the identification and prioritizing of the zonal technologies and activities, as well as improved contact and communication with other stakeholders.

### Organizational change

One of the main benefits of the learning cycle was the improvement of teamwork at Ngetta ZARDI. Improved interaction resulted in the establishment of a regular bi-monthly series of meetings for technical teams, which in turn led to improved consultation between staff, and better involvement of technicians who had previously been less involved in decision-making. Farmer groups for adaptive research were established through local government and with extension (rather than directly as previously), which led to improved needs assessment at the organizational level.

### Institutional change

Prior to the learning cycle, Ngetta ZARDI interacted with farmers and some development partners such as local government and NGOs. However, little effort had been made to involve a wider spectrum of stakeholders such as traders, processors, stockists and others whose potential input to research and development activity had been under-estimated. In this case, it led to the establishment of a multi-stakeholder umbrella—the 'Ngetta IAR4D Initiative Committee on Upland Rice Production'—as a means to coordinate stakeholder activity. The involvement of these stakeholders during the learning cycle led to improved interaction between them and the ZARDI, exemplified by increased sharing of resources (e.g. district production department making vehicles, computers and a digital camera available to the research institute).

# Case study 11:
# CORDEMA in Tanzania[136]

## Context

Based on lessons learned during the last decade, and under the Tanzanian Agricultural Sector Development Programme (ASDP 2006–2011), research is being decentralized, stressing client orientation and the effective delivery of productive, profitable and sustainable technologies for small-holders. A crucial part of this process is the introduction of the 'Client-Oriented Research and Development Management Approach' (CORDEMA) across the entire Tanzanian NARS.

CORDEMA adds an essential development focus (not emphasized in CORMA as earlier implemented) by incorporating three important additional components:

- Changing mindsets through training—CORDEMA training will reach beyond researchers to the wider R&D community;
- Funds for planning collaborative activities—multi-stakeholder teams will be formed around priority research problems;
- A mainstream development-orientated research fund—a market-oriented research agenda will be funded.

The CORDEMA institutional and organizational change programme will build on the experiences of pilot projects in the Northern, Lake and Eastern Zones and, under ASDP, extend these to all seven research and development zones in Tanzania.

CORDEMA aims to enhance the performance of research and development through zonal agricultural research and development funds (ZARDEFs), enhanced individual capacity of researchers and partners with emphasis on multi-stakeholder interactive learning, organizational change and institutional change in zonal research centres, and the required policy change at national level. The objective of CORDEMA is therefore to increase the level of client orientation of agricultural research centres through improved management and organization, e.g. in terms of human and financial resource management for efficiency and enhanced stakeholder interaction and partnership development, participatory planning and knowledge management for effectiveness.

## IAR4D principles illustrated

### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

Based on priorities identified at district and zonal levels, multi-stakeholder partnerships will prepare proposals that will be reviewed by a multi-stakeholder technical committee and approved by the zonal steering committee for funding by the ZARDEF.

### Integration of learning that stakeholders achieve through working together

Joint implementation of activities will be achieved through regular training and facilitation by zonal advisory services. The CORDEMA training and facilitation programme is supported by a consortium of the Ministries (Departments of Research), Sokoine University, an NGO (Participatory Ecological Land Use Management, PELUM)[137] and a farmer organization (MVIWATA).[138]

### Integration of analysis, action and change across the different dimensions of development

The ZARDEF screening criteria on multi-stakeholder priority-setting, interactive partnership learning, integrated assessments for pro-poor development and up-scaling/uptake strategies set the scene for the integration of different dimensions of economic development with a livelihood perspective. Only research-for-development proposals meeting the criteria will be funded by zonal funds.

### Integration of analysis, action and change at different levels of spatial and social organization

Interaction between district-level farmers' forums, district authorities and the zonal steering committees will lead to a clear priority-setting for use of the zonal funds. The feedback from research partners on the implemented research programmes, as well as the role of research centres in these programmes, will lead to recommendations for research managers and policy-makers.

## Lessons learned

The CORDEMA capacity-development programme is about institutional development (i.e. the quality of relations with other stakeholders leading to an effective role of research), organizational development (efficient use of resources for client-oriented research), development of personal skills and knowledge on client-orientation in an innovation-system perspective, as well as use of the proper tools and methods for quality client-oriented research.

### Individual change

Tanzania has made major investments in individual training in various bilateral and multi-lateral funded projects and programmes. More than 400 researchers have received training in farming systems. Nevertheless, a dominant attitude in relation to non-public-sector stakeholders remains, as interaction with the private sector is limited.

### Organizational change

A central element in CORDEMA is to change the management of research centres from a supply-driven orientation to more demand-driven service delivery. This requires doing 'business unusual' both in terms of internal management (market principles, incentives, etc.) as well as external linkages—changing to a service attitude and recognition of a multi-actor innovation system.

### Institutional change

Though CORDEMA is doing business unusual in terms of interaction of research with other actors in the innovation system, institutional innovation will be needed. In Tanzania, lessons have been learned in relation to multi-stakeholder platforms at zonal level, farmer forums, decentralized competitive and stakeholder-driven funding mechanisms, as well as interactive learning in action-research. Organizational and, above all, institutional change requires policy support and change. Recent developments in terms of re-centralization of resource management (limitation in zonal revenue retention, removal of levies for research, etc.) do not support this institutional change.

## Case study 12:

## Water management in Noord Brabant, the Netherlands[139]

### Context

In the last years of the 20th century, ground-water tables were decreasing on sandy soils in the eastern and southern provinces of the Netherlands. The fast discharge of surplus water in winter and spring due to improved drainage and the increased water use by agriculture, industry and consumers was having a negative effect on the water availability to nature reserves in drier periods and was therefore considered to be environmentally damaging. Many dairy farms in the area applied supplementary irrigation to maximize pasture and fodder production, and were then sometimes blamed by water authorities for luxury use of scarce ground water.

### IAR4D principles illustrated

#### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

The National Water Plan aimed to reduce water use by at least 25% in drought-affected areas of nature reserves and forests. Within this framework, the Provincial Government of Noord Brabant (PB) developed a Regional Water Policy, which banned irrigation before June, limited irrigation on grass during daytime, and included further measures to ban irrigation from ground water completely from 2000. However, a total ban would have drastically affected forage production from grass and maize. To avoid this type of conflict between stakeholders, the PB and the main farmer organization (Zuidelijke Land- en TuinbouwOrganisatie, ZLTO) formed the Agricultural Innovation Bureau (LIB) in 1993 to support and coordinate activities leading to acceptable solutions for all stakeholders. The LIB therefore established and partially financed research aimed at finding more drought-tolerant crops and improving the efficiency of irrigation strategies.

Results from research and farmers' experience showed that dairy farming without irrigation on intensively used, drought-sensitive sandy soils in the southern Netherlands is very difficult if not impossible in dry years. Alternative forages such as lucerne were not as suitable as hoped. The plan to ban irrigation completely was therefore dropped, and emphasis from 1996 was subsequently placed on improving water use through more efficient irrigation.

To this end, research developed and tested in pilot farms a number of decision-support tools that predicted the water status of individual fields and soil types, identified supplementary irrigation needs and the likely economic benefit of such irrigation. These management tools were introduced and demonstrated on 15 pilot farms in 1996, on 200 farms in 1997, and on 2000 farms in 1998. At this stage, and with the resulting lower water use from the more efficient irrigation, the province of Brabant lifted the ban on daytime irrigation.

#### Integration of learning that stakeholders achieve through working together

This research and development involved several stakeholders working closely and learning together. The LIB coordinated the overall project, with the support of a steering committee with representatives of the farmer organization (ZLTO), the provincial government (PB), applied research centres (National Research Station for Cattle, Sheep and Horse Husbandry or PR, National Research Station for Arable

Farming and Field Production of Vegetables or PAV), adaptive research institutes (Centre for Agriculture and Environment or CLM, Institute for Integrated Land, Soil and Water Management or SC-DLO) and extension (DLV).

The local research was mainly located at Cranendonck (one of the field stations of PR) and in farmers' fields, with support from the extension service (DLV), which selected participating farmers and introduced, demonstrated and gave advice on the irrigation decision-support tools. DLV did this both in farmer group meetings ('study groups') and with individual farmers. Feedback from the pilot farmer groups was very important in evaluating and refining the tools, and researchers also participated in these sessions. The DLO institutes carried out supplementary research, and a private company collaborated to develop the decision-support software.

Joint learning thus took place in field demonstrations (at both the research station and in farmers' fields), in farmer study groups (when extensionists and researchers were present), as well as during discussions of the steering group and regional research committees (where farmer representatives were present, along with extension and other stakeholders such as the ministry and animal-health bodies). The research stations provide information to and train specialized extension workers from DLV and commercial extension agents.

The most telling evidence of learning together in this case is provided by the change of irrigation practice by individual farmers, and the change in agricultural water-use policy of the PB—neither of which would have happened without joint learning.

#### Integration of analysis, action and change across the different dimensions of development

From the beginning, the provincial authorities and regional farmer organizations in Noord Brabant both wished to promote the development of economically and ecologically sustainable agriculture. The LIB that they established was mandated to only support projects that considered both economic and ecological outcomes.

#### Integration of analysis, action and change at different levels of spatial and social organization

The original need to innovate was promoted by provincial and national concern with water management, and the impact on nature reserves, as well as general water availability and quality. The subsequent actions involved stakeholder analysis and action at all levels—national, provincial, farmer groups and individual.

## Lessons learned

This case shows strong stakeholder linkages, which function even (or especially) when there are conflicts of interest. Farmer organizations in the Netherlands have a long history, have considerable lobbying power with provincial and national authorities, and play a decisive role in determining the research and extension agenda (through levies, they fund approximately 50% of applied research; after privatization of DLV in 1993, farmers also pay for extension services).

A principle linkage mechanism is the mixed stakeholder representation on the boards of many organizations (e.g. research, district water boards). Nevertheless, it was felt necessary by the main farmer organization and the provincial authorities to establish a specific mechanism—the LIB—to improve further joint action that satisfies both the wider interests of society and also the more specific interests of farmers.

# Case study 13:
# Mainstreaming IAR4D in Uganda[140]

## Context

In line with the Comprehensive Africa Agriculture Development Programme (CAADP),[141] the Ugandan Poverty Eradication Action Plan (PEAP) of 1997 and the Plan for Modernisation of Agriculture (PMA) of 2000 identified the need to make public extension and research services more demand-driven and market-responsive for enhanced rural poverty reduction. Government acts on the National Agricultural Advisory Services (NAADS) in 2001, and national agricultural research in 2005, were also passed with this objective. In practice, major emphasis was given to decentralization of agricultural advisory services to district/sub-county levels and to research services at zonal level, as well as stronger involvement of non-public actors in both extension and research services, and the introduction of performance contracts for public services. Related to these reforms, the National Agricultural Research Organisation (NARO) implemented a 'pilot IAR4D learning cycle' in 2004–2005 (see Case study 10), and different teams of researchers and partners (in total 11 teams) participated in the ASARECA competitive grant scheme which also applied IAR4D principles. The recent National Agricultural Research Strategy (2008–2018) emphasizes that the IAR4D concept requires mainstreaming in all agricultural research of the publicly funded NARS. The following illustrates how this will be achieved.

## IAR4D Principles illustrated

### Integration of perspectives, knowledge and actions of different stakeholders around a common theme

In the National Agricultural Research System Programme 2009–2014, the research programme will become more focused on demand and markets through enhanced priority-setting. Innovation-systems analysis and livelihood assessments will involve all key stakeholders in priority commodity chains at national level, and in major themes at zonal level. Guidelines are being revised to enable priorities to be determined and updated annually by farmer forums at district level, and by key actors in the product chains of national importance. As a result, priorities are expected to reflect market and environmental issues, rather than focus mainly on production.

### Integration of learning that stakeholders achieve through working together

Innovation platforms of key stakeholders will be formed at the district and zonal levels (for local themes), and at the national level (for specific and priority commodities). These platforms will meet regularly to endorse action plans and supervise facilitators of multi-stakeholder processes of action-research and development. The research programmes will be analysed, discussed and appraised annually in multi-stakeholder forums at zonal and national levels, based on jointly agreed learning-process indicators.

### Integration of analysis, action and change across the different dimensions of development

The NARS Programme 2009–2014 and its competitive grant scheme have established guidelines for inclusion of market analysis and livelihood analysis, as well as simple analysis of productivity in its research programmes. A special environmental issues programme, which addresses sustainable production as well as guidelines for the mitigation of climate change, is being developed. All stakeholders in the innovation platform are involved in the monitoring and assessment of these programmes.

### Integration of analysis, action and change at different levels of spatial and social organization

The provision of agricultural advisory services through NAADS has to a large extent been privatized in Uganda. The wide variety of service providers from both the public and private sectors are the principal partners for research, further use of jointly generated knowledge and reflection on lessons learned at zonal and national levels. The NARO and NAADS secretariats will jointly oversee these processes, which will be further strengthened by joint operation in 12 national priority enterprises and joint zonal adaptive research and dissemination programmes.

## Lessons learned

### Individual change

Since 2000, individual researchers have interacted significantly more with other stakeholders, notably farmers, but have retained a public-sector attitude. More development of IAR4D competences is still needed, in terms of knowledge, skills and attitude. To develop this competency, a national team of experienced IAR4D researchers from NARO research institutes and from Makerere University, under the coordination of NARO Secretariat, oversees IAR4D training programmes. These programmes bring together stakeholders within the context of established research programmes. Further strengthening of IAR4D capacity is expected from an IAR4D capacity-development programme being developed by ASARECA, as well as programmes of FARA's SSA CP and international agencies strong in IAR4D expertise.

### Organizational change

As a result of experiences with the IAR4D national team, an IAR4D coordinator will be appointed within the NARO Secretariat. The IAR4D team will also monitor the level and quality of implementation of the IAR4D principles, using criteria to be established. Priority-setting guidelines will be updated with multi-stage selection or decision-tree processes, to avoid the tendency for important criteria such as market orientation to be under-emphasized when simple scoring lists with multiple criteria are used. The guidelines for the screening of competitive grant scheme proposals will be updated to ensure that only proposals that have explicit reference to and implementation pathways for all four IAR4D principles will pass the screening process.

### Institutional change

The IAR4D experience in Uganda to date has shown that it is essential to strengthen partnerships and alliances between key stakeholders focused on a particular R&D theme in such a way that these allow for interactive learning. Above all, this requires a change of attitude by researchers from one of technology provider to one of service provider and knowledge contributor. Empowered multi-stakeholder configurations, such as formal partnerships with effective MoUs, as well as innovation platforms endorsing joint action plans, are essential elements in this process of transformation.

# Acronyms and abbreviations

| | |
|---|---|
| ACP | African, Caribbean and Pacific Group of States |
| AHI | African Highlands Initiative |
| AIDS | Acquired Immune Deficiency Syndrome |
| AIS | agricultural innovation systems |
| AKF | Aga Khan Foundation |
| AKIS | agricultural knowledge and information system |
| AKST | agricultural knowledge, science and technology |
| ALFCU | Ada'a-Lume Farmers' Cooperatives' Union, Ethiopia |
| APRA | *Apprentissage Participatif et Recherche Action* (French for PLAR) |
| AR | action-research |
| ARD | Agricultural Research for Development |
| ASARECA | Association for Strengthening Agricultural Research in Eastern and Central Africa |
| ASCO | Ayensi Starch Company, Ghana |
| ASDP | Agricultural Sector Development Programme, Tanzania |
| ASTI | Agriculture, Science, Technology and Innovation |
| ATPS | African Technology Policy Studies Network |
| BoARD | Bureau of Agriculture and Rural Development, Ethiopia |
| CAADP | Comprehensive Africa Agriculture Development Programme |
| CABI | CAB International, UK |
| CAP | *Centrales d'Autopromotion Paysanne* (producer/farmer organizations), Togo |
| CASE | Competitive Agricultural Systems and Enterprises |
| CGIAR | Consultative Group on International Agricultural Research |
| CIAT | International Center for Tropical Agriculture (*Centro Internacional de Agricultura Tropical*) |
| CIP | International Potato Centre |
| CLM | Centre for Agriculture and Environment, the Netherlands |
| CORDEMA | Client-Oriented Research and Development Management Approach |
| CORMA | Client-Oriented Research Management Approach |
| CRIG | Cocoa Research Institute of Ghana |

| | |
|---|---|
| CSIR | Council for Scientific and Industrial Research, Ghana |
| CTA | Technical Centre for Agricultural and Rural Cooperation ACP–EU |
| DFID | Department for International Development, UK |
| DLO | *Dienst Landbouwkundig Onderzoek*, the Netherlands |
| DLV | *Dienst Landbouw Voorlichting* (extension service), the Netherlands |
| DRDR | *Direction Régionale du Développement Rural* (extension service), Madagascar |
| DRT | Department of Research and Training, Tanzania |
| DZRC | Debre Zeit Research Centre, Ethiopia |
| EARO | Ethiopian Agricultural Research Organization |
| EB | Ethiopian Birr (unit of currency in Ethiopia) |
| ECAPAPA | Eastern and Central Africa Programme on Agricultural Policy Analysis (ASARECA) |
| ECDPM | European Centre for Development Policy Management |
| EFCU | Ethiopian Farmers' Cooperatives Union |
| e.g. | for example (*exempli gratia*) |
| EIARD | European Initiative for Agricultural Research for Development |
| ENDA-GRAF | *Environnement et Développement Afrique—Groupe Recherche Action Formation,* Senegal |
| EPA | Economic Partnership Agreement |
| ERI | Enabling Rural Innovation |
| etc. | and so on (*et cetera*) |
| EU | European Union |
| Faida MaLi | NGO empowering women and men in rural Tanzania |
| FAO | Food and Agriculture Organization of the United Nations |
| FARA | Forum for Agricultural Research in Africa |
| FFS | Farmer Field School |
| FOFIFA | *Centre national de la Recherche Appliquée au Développement Rural*, Madagascar |
| FRI | Food Research Institute (CSIR), Ghana |
| FSR | farming systems research |
| GDP | Gross Domestic Product |
| GIR | Gestion Intégrée de la culture de Riz de bas-fonds |
| ha | hectare(s) |
| HIV | Human Immunodeficiency Virus |
| IAASTD | International Assessment of Agricultural Knowledge, Science and Technology for Development |
| IAR4D | Integrated Agricultural Research for Development |

| | |
|---|---|
| ICRA | International Centre for development oriented Research in Agriculture |
| ICT | information and communications technology |
| IDRC | International Development Research Centre, Canada |
| i.e. | that is (*id est*) |
| IER | *Institut d'Economie Rurale*, Mali |
| IFAD | International Fund for Agricultural Development |
| IFDC | International Center for Soil Fertility and Agricultural Development (*formerly* International Fertilizer Development Center) |
| IFPRI | International Food Policy Research Institute |
| IFSA | International Farming Systems Association |
| IIED | International Institute for Environment and Development |
| IIRR | International Institute of Rural Reconstruction |
| ILAC | Institutional Learning and Change (CGIAR initiative) |
| ILEIA | Centre for Information on Low External Input and Sustainable Agriculture |
| ILRI | International Livestock Research Institute |
| INRM | integrated natural-resource(s) management |
| IPM | Integrated Pest Management |
| IRD | Integrated Rural Development |
| IRM | integrated rice management |
| ISFM | Integrated Soil Fertility Management (IFDC project); integrated soil-fertility management |
| ISNAR | International Service for National Agricultural Research (now the Knowledge, Capacity and Innovation Division of IFPRI) |
| KARI | Kenya Agricultural Research Institute |
| KENFAP | Kenyan National Federation of Agricultural Producers |
| KFSC | Kaliti Food Company, Ethiopia |
| KIT | Royal Tropical Institute (*Koninklijk Instituut voor de Tropen*), The Netherlands |
| km | kilometre(s) |
| LIB | Agricultural Innovation Bureau, the Netherlands |
| LINK | Learning INnovation Knowledge (network of regional innovation policy study hubs) |
| M&E | monitoring and evaluation |
| MAK | Makerere University, Uganda |
| MDG | Millennium Development Goal |
| MoA | Ministry of Agriculture |
| MoLD | Ministry of Livestock Development, Kenya |
| MoU | Memorandum of Understanding |

| | |
|---|---|
| MVIWATA | National network for smallholder farmers in Tanzania |
| NAADS | National Agricultural Advisory Services, Uganda |
| NARO | National Agricultural Research Organisation, Uganda |
| NARS | national agricultural research system(s) |
| NATURA | Network of European Agricultural (Tropically and Sub-tropically oriented) Universities and Scientific Complexes Related with Agricultural Development |
| NEPAD | New Partnership for Africa's Development |
| NGO | non-governmental organization |
| NHRC | National Horticultural Research Centre, Kenya |
| NIE | New Institutional Economics |
| NRM | natural-resource(s) management |
| NUFG | Nyabyumba United Farmers Group, Kabale, Uganda |
| ODA | Overseas Development Administration, UK (now DFID) |
| PAR | participatory action-research |
| PAV | National Research Station for Arable Farming and Field Production of Vegetables, the Netherlands |
| PB | Provincial Government of Noord Brabant, The Netherlands |
| PEAP | Poverty Eradication Action Plan, Uganda |
| PELUM | Participatory Ecological Land Use Management (NGO, regional network) |
| PhD | Doctor of Philosophy (doctoral degree) |
| PID | participatory innovation development |
| PLAR | participatory learning and action-research |
| PMA | Plan for Modernisation of Agriculture, Uganda |
| PR | National Research Station for Cattle, Sheep and Horse Husbandry, The Netherlands |
| PRA | participatory rural appraisal |
| PRAPACE | Regional Potato and Sweet Potato Improvement Network in Eastern and Central Africa |
| Prolinnova | PROmoting Local INNOVAtion (global learning network to promote local innovation in ecologically oriented agriculture and NRM) |
| PSSDRI | *Projet de Soutien de la région SOFIA pour le Développement Rural Intégré,* Madagascar |
| PTD | participatory technology development |
| R&D | research and development |
| RAAKS | Rapid Appraisal of Agricultural Knowledge Systems |
| RAFIA | *Recherche-Action et Formation aux Initiatives d'Autodéveloppement* (NGO), Togo |

| | |
|---|---|
| RRA | rapid rural appraisal |
| RUFORUM | Regional Universities Forum for Capacity Building in Agriculture (consortium of 22 universities in East, Central and Southern Africa) |
| SC-DLO | *Staring Centrum-Dienst Landbouwkundig Onderzoek* (Institute for Integrated Land, Soil and Water Management), the Netherlands |
| SEMCA | Sustainability, Education and the Management of Change in Africa |
| SRI | Système riz intensif |
| SRL | sustainable rural livelihoods |
| SSA | Sub-Saharan Africa |
| SSA CP | Sub-Saharan Africa Challenge Programme |
| SSM | Soft-systems methodology |
| STEPRI-CSIR | Science and Technology Policy Research Institute (CSIR), Ghana |
| UK | United Kingdom |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| UNU-MERIT | United Nations University—Maastricht Economic and social Research training centre on Innovation and Technology, the Netherlands |
| UPWARD | Users' Perspectives With Agricultural Research and Development (CIP Asian network) |
| US$ | United States dollar |
| VECO | *Vredeseilanden* (NGO), Belgium |
| WARDA | Africa Rice Center |
| WTO | World Trade Organization |
| ZARDEF | zonal agricultural research and development fund, Tanzania |
| ZARDI | Zonal Agricultural Research and Development Institute, Uganda |
| ZLTO | *Zuidelijke Land- en TuinbouwOrganisatie* (agricultural producers' organization), the Netherlands |

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# Endnotes

1. This paper was written in response to an invitation from the Forum for Agricultural Research in Africa (FARA), which invited us 'to look at the origins, background and foundations of IAR4D'. FARA conceived this paper as the first of a series of three separately commissioned documents: the first being this 'white paper'; the second (in 2011) to look at the 'proof of concept' of IAR4D and techniques of out-scaling and up-scaling; and the third (in 2015) to look at the impact of IAR4D on rural income, livelihoods, poverty reduction and the accomplishment of relevant aspects of the Millennium Development Goals.

2. We believe the term 'IAR4D' was initially used at the first of the SSA CP formulation meetings held in Accra in March 2003. The concept was further explored at an ICRA–NATURA discussion group and meeting later that year, at the IAR4D conference hosted by the National Agricultural Research Organisation (NARO) in Uganda in 2004 (see *Uganda Journal of Agricultural Sciences* Volume 9), and through a KIT–ASARECA discussion group and workshops in East Africa during 2007. IAR4D is now used as the basis for national initiatives in Kenya and Uganda, as well as for the FARA SSA CP (see http://www.fara-africa.org/networking-support-projects/ssa-cp).

3. As with many such concepts, there are many definitions of 'innovation'. For the purposes of this concept paper, we define it as 'a new product, new process or new form of organization brought into economic use' (adapted from the definition of an innovation system in Hall, A., L. Mytelka and B. Oyeyinka, 2006. Concepts and Guidelines for Diagnostic Assessments of Agricultural Innovation Capacity*. UNU-MERIT Working Paper no. 2006-017*. UNU-MERIT, Maastricht, the Netherlands (available at http://www.merit.unu.edu/publications/wppdf/2006/wp2006-017.pdf). For a whole 'blogful' of definitions, visit http://jburg.typepad.com/future/2007/08/innovation.html.

4. The Learning INnovation Knowledge (LINK) network, established by the United Nations University—Maastricht Economic and social Research and training centre on Innovation and Technology (UNU-MERIT) and the Food and Agriculture Organization of the United Nations (FAO) aims to strengthen the interface between rural innovation studies, policy and practice and to promote North–South and South–South learning on rural innovation (http://www.innovationstudies.org).

5. See, for example, Spielman, D.J., 2005. Innovation Systems Perspectives on Developing-Country Agriculture: A Critical Review. *ISNAR Discussion Paper* No. 2. IFPRI, Washington, DC (available at http://www.ifpri.org/divs/isnar/dp/isnardp02.asp).

6. World Bank, 2006. *Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems.* The World Bank, Washington, DC (available at http://siteresources.worldbank.org/INTARD/Resources/Enhancing_Ag_Innovation.pdf).

7. IFAD, 2007. *Innovation Strategy.* IFAD, Rome (available at http://www.ifad.org/pub/policy/innovation/e.pdf). Includes concept of innovation as it applies to rural small-holders.

8. The Royal Tropical Institute (KIT) maintains a portal on rural innovation systems at http://portals.kit.nl/smartsite.shtml?id=7587; the Technical Centre for Agricultural and Rural Cooperation ACP–EU (CTA) maintains a portal on 'demanding innovation' at http://knowledge.cta.int/en/content/view/full/391.

9. See, for example, the papers presented at the Innovation Africa Symposium, 20–23 November 2006, Kampala, Uganda (available at http://www.innovationafrica.net, and also published as Sanginga, P.C., A. Water-Bayer, S. Kaaria, J. Njuki and C. Wettasinha (ed.), 2009. *Innovation Africa: Enriching Farmers' Livelihoods.* Earthscan, London and Sterling, VA), and at the International Conference on Advancing Agriculture in Developing Countries through Knowledge and Innovation, 7–9 April 2008, Addis Ababa, Ethiopia (available at http://www.ifpri.org/events/conferences/2008/20080407.asp).

10. ICRA's concept of ARD is described at http://www.icra-edu.org.

11. More information on EIARD is available at http://www.eiard.org.

12. We note here the similar definition of IAR4D as used by the FARA SSA CP: 'IAR4D is an action research approach for investigating and facilitating the organization of groups of stakeholders (including researchers) to innovate more effectively in response to changing complex agricultural and natural resources management contexts for improved developmental outcomes' (FARA, 2007. *Sub-Saharan Africa Challenge Programme, Medium Term Plan 2008–2010*. FARA, Accra, Ghana).

13. The SSA CP describes IAR4D as characterized by approaches that are: inclusive of multiple stakeholders and promote collective/collaborative interaction among these different stakeholders; multi-disciplinary, multi-sectoral and multi-scalar (rather than disciplinary/commodity-specific); participatory (not just consultative of farmers); based on innovation platforms formed by partnership/teams around problems/entry points; directed at all parts of the value chain (input supply–seeding–production–consumption); based on knowledge sharing by interaction and specific allocation of time/resources; flexible and adaptive to new knowledge (FARA, 2007. *Sub-Saharan Africa Challenge Programme, Medium Term Plan 2008–2010*. FARA, Accra, Ghana, page 59).

14. For more information on the SSA CP, see http://www.fara-africa.org/networking-support-projects/ssa-cp.

15. FARA, 2007. *Sub-Saharan Africa Challenge Programme, Medium Term Plan 2008–2010*. FARA, Accra, Ghana (page 59).

16. The systems thinker Russell Ackoff explored the idea of 'complex problems' in his 1974 book *Redesigning the Future* (Ackoff, R.L., 1974. *Redesigning the Future: A Systems Approach to Societal Problems*, vol. 10. Wiley). He defined three levels: a 'mess' (when the nature of the problem is unclear), a 'problem' (which is more clear cut, but has several alternative solutions, depending on circumstances), and a 'puzzle' (which is well defined and well structured, with a specific solution). More recently, Patricia Rogers has described three types of intervention: 'simple' (e.g. following a recipe), 'complicated' (e.g. a rocket to the moon) and 'complex' (e.g. raising a child), and has emphasized that different types of intervention need different types of impact assessment (see Rogers, P., 2008. Four key tasks in impact assessment of complex interventions. Paper presented at the Workshop on Rethinking Impact: Understanding the Complexity of Poverty and Change, Cali, Colombia, 26–28 March 2008; available at http://www.prgaprogram.org/riw/files/papers/Rogers%20material%20for%20workshop.ppt).

17. By 'stakeholders', we refer to individuals, groups or organizations that can affect or are affected by a particular issue, system or innovation. Related terms are 'interest groups' (which indicates that people can be grouped according to a common interest), and 'actors' (which emphasizes that some or all stakeholders are active and interact with each other).

18. For a more thorough but relatively brief consideration of constructivism in science, see Matthews, M.R., 2000. Constructivism (editorial). *Science and Education* 9: 491–505 (special issue on 'Constructivism, Epistemology and the Learning of Science').

19. We use here the term 'epistemology' as 'the theory of the method or the grounds of knowledge' (*Concise Oxford Dictionary*).

20. A relatively early account of African farmer expertise can be found in de Schlippé, P., 1956. *Shifting Cultivation in Africa. The Zande System of Agriculture.* Routledge and Kegan Paul.

21. An example of the growing recognition of African farmers' capacity to innovate was Richards, P., 1985. *Indigenous Agricultural Revolution: Ecology and Food Production in West Africa.* Hutchinson and Co. One of the authors of this paper—Robert Booth—is happy to acknowledge that much of his early professional credit, for his work on diffused light storage of potatoes, was gained from a technology originally developed by farmers in Kenya, Nepal and Peru.

22. The importance of farmer innovation was recognized by Biggs, S.D. and E.J. Clay, 1981. Sources of innovation in agricultural technology. *World Development* 9(4): 321–336. Two later compilations of the growing experience with farmer innovation and farmer participation in research were Peter Matlon, P.J., R. Cantrell, D. King and M. Benoit-Cattin (ed.), 1984. *Coming Full Circle: Farmers' participation in the development of technology.* IDRC, Ottawa, and Chambers, R., A. Pacey and L.A. Thrupp, 1989. *Farmer First: Farmer Innovation and Agricultural Research.* Intermediate Technology Publications.

23. An example of the initiatives that promote PTD/PID across countries in Africa and elsewhere is Prolinnova: PROmoting Local INNOVAtion in ecologically-oriented agriculture and NRM—see http://www.prolinnova.net.

24. Published resources on 'participation' are too numerous to summarize. A good place to start looking is the Eldis participation portal: http://www.eldis.org/participation.

25. All major donors and agencies have published extensively on participatory methods. Just two examples are Rietbergen-McCraken, J. and D. Narayan, 1996. *Participation and Social Assessment: Tools and Techniques.* The World Bank, Washington, DC (available at http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1996/04/01/000009265_3980624143608/Rendered/PDF/multi0page.pdf), and World Bank, 1996. *The World Bank Participation Sourcebook*. The World Bank, Washington, DC (available via http://go.worldbank.org/R3WF0ID3N0).

26. Experience with participation in agricultural research was reviewed by Okali, C., J. Sumberg and J. Farrington, 1994. *Farmer Participatory Research: Rhetoric and Reality.* Intermediate Technology Publications, London. A more recent overview of concepts and methods is given by Gonsalves, J., T. Becker, A. Braun, D. Campilan, H. Chavez, E. Fajber, M, Kapiriri, J. Rivaca-Caminade and R. Vernooy, 2005. *Participatory Research and Development for Sustainable Agriculture and Natural Resource Management: A Sourcebook*. CIP-UPWARD/IDRC (available at http://www.idrc.org.sg/en/ev-84706-201-1-DO_TOPIC.html).

27. Much of the experience with participatory research tools has been summarized over the years in the informal journal *Participatory Learning and Action* (formerly *PRA Notes*). See http://www.iied.org/NR/agbioliv/pla_notes/index.html.

28. The changing emphasis of participation is illustrated by a series of books from the International Development Studies Group and others: Chambers, R., A. Pacey and L.A. Thrupp, 1989. *Farmer First: Farmer Innovation and Agricultural Research.* Intermediate Technology Publications; Thompson, J. and I. Scoones (ed.), 1994. *Beyond Farmer First: Rural People's Knowledge, Agricultural Research and Extension Practice*. Intermediate Technology Development Group; and I. Scoones and J. Thompson (ed.), 2009. *Farmer First Revisited: Innovation for Agricultural Research and Development.* Practical Action.

29. A good example is the UK: ODA, 1995. *Comprehensive Guidance Note on How to do Stakeholder Analysis of Aid Projects and Programmes*. Social Development Department, Overseas Development Administration, London (available at http://www.euforic.org/gb/stake1.htm).

30. A comprehensive overview of stakeholder analysis is given in Ramírez, R., 1999. Stakeholder analysis and conflict management. In: D. Buckles (ed.) *Cultivating Peace Conflict and Collaboration*

*in Natural Resource Management*. IDRC, Ottawa and The World Bank, Washington, DC (available at: http://www.idrc.ca/en/ev-27971-201-1-DO_TOPIC.html).

31. RAAKS (Rapid Appraisal of Agricultural Knowledge Systems) was developed by Engel, P. and M.L. Salomon, 1997. *Facilitating Innovation for Development: A RAAKS Resource Box.* Royal Tropical Institute, Amsterdam (available at http://www.kit.nl/smartsite.shtml?&ch=FAB&id=SINGLEPUBLICATION&ItemID=1512).

32. Checkland and his colleagues at the University of Lancaster in the UK developed what they termed 'soft systems methodology' or SSM (see, for example, Checkland, P. and J. Scholes, 1990. *Soft Systems Methodology in Action*. Wiley and Sons, Chichester, UK). Adaptations of this methodology have increasingly been advocated and used in environmental management and rural development projects.

33. One way to consider the dichotomy between 'hard' and 'soft' systems is to view hard systems as those where agreement on the nature, composition, limits and purpose of the system are undisputed—the issue is how to improve the efficiency of the components in achieving the purpose.

34. The AKIS concept was developed by Niels Röling and colleagues at Wageningen Agricultural University—see, for example, Röling, N.G. and P.G.H. Engel, 1991. The development of the concept of the agricultural knowledge and information system (AKIS): Implications for extension. In: W. M. Rivera and D.J. Gustafson (ed.) *Agricultural Extension: Worldwide Institutional Evolution and Forces for Change*. Elsevier, Amsterdam, pp. 125–139.

35. By the 'transfer of technology' model, we refer to the assumption that new technology drives innovation, that generation of this technology is mostly by publicly funded research institutes, and that this technology is then 'transferred' to farmers by extensionists in a supply-driven process. This model was largely based on the very influential theory of 'diffusion of innovations' as developed by Everett Rogers in the USA.

36. The need to reform Africa's NARS to become more demand/market driven and more outward looking was described by Chema, S., E. Gilbert and J. Roseboom, 2003. A Review of Key Issues and Recent Experiences in Reforming Agricultural Research in Africa. *Research Report* 24. ISNAR, The Hague (available at ftp://ftp.cgiar.org/isnar/publicat/PDF/rr-24.pdf).

37. One of Everett Rogers' students, Niels Röling, recently stated that: 'Throughout Africa, most policy-makers, ministry officials, research administrators, economists and researchers cannot imagine any other theory of innovation than the linear model and continue to adhere to it, even after years of failure in situations where it does not apply' (Röling, N., 2009. Conceptual and methodological developments in innovation. In: Sanginga, P.C., A. Water-Bayer, S. Kaaria, J. Njuki and C. Wettasinha (ed.), 2009. *Innovation Africa: Enriching Farmers' Livelihoods.* Earthscan, London and Sterling, VA, pp. 9–34).

38. For a more exhaustive discussion of innovation systems and a comparison with 'agricultural research systems', see Hall, A., L. Mytelka and B. Oyeyinka, 2006. Concepts and Guidelines for Diagnostic Assessments of Agricultural Innovation Capacity. *UNU-MERIT Working Paper no. 2006-017*. UNU-MERIT, Maastricht, the Netherlands (available at http://www.merit.unu.edu/publications/wppdf/2006/wp2006-017.pdf).

39. Hall, A., L. Mytelka and B. Oyeyinka, 2006. Concepts and Guidelines for Diagnostic Assessments of Agricultural Innovation Capacity. *UNU-MERIT Working Paper no. 2006-017*. UNU-MERIT, Maastricht, the Netherlands (available at http://www.merit.unu.edu/publications/wppdf/2006/wp2006-017.pdf).

40. Others go further in their view of 'innovation systems'. Andy Hall argues that we should see innovation systems as a 'metaphor for innovation diversity', and that we should encourage a diversity of innovation experiences as a way of learning about the policy and institutional changes

needed to promote innovation (Hall, A., 2009. Challenges to strengthening agricultural innovation systems. In: I. Scoones and J. Thompson (ed.) *Farmer First Revisited: Innovation for Agricultural Research and Development.* Practical Action).

41. The *New Palgrave Dictionary of Economics* defines 'social learning' as a 'process whereby individuals learn about a new and uncertain technology from the decisions and experiences of their neighbours'. In this paper, we use the term to reflect the shared learning of a broad array of independent stakeholders, processes which were explored in the book Leeuwis, C. and R. Pyburn (ed.), 2002. *Wheelbarrows Full of Frogs: Social Learning in Rural Resource Management*. Van Gorcum, The Netherlands. By experiential learning, we simply mean learning from experience, although this concept was developed by Kolb (see section 2.2.2 of main text).

42. Although the term 'andragogy' was first used by a German teacher, Alexander Kapp, in 1833, its use became more widespread with the work Malcolm Knowles. See, for example, Smith, M.K. Andragogy. In: *The Encyclopaedia of Informal Education* (available at http://www.infed.org/lifelonglearning/b-andra.htm).

43. 'Andragogy' (from 'andros', meaning adult) is often contrasted with 'pedagogy' which is derived from the Greek 'paedagogus', who was a slave who took a boy to and from school ('agogos', meaning leader, and 'paidos' meaning child). When contrasted with andragogy, pedagogy is taken to imply teaching as instruction or transfer of knowledge from one who knows (the instructor) to one who doesn't (the student), although this more authoritarian way of teaching is said to have been developed in the monastic schools of Christian Europe in the Middle Ages (7th to 12th centuries AD).

44. More information on Kolb's theories of experiential learning and how these have been put into practice can be obtained from the Experience Based Learning Systems, Inc. website: http://www.learningfromexperience.com.

45. Another commonly used model of learning styles is based on the 'Multiple Intelligences' Theory of Howard Gardner. A concise description of which is available at http://www.businessballs.com/howardgardnermultipleintelligences.htm.

46. An entry point into more information on knowledge management is the 'Knowledge Management Resource Centre': http://www.kmresource.com.

47. Among many action-researchers, Orlando Fals Borda, a Colombian sociologist, has been a pioneer of Participatory Action Research (PAR) in Latin America and has given PAR its renown and credibility. In Africa, one of the earlier experiences has been Bud Hall's work in Tanzania's Ujamaa villages. Today, a notable experience is Emmanuel Ndione's 'Recherche-Action-Formation' with ENDA-GRAF in West Africa.

48. The work of the African Highlands Initiative, showing how action-research plays a major role in integrated natural-resources management (INRM) is detailed in the publications of AHI available at http://www.africanhighlands.org.

49. PLAR as applied to soil fertility is described in Defoer, T. and A. Budelman (ed.), 2000. *Managing Soil Fertility in the Tropics: A Resource Guide for Participatory Learning and Action Research.* KIT, Amsterdam. PLAR as used with rice is described by Defoer, T., M.C.S. Wopereis, P. Idinoba, T.K.L. Kadisha, S. Diack and M. Gaye, 2004. *Curriculum d'apprentissage participatif et recherche action (APRA) pour la gestion intégrée de la culture de riz de bas-fonds (GIR) en Afrique sub-saharienne.* WARDA (available at http://www.warda.org/publications/PLAR/manuel-fr/index.htm).

50. A useful 'Brief look at the historical context of the FFS' is provided as chapter 2 in Pontius, J., R. Dilts and A. Bartlett, 2002. *Ten Years of IPM Training in Asia—From Farmer Field School to Community IPM*. FAO, Rome (available at http://www.fao.org/docrep/005/ac834e/ac834e04.htm).

51. For an example of the FFS methodology with soil-fertility management in Kenya, with a useful description of the overall approach, see Mweri, B.A.M., C.D.A. Mombasa and Khisa S. Godrick, 2001. *Report of the Training of Trainers Course on Farmer Field School Methodology for Kari's Soil Management And Legume Research Network Project*. FAO, Rome (available at ftp://ftp.fao.org/agl/agll/farmspi/KARI_ToT.pdf). A description of how the 'Farm Forestry Field School' as a key approach within the Intensified Social Forestry Project (ISFP) in Kenya can be found at http://www.isfp-fd.org/index.html.

52. More information on ICRA and its programmes is available at http://www.icra-edu.org.

53. Quote from Lundy, M., M.V. Gottret and J. Ashby, 2005. Learning Alliances: An Approach for Building Multi-stakeholder Innovation Systems. *ILAC Brief* No. 8. ILAC, Rome (available at: http://www.cgiar-ilac.org/downloads/Briefs/Brief8Proof2.pdf).

54. According to Patti Kristjanson *et al.*, 2007. Linking International Agricultural Research Knowledge with Action for Sustainable Poverty Alleviation. *ILRI Innovation Works Discussion Paper* 01-07. ILRI, Nairobi (available at http://www.prgaprogram.org/riw/files/papers/ILRI_Harvard_Innovation_Synthesis_%20Latest.doc), high-tech R&D firms use a 70% failure rate to demonstrate that they are taking enough risks.

55. In field studies in South Africa, ICRA teams have consistently found that income from agricultural sources forms only a minor component of the income of rural households in former homeland and settlement areas—with the majority of the income coming from pensions and wage labour, etc. In Mbuzini and Ga-Nchabeleng villages in Sekhukune District (Limpopo Province), for example, only 1% and 2% of the households (respectively) gained their income solely from agriculture, and 69% and 63% (respectively) were not involved in any form of agricultural activity at all (Anteneh, N.T., D.G. Mekala, P.E. Minisi, C. Mukisira, M. Muthui, C. Murungweni and S. Oneile, 2004. Goat Production and Livelihood Systems in Sekhukhune District of the Limpopo Province, South Africa: Opportunities for Commercialising Goats and Their By-products. *Working Document Series* 118. International Centre for development oriented Research in Agriculture (ICRA); available at: http://www.icra-edu.org/objects/public_eng/RepFSSouthAfr2004.pdf). In another study in a Makwe and Madikwe Districts of North West Province, the team classified 66% of households as non-farming households, with 26% having both farming and non-farming income, and only 8% obtaining income from farm activities alone (7% from livestock and 1% from crops and livestock) (Armecin, R.B., J. Motswatswe, S. Rabe, T.S. Vamsidhar Reddy, K. Vatta, and B. Yesperova, 2002. Towards Sustainable Land and Water Use Management: Constraints and Opportunities for Research and Development in the Farming Systems of Mankwe and Madikwe Districts, North West Province. South Africa. *Working Document Series* 103. International Centre for development oriented Research in Agriculture (ICRA); available at: http://www.icra-edu.org/objects/public_eng/FS-SA2002NW.pdf).

56. More information about the SRL approach, including guidance sheets and learning materials, can be obtained from the Sustainable Livelihoods Website: http://www.livelihoods.org

57. This definition of INRM and the characteristics of the approach described are taken from the INRM website, http://www.icarda.cgiar.org/INRMsite/index.htm, where a number of comprehensive documents and workshop reports describing the approach in more detail can be obtained.

58. More detailed information of the African Highlands Initiative was previously available at http://www.africanhighlands.org. For a good summary of the evolution of institutional 'world views' in the agricultural research and development establishment that set the stage of the IAR4D concept—see Stroud, A., 2004. Understanding people, their livelihood systems and the demands and impact of innovations: A synthesis. *Uganda Journal of Agricultural Sciences* 9: 797–818.

59. More information on the 'Competing Claims' programme can be obtained on their website: http://www.competingclaims.nl.

60. Much of the literature on 'low external input agriculture', 'resource conserving agriculture' or just 'sustainable agriculture' emphasizes the integration of technological and social aspects. Two examples are Pretty J.N., 1995. *Regenerating Agriculture*. Earthscan, London; and Reijntjes, C., B. Haverkort and A. Waters-Bayer, 1992. *Farming for the Future.* Macmillan and ILEIA.

61. For a discussion of how changing food markets are affecting small-scale producers, see the 'Regoverning Markets' website at http://www.regoverningmarkets.org.

62. More information on CIAT's ERI approach is available at http://www.ciat.cgiar.org/africa/eri.htm. The approach is closely linked to the 'territorial approach to rural agro-enterprise development' also promoted by CIAT, especially in Latin America, with information and methodological manuals available at http://www.ciat.cgiar.org/agroempresas/ingles/index.htm.

63. More information on the CASE approach is available from the Network for Agricultural Intensification in Sub-Saharan Africa: http://www.aissa.org.

64. The importance of improving the competitive advantage of agri-business clusters (based on knowledge, innovation and human capital) as opposed to comparative advantage (based on natural resources and cheap labour) is a theme developed by Fairbanks, M. and S. Lindsay, 1997. *Plowing the Sea: Nurturing the Hidden Sources of Growth in the Developing World.* Harvard Business School Press, Boston, MA, and based on Michael Porter's earlier work 'The Competitive Advantage of Nations'.

65. KIT, Faida Market Link and IIR, 2006. *Chain Empowerment: Supporting African Farmers to Develop Markets.* KIT, Amsterdam; Faida Market Link, Arusha; IIRR, Nairobi (available at http://www.mamud.com/Docs/chains.pdf), includes 19 case studies.

66. See, for example, Peppelenbos, L. (coord.), 2008. *Trading Up: Building Cooperation Between Farmers and Traders in Africa*. KIT, Amsterdam (available via http://www.kit.nl/smartsite.shtml?id=SINGLEPUBLICATION&ItemID=2501).

67. According to United Nations statistics, quoted by Williams, S., J. Seed and A. Mwau (1997. *Oxfam Gender Training Manual*. Oxfam, Oxford) women do two-thirds of the work in the world, earn one-tenth of world income, represent two-thirds of the illiterate population of the world, and own less than one-thousandth of the world's property. Numerous studies continue to show that many of the benefits of development accrue mostly to men.

68. The 'Harvard Framework' was developed by the Institute for International Relations of Harvard University. Sometimes called simply the 'gender analysis framework', it was described by Catherine Overholt, C., 1985. *Gender Roles in Development Projects: A Case Book.* Kumarian Press. The approach was later adapted by Feldstein, H.S. and S.V. Poats (1990. *Working Together: Gender Analysis in Agriculture*, 2 vols. Kumarian Press) specifically for use in agricultural research.

69. The 'Women's Empowerment Framework' is sometimes called the 'Longwe Framework/Method', after Sara Hlupekile Longwe (cited in Williams, S., J. Seed and A. Mwau, 1997. *Oxfam Gender Training Manual*. Oxfam, Oxford).

70. Many practitioners have expressed their frustration about the interaction between disciplines—especially between social and technical scientists: examples are Maxwell, S., 1986. The social scientist in Farming Systems Research. *Journal of Agricultural Economics* 37(1): 25–35; and Cernea, M.M. (1991. *Putting People First: Sociological Variables in Rural Development* (2nd edn), The World Bank, Washington, DC), who lamented that 'technical experts are not prepared in their training to cooperate later with social experts—don't know what to ask from them and [are] unaware of what they are entitled to receive from them'. This is still true today.

71. The terms 'multi-disciplinary', 'inter-disciplinary' and 'trans-disciplinary' are often used interchangeably. Others distinguish the degree of interaction, with 'interdisciplinary studies as projects that involve

several unrelated academic disciplines in a way that forces them to cross subject boundaries to create new knowledge and theory and solve a common research goal … [and] … transdisciplinary studies as projects that both integrate academic researchers from different unrelated disciplines and non-academic participants, such as land managers and the public, to research a common goal and create new knowledge and theory. Transdisciplinarity [therefore combining] interdisciplinarity with a participatory approach'. See, for example, 'Trans- & Inter-disciplinary Science Approaches', available at http://learningforsustainability.net/research/interdisciplinary.php.

72. This 20th century emphasis of development is taken from the influential book Eicher, C.K. and J.M. Staatz (ed.), 1984, 1990. *Agricultural Development in the Third World*. John Hopkins University Press, Baltimore, MD. The fact that both editors were economists, and that the history of agricultural development was considered in terms of development economics, perhaps emphasizes the focus on this dimension at that time.

73. The Brundtland Commission presented its 'Report of the World Commission on Environment and Development: Our Common Future' to the UN General Assembly in 1987. It is available at http://www.un-documents.net/wced-ocf.htm.

74. One example of the commonly held concept of 'sustainable development' can be found in the English Wikipedia: http://en.wikipedia.org/wiki/Sustainable_development.

75. The 'Human Development Concept', as described by UNDP on its website: http://hdr.undp.org/en/humandev/.

76. 'About the MDGs: Basics. What are the Millennium Development Goals?' Available at http://www.undp.org/mdg/basics.shtml.

77. The *World Development Report: 2000/2001—Attacking Poverty*. The World Bank, Washington, DC, is available at http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/0,,contentMDK:20194762~pagePK:148956~piPK:216618~theSitePK:336992,00.html.

78. The IAASTD reports are available at www.agassessment.org.

79. For a comparison of the NARS, AKIS and AIS perspectives, see World Bank, 2006. *Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems.* The World Bank, Washington, DC(available at http://siteresources.worldbank.org/INTARD/Resources/Enhancing_Ag_Innovation.pdf).

80. In rural research and development, where we put the boundaries of a what we consider to be 'the system' depends on and also determines which factors are considered to be amenable to intervention through project activities, and which are taken as unalterable (factors that can be changed are sometimes called 'variables', and those that are fixed 'parameters'). Nevertheless, even if such external or environmental factors are outside our immediate control, they can still very much affect the system we are considering. Many projects fail not because they do not implement the activities planned or change the factors considered as internal, but because they do not take into account the (changing) external factors and how the system will be affected by this changing environment.

81. The late Robert Hart adapted Odum's ecological analysis procedures to agriculture, stressing the integration of biological and social sub-systems; with biological systems being more important at the lower levels (field, farm), and social sub-systems increasingly important at higher levels (village, region, nation). Much of Hart's work was published in Spanish, but see, for example, Hart, R.D., n.d. The effect of interlevel hierarchichal system communication on agricultural system input-output relationships. *CIHEAM – Options Mediterraneenes*, pp. 111–124 (available at http://ressources.ciheam.org/om/pdf/s07/CI010840.pdf).

82. Shaner, W.W., P.F. Philipp and W.R. Schmehl (ed.), 1982. *Farming Systems Research and Development: Guidelines for Developing Countries*. Westview Press, Boulder, CO, represented a summary of early FSR approaches when it was compiled. A good overview of FSR is also given in D.W. Norman, F.D. Worman, J.D. Siebert and E. Modiakgotia, 1995. *The Farming Systems Approach to Development and Appropriate Technology Generation (FSD)*, FAO, Rome (available at http://www.fao.org/docrep/v5330e/v5330e00.htm). A more recent and wide-ranging review of FSR approaches is given in Collinson, M., 2000. *A History of Farming Systems Research*. FAO and CABI.

83. 'Francophone' approaches also emphasized 'typology' as an method for investigating diversity and hence understanding the evolution and rationale of specific farming practice; see, for example, Jouve, P., 1992. *Assessment of the Rural Environment: From Region to Field.* CNEARC.

84. Heemskerk, W., N. Lema, D. Guido, C. Schouten, Z. Semgalawe, H. Verkuijl, B. de Steenhuijsen Piters and P. Penninkhoff, 2003. *A Guide to Demand-driven Agricultural Research: The Client-oriented Research Management Approach*, KIT, Amsterdam; IER, Mali; Department of Research and Development, Tanzania (available at http://www.kit.nl/smartsite.shtml?id=SINGLEPUBLICATION&ItemID=1500).

85. A synthesis of evaluation of DFID's experience with IRD projects in Africa, for example, is available: DFID, 2004. *Synthesis of Integrated Rural Development Projects*. DFID, London (available at http://www.dfid.gov.uk/Documents/publications/evaluation/ev438s.pdf).

86. By 'scaling up', we refer to the creation of conditions that enable the sustained use of the innovation (e.g. through terms of policies and institutional support); by 'scaling out', we refer to expanding the impact of the innovation beyond the stakeholder group initially involved and beyond the time duration of the project.

87. See, for example, Birner, R. *et al.*, 2006. *From 'Best Practice' to 'Best Fit': A Framework for Designing and Analyzing Pluralistic Agricultural Advisory Services*. IFPRI, Washington, DC (available at http://www.ifpri.org/PUBS/ib/rb04.asp).

88. See, for example, Start, D. and I. Hovland, 2004. *Tools for Policy Impact: A Handbook for Researchers.* Overseas Development Institute, London (available at http://www.odi.org.uk/rapid/Publications/Documents/Tools_handbook_final_web.pdf); and 'Power Tools', a website of 'how-to ideas that marginalised people and their allies can use to have a greater positive influence on natural resources policy', available at http://www.policy-powertools.org.

89. See the International Society for New Institutional Economics website: www.isnie.org.

90. Coarse, R., 1937. The nature of the firm. *Economica* 4: 386–405. Also Coasre, R., 1960. The problem of social cost. *Journal of Law and Economics* 3: 1–44, in which he makes a case for well-defined property rights as a means to overcome externalities and increase economic efficiency.

91. See, for example, Dorward, A., J. Kydd and C. Poulton (ed.), 1998. *Smallholder Cash Crop Production Under Market Liberalization. A New Institutional Economic Perspective*. CAB International, UK.

92. The cotton marketing boards are an example of 'hard' (i.e. exogenously established) institutional arrangements to ensure coordination, where the state-owned marketing board ensured access to credits and inputs, and exercised monopolistic power over the purchase and export of cotton.

93. The capacity-development needs for IAR4D were discussed in the ICRA–NATURA IAR4D e-forum and workshop held in 2003 (Hagmann, J., J. Ceballos-Müller, H. Ngwenya and P. Kibwika, 2003. *Mobilising Partnerships for Capacity Building in Integrated Agricultural Research for Development (IAR4D). Workshop held at the International Agricultural Center IAC in Wageningen, the Netherlands, 27–29 November 2003. Workshop Documentation*. ICRA and NATURA; available at http://www.icra-edu.org/objects/public_eng/ICRA-natura.pdf), and also in the consultancy on

'Integrated Agricultural Research for Development Capacity Strengthening' assessment carried out for ASARECA by KIT in 2007 (full report available from the ASARECA Secretariat).

94. For a discussion of the nature of capacity building, useful articles include: 'Defining Capacity Development' from the Global Development Research Centre, available at http://www.gdrc.org/uem/capacity-define.html; Mentz, J.C.N., 1997. Personal and Institutional Factors in Capacity Building and Institutional Development. *ECDPM Working Paper* no. 14 (available at http://www.ecdpm.org/Web_ECDPM/Web/Content/FileStruc.nsf/index.htm?ReadForm&4127CD381A9C7406C1256C8B0036A3AB; Bolger, J., 2000. Capacity Development: Why, What and How?' *Capacity Development Occasional Series* 1(1). Canadian Development Agency (available at http://www.acdi-cida.gc.ca/INET/IMAGES.NSF/vLUImages/CapacityDevelopment/$file/CapDevOSVol1No1-E.pdf); and Potter, C. and R. Brough, 2004. Systemic capacity building: A hierarchy of needs. *Health Policy and Planning* 19(5): 336–345 (available at http://heapol.oxfordjournals.org/cgi/reprint/19/5/336).

95. By 'competencies', we mean a mix of knowledge, skills and attitudes required for a particular context and expressed at different levels.

96. For more information on emotional intelligence, see, for example, the website of the Consortium for Research on Emotional Intelligence in Organisations: http://www.eiconsortium.org/; or the Emotional Intelligence website: http://www.unh.edu/emotional_intelligence.

97. A review of the key elements in fostering institutional change to better enable IAR4D is given by Stroud, A., 2006. Transforming Institutions to Achieve Innovation in Research and Development. *AHI Working Paper* no. 4. African Highlands Initiative.

98. See, for example, Mayne, J., 2008. Building an Evaluative Culture for Effective Evaluation and Results Management, *ILAC Brief* no. 20. ILAC, Rome (available at http://www.cgiar-ilac.org/files/publications/briefs/ILAC_Brief20_Evaluative_Culture.pdf).

99. See Kaner, S., J. Watts and E. Frison, 2008. Participatory Decision-making: The Core of Multi-stakeholder Collaboration. *ILAC Brief* no. 19. ILAC, Rome (available at http://www.cgiar-ilac.org/files/publications/briefs/ILAC_Brief19_Participatory_decision.pdf).

100. Useful publications on measures needed to nurture partnerships include 'Facilitating multi-stakeholder partnerships: Lessons from PROLINNOVA', available at http://www.prolinnova.net/fmsp-booklet.php, and Maselli, D., J.-A. Lys and J. Schmid, 2006. *Improving Impacts of Research Partnerships* (2nd edn). KFPE< Bern, Switzerland (available at http://www.kfpe.ch/download/KFPE_ImpactStudy-final.pdf).

101. The 'Outcome Mapping' mapping approach to monitoring and evaluation has been promoted by IDRC; more information is available at http://www.outcomemapping.ca/.

102. The use of logical frameworks has been extensively criticized, but seems likely to remain as a requirement of most funding agencies for the near future. A useful and perhaps more balanced resource is 'Working with the Logical Framework (under duress or by desire)', available from the Monitoring and Evaluation News website at http://www.mande.co.uk/logframe.htm.

103. A recent review of impact-assessment methods, particularly within the CGIAR, is given by Kristjanson P; Lilja N; Watts J, 2008. Rethinking Impact: Understanding the complexity of poverty and change. Key Issues Discussed at the Workshop. *ILAC Working Paper* no. 6; *PRGA Program Working Document* no. 25; *ILRI Innovation Works Discussion Paper* no. 3. Rome; Cali, Colombia; Nairobi, (available at http://www.prgaprogram.org/riw/files/RIW%20Key%20Messages.pdf). Notable in their conclusions is that 75% of the CGIAR's current budget is directed to activities for which [economic] rate-of-return studies are not suited—yet these are fully institutionalized as the standard for CGIAR impact assessment. The authors are also aware of a recent set of 'impact studies' undertaken as preparation for a new phase of World Bank support to the agricultural sector in Uganda that almost exclusively focuses on economic models.

104. 'Engaging researchers into policy research' was rated as the biggest challenge facing researchers in an IAR4D learning programme in Uganda during 2004–2005.

105. An example of policy integration is ASARECA's ECAPAPA network, which has contributed to sub-regional change in national seed legislation.

106. The need to reform tertiary education in agriculture has long been recognized. Current initiatives to promote such reform include 'Sustainability, Education and the Management of Change in Africa' (SEMCA, http://www.iln-africa.net/index.php/semca); the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM, http://www.ruforum.org), and Francis, J.A. and J. Sluijs, 2008. *Reshaping Tertiary Agricultural Education*. CTA and KIT (available at http://knowledge.cta.int/en/content/view/full/6315). Davis, K., J. Ekboir, W. Mekasha, C.M.O. Ochieng, D.J. Spielman and E. Zerfu, 2007. Strengthening Agricultural Education and Training in Sub-Saharan Africa from an Innovation Systems Perspective: Case Studies of Ethiopia and Mozambique. *IFPRI Discussion Paper* no. 736. International Food Policy Research Institute (IFPRI), Washington, DC (available at http://www.ifpri.org/pubs/dp/IFPRIDP00736.pdf) also provide a good overview.

107. See, for example, Hall, A., n.d. Challenges to Strengthening Agricultural Innovation Systems: Where Do We Go From Here?, available at http://www.future-agricultures.org/farmerfirst/files/D1_Hall.pdf.

108. The authors note the criticisms of the direction and research policy of the CGIAR expressed in, for example: Scoones, I., J. Thompson and R. Chambers, 2008. Farmer First Revisited: Some Reflections on the Future of the CGIAR. An Informal Note to the CGIAR Independent Review Team (available at http://www.cgiar.org/changemanagement/pdf/farmer_first_revisited.pdf); and Hall, A., 2008. Negotiating a new agricultural innovation paradigm: the anatomy of the debate. *LINK News Bulletin* March–April 2008, pp. 1–4 (available at http://innovationstudies.org).

109. In respect to impact assessment of research, and the wider question of the role of research, we note the debates promoted by the Institutional Learning and Change Initiative (http://www.cgiar-ilac.org/) and its Impact Evaluation Project, and the Workshop on 'Rethinking impact: understanding the complexity of poverty and change' (ILAC Initiative, PRGA Program and ILRI, 2008. Rethinking Impact: Understanding the complexity of poverty and change. Key Issues Discussed at the Workshop. *ILAC Working Paper* no. 7; *PRGA Program Working Document* no. 26; *ILRI Innovation Works Discussion Paper* no. 4. Rome; Cali, Colombia; Nairobi; available at http://www.prgaprogram.org/riw/files/RIW Summary.pdf).

110. In the UK, perhaps in contrast, many would argue that supermarkets play an over-powerful role in the innovation system, to the detriment of farmers, suppliers and other stakeholders—see, for example, http://www.tescopoly.org.

111. Case studies on outsourcing advisory services in Mali, Mozambique, Tanzania and Uganda are described in Heemskerk, W., E.S. Nederlof and B. Wennink, 2008. Outsourcing Agricultural Advisory Services: Enhancing Rural Innovation in Sub-Saharan Africa. *Bulletin* no. 380. The Royal Tropical Institute (available at http://www.kit.nl/smartsite.shtml?id=SINGLEPUBLICATION&ItemID=2500).

112. For a discussion of competitive funding mechanisms and experience in Benin and Tanzania, see Heemskerk, W. and B. Wennink (ed.), 2006. Stakeholder-driven Funding Mechanisms for Agricultural Innovation: Cases from Sub-Saharan Africa. *KIT Bulletin* no. 373 (available at http://www.kit.nl/smartsite.shtml?id=SINGLEPUBLICATION&ItemID=1951).

113. The Statute of Interprofessions was a law of 1975, ultimately codified to French Rural Code. An 'inter-profession' was considered as an organization in the private domain using public sector methods, based on agreement reached between different actors (http://www.cliaa.com/).

114. Klerkx, L. and C. Leeuwis, 2008. Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries. *Food Policy* 33(3): 260–276. The authors argue that the state should promote innovation by financing such intermediaries. See also Klerkx,

L., A. Hall and C. Leeuwis, 2009. 'Strengthening Agricultural Innovation Capacity: Are Innovation Brokers the Answer? *UNU-MERIT Working Paper Series* no. 2009-019 (available at http://www.merit.unu.edu/publications/wppdf/2009/wp2009-019.pdf).

115. 'Boundary organizations' are conceived as institutions that 'straddle the shifting divide between politics and science' by Guston, D.H., 1999. Stabilizing the boundary between US politics and science: The role of the Office of Technology Transfer as a boundary organization. *Social Studies of Science* 29(1): 87–112. It has been taken up as a project to explore the concept further to integrate knowledge and action in international development (http://www.hks.harvard.edu/sed/borgs/index.html). Experiences with 'boundary spanning' organisations and individuals in agricultural research is explored by Kristjanson, P., R.S. Reid, N. Dickson, W.C. Clark, D. Romney, R. Pushur, S. MacMillan and D. Grace, 2009. Linking international agricultural research knowledge with action for sustainable development. *PNAS Early Edition* (available at http://www.ilri.org/Link/Files/InnovationWorks/Linking_K_with_A_PNAS.pdf).

116. The case studies were not all described by those involved as 'IAR4D'. They were selected by the authors from projects and programmes with which they were familiar, to illustrate practice mainly in different parts of Africa (but with a European example for comparison), and in different contexts (project, programme, national). We note the existence of other interesting collections of case studies in rural innovation, such as those compiled by Patti Kristjanson of ILRI and colleagues (see previous note), and the World Bank (see note 6); in general, we think these case studies support many of our arguments in this paper.

117. See Sanginga, P., 2006. Enhancing Partnerships for Enabling Rural Innovation in Africa: Challenges and Prospects for Institutionalizing Innovation Partnerships. Paper presented at the Innovation Africa Symposium, Kampala, 20–23 November 2006 (available at http://www.innovationafrica.net/pdf/s3_sanginga_full.pdf).

118. Again, it should be admitted that the absence of reports documenting process issues may simply be due to the authors' lack of knowledge concerning such reports. However, we suspect that even where such reports are available, it tends to reflect the interest of international research organizations in research and development processes. The lack of personal incentives for documenting process issues and institutional cultures still, we suspect, makes professionals in national research organizations disinclined to analyse and document reflections on stakeholder processes.

119. Active groups calling for fundamental institutional and policy changes to promote the concept of innovation studies include the Learning INnovation Knowledge (LINK) network established by the United Nations University (UNU-MERIT)—see http://www.innovationstudies.org, and the Institutional Learning and Change Initiative (ILAC) (http://www.cgiar-ilac.org).

120. Case study 1—the Ethiopian experience with durum wheat—is taken from Abata, T. (ed.), 2006. Successes with Value Chain: Proceedings of Scaling-up and Scaling out Agricultural Technologies in Ethiopia: An International Conference, 9–11 May 2006, Addis Ababa. Ethiopian Institute for Agricultural Research, Addis Ababa.

121. Case study 2 is adapted from: Aliguma, L., D. Magala and S. Lwasa, 2007. Connecting small-scale producers to markets: The case of the Nyabyumba United Farmers Group in Kabale district. In: Regoverning Markets. *Innovative Practice Series*. IIED, London; Kaaria, S., J. Njuki, A. Abenakyo, R. Delve and P. Sanginga, 2008. Assessment of the enabling rural innovation approach: case studies from Malawi and Uganda. *Natural Resources Forum* 32: 53–63; and Kaaria, S., *et al.*, 2006. Enabling rural innovation: Empowering farmers to take advantage of market opportunities and improve livelihoods. Paper presented at the Innovation Africa Conference in Kampala, 20–23 November 2006 (available at http://www.innovationafrica.net/pdf/s7_kaaria_full.pdf).

122. Case study 3 on the tomato business cluster in Togo was written by Arno Maatman for this paper.

123. Case study 4, on the cassava sector in Ghana, is adapted from Essegbey, G.O., 2008. *Agribusiness innovation study—the Ghana Experience*. Science and Technology Policy Research Institute (STEPRI-CSIR), Ghana (available at http://info.worldbank.org/etools/docs/library/243547/GHAGRIBUSINESSINNOVATIONSTUDY.pdf).

124. Case study 5 is taken from Bolo, M., 2005. The case of Kenya's floriculture industry. Paper submitted to the Technical Centre for Agricultural and Rural Cooperation (CTA), Agricultural Systems of Science, Technology and Innovation (ASTI) study. See also: Bolo, M., [2007]. Demand-led Research Priority Setting in the Kenyan Floriculture Industry (available at http://www.fara-africa.org/media/uploads/File/general_assembly_2007/side_events/capacity_strengthening_information/FARA_4th_GA_SE_Cap_Streng_Demand-led-Res-Priority-setting.pdf), and ATPS, n.d. ATPS Makes Public the Findings of the Case Study of Kenya's Floriculture Industry, http://www.atpsnet.org/about/news/floriculture.html.

125. The ASTI analytical framework was developed by CTA, in collaboration with UNU-MERIT and KIT. The framework has five main components: (1) review of the agricultural sub-sector and political environment of innovation; (2) identification of key actors in the sector; (3) assessment of innovation habits and practices, competencies and performance of the key ASTI actors; (4) identification and assessment of the ASTI system's essential key functions; and (5) identification and assessment of ASTI system linkages. For more information, see Heemskerk, W., 2006. A Framework for Analysing ASTI Systems in ACP Countries. CTA, Wageningen (available at http://knowledge.cta.int/en/content/view/full/3010).

126. Case study 6, on pest and disease management of cocoa in Ghana, is based on Dormon, E.N.A., 2006. *From a Technology Focus to Innovation Development: The Management of Cocoa Pests and Diseases in Ghana.* Published doctoral dissertation, Wageningen University.

127. This case refers to the 'Projet de Soutien de la Région Sofia pour le Développement Rural Intégré' (PSSDRI), managed by the Aga Khan Foundation, and on information from Defoer, T., M. Wopereis, S. Diack and P. Idinoba, 2008. *Apprentissage participatif et recherche action pour la gestion intégrée du riz à Madagascar: Manuel du facilitateur*. AKF, Geneva. More information about the project and the work of the Foundation can be obtained at http://www.akdn.org/madagascar.asp, and a more detailed explanation of the PLAR approach is given in Budelman, A. and T. Defoer, 2000. *Managing Soil Fertility in the Tropics: A Resource Guide for Participatory Learning and Action Research*. Royal Tropical Institute, Amsterdam, with IIED, London; CTA, Wageningen; IER, Bamako; FAO, Rome.

128. The intensive rice package referred to is in this case is the SRI (Système riz intensif) which was developed by a Jesuit priest in Madagascar some years ago. He based his findings on close observations of practices of local farmers that are constrained by lack of cultivable land but endowed by optimal irrigation facilities. Some of the results claimed by adherents of SRI are outstanding at well over 10 tonnes per hectare. However, there is also a fascinating debate within the research community on this approach, and almost everyone agrees that the approach depends on extremely good control of water and is very labour demanding.

129. Unlike the 'Farmer Field School' approach, which focuses on a group learning plot, PLAR encourages each farmer to experiment on one or several portions of his or her own land, called 'the innovation space'. In PLAR, farmers identify new ideas, which each farmer is free to try (or not) at home. PLAR facilitators often include members from extension services, research or an NGO, and gradually more and more farmers.

130. The information used in this case study has been taken from the briefs and working documents formerly available on the African Highlands website: http://www.africanhighlands.org/sites.html.

131. Amedea, T., T. Belachewb and E. Getab, n.d. Reversing Degradation of Arable Lands in Southern Ethiopia. *African Highlands Initiative Working Paper* No. 1.

132. German, L., *et al.*, 2007. Enabling Equitable Collective Action & Policy Change for Poverty Reduction and Improved Natural Resource Management in Ethiopia and Uganda. *African Highlands Initiative Working Paper* No. 25.

133. Case study 9 is taken from Ambula, M., *et al.,* 2006. Water for the Thirsty: A Case Study of Katulani Location Water Situation, Kitui District, Kenya. *ICRA Working Document Series* no. 128 (available at http://www.icra-edu.org/objects/public_eng/ACFqr9XYn.pdf).

134. For more information on ICRA's European-based learning programmes, see http://www.icra-edu.org/page.cfm?pageid=ardEPr.

135. Case study 10 is taken from Hawkins, R., *et al.*, 2006. Building Inter-institutional Capacity for Rural Innovation: Experience from Uganda, Kenya and South Africa. Paper presented at the Innovation Africa Symposium, Kampala, 20–23 November 2006 (available at http://www.innovationafrica.net/pdf/s8_hawkins_full.pdf), and from unpublished data presented by Ngetta ZARDI staff during various reviews of the NARO–MAK–ICRA initiative.

136. CORDEMA is based on earlier work with the 'Client-Oriented Research Management Approach' in Tanzania: see Willem Heemskerk, W., N. Lema, D. Guido, C. Schouten, Z. Semgalawe, H. Verkuijl, B. de Steenhuijsen Piters and P. Penninkhoff, 2003. *A Guide to Demand-driven Agricultural Research: The Client-oriented Research Management Approach*, KIT, Amsterdam; IER, Mali; Department of Research and Development, Tanzania (available at http://www.kit.nl/smartsite.shtml?id=SINGLEPUBLICATION&ItemID=1500). Additional information on the Agricultural Sector Development Programme (ASDP) is available at http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=64290415&theSitePK=40941&menuPK=228424&Projectid=P085752.

137. The Participatory Ecological Land Use Management (PELUM) Association is a regional network whose membership grew from 160 to 200 civil-society organizations in eastern, central and southern Africa over the period 2005–2008 (http://www.pelumrd.org).

138. MVWATA is a national network of farmer organizations in Tanzania.

139. The information for this case is taken from notes prepared for a 'field exercise' which was part of the ICRA Anglophone programme. Notes for this exercise were prepared by Driek Enserink (ICRA), with P.J.M. Snijders, A.P. Philipsen and A.P. Wouters (PR), and J. van Hees (DLV). Data for this case study refers to the situation in 2000, when the ICRA field exercise was carried out.

140. This case study is based on a consultancy carried out by one of us (Willem Heemskerk) in April 2009 to help the Ugandan Government prepare a proposal for external support to the agricultural sector.

141. The CAADP is a programme of the New Partnership for Africa's Development (NEPAD). See http://www.nepad-caadp.net for more details.

## About FARA

FARA is the Forum for Agricultural Research in Africa, the apex organization bringing together and forming coalitions of major stakeholders in agricultural research and development in Africa.

FARA is the technical arm of the African Union Commission (AUC) on rural economy and agricultural development and the lead agency of the AU's New Partnership for Africa's Development (NEPAD) to implement the fourth pillar of the Comprehensive African Agricultural Development Programme (CAADP), involving agricultural research, technology dissemination and uptake.

FARA's **vision**: reduced poverty in Africa as a result of sustainable broad-based agricultural growth and improved livelihoods, particularly of smallholder and pastoral enterprises.

FARA's **mission**: creation of broad-based improvements in agricultural productivity, competitiveness and markets by supporting Africa's sub-regional organizations in strengthening capacity for agricultural innovation.

FARA's **Value Proposition:** to provide a strategic platform to foster continental and global networking that reinforces the capacities of Africa's national agricultural research systems and sub-regional organizations.

FARA will make this contribution by achieving its *Specific Objective* of **sustainable improvements to broad-based agricultural productivity, competitiveness and markets**.

Key to this is the delivery of five *Results,* which respond to the priorities expressed by FARA's clients. These are:

1. Establishment of appropriate institutional and organizational arrangements for regional agricultural research and development.
2. Broad-based stakeholders provided access to the knowledge and technology necessary for innovation.
3. Development of strategic decision-making options for policy, institutions and markets.
4. Development of human and institutional capacity for innovation.
5. Support provided for platforms for agricultural innovation.

FARA will deliver these results through the provision of networking support to the SROs, i.e.

1. **Advocacy and resource mobilization**
2. **Access to knowledge and technologies**
3. **Regional policies and markets**
4. **Capacity strengthening**
5. **Partnerships and strategic alliances**

FARA's major donors are The African Development Bank, The Canadian International Development Agency, European Commission, the Governments of the Netherlands, United Kingdom, Italy, Ireland, Germany and France, the Consultative Group on International Agricultural Research, the Rockefeller Foundation, Bill and Melinda Gates Foundation, the World Bank, and the United States of America Agency for International Development.


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