Danièle Clavel

Knowledge and Rural Development

Dialogue at the heart of innovation

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ISBN 978-94-017-9123-6 ISBN 978-94-017-9124-3 (eBook)
DOI 10.1007/978-94-017-9124-3
Springer Dordrecht Heidelberg New York London

Library of Congress Control Number: 2014942684

Éditions Quæ, R10, 78026 Versailles cedex, France www.quae.com

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

About CTA

The Technical Centre for Agricultural and Rural Cooperation (CTA) was established in 1983 under the Lomé Convention between the ACP (African, Caribbean and Pacific) Group of States and the European Union Member States. Since 2000, it has operated within the framework of the ACP-EU Cotonou Agreement. CTA's tasks are to develop and provide products and services that improve access to information for agricultural and rural development, and to strengthen the capacity of ACP countries to acquire, process, produce and disseminate information in this area. CTA is financed by the European Union.

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Éditions Quæ
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78026 Versailles cedex, France
www.quae.com

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6700 AJ Wageningen, The Netherlands
www.cta.int

ISBN (Quæ): 978-2-7592-1024-4
ISBN (CTA): 978-92-9081-472-6

I believe that we can create a poverty-free world because poverty is not created by poor people. It has been created and sustained by the economic and social system that we have designed for ourselves. […] Poverty is caused by the failure at the conceptual level rather than any lack of capability on the part of people.

(Creating a World Without Poverty, Muhammad Yunus, economist, Nobel Peace Prize 2006)

To Jacques Faye

Foreword

The 'food riots' of 2008, notably in Africa and elsewhere in the developing world, were triggered by a sharp rise in food prices on the international market due to poor harvests in Asia, the main supplier of rice. The effects of rising food prices, however, were made worse by the fragility of the agricultural systems and the precariousness of the resources available to African rural populations. The severe repercussions of these events prompted reflections about the impact of international aid on agricultural and rural development, particularly in Africa, and the role that agricultural research ought to be playing in it in the broad sense. This questioning of the international aid system was stimulated by the economic crisis in the industrialized nations. Indeed, it highlighted the economic, ecological and social limitations of our development approach and the agricultural policies implemented for the last 20 years or so, policies that have widened the gap between rich and poor, between North and South. The structural adjustments uniformly and rigidly operated by the World Bank (WB) and the International Monetary Fund (IMF) in the 1980s, increased the isolation of rural Africa, by suppressing the fabric of the extension systems and state support for agricultural prices after independence. In its annual report on world development in 2008 – the first report of its kind to be devoted to agriculture by the WB for more than 30 years – the WB itself admitted its responsibility in the plight of food crop production in Africa (World Bank 2008).

At the same time as that report was being circulated in 2008, the 'hunger demonstrations' multiplied, triggering a series of major international events. The African Union had been one step ahead of these events, announcing a new framework for African agricultural production, the Comprehensive Africa Agricultural Development Programme (CAADP), at the African Union summit in Banjul (The Gambia) in June 2006. Under that agreement in the guidelines for agricultural development in Africa, the research component, pillar No. 4 of the CAADP, was assigned to the Forum for Agricultural Research in Africa (FARA 2009). The framework of the CAADP, which placed African producers at the heart of the process, is considered to be a major tool for restoring agricultural growth, food security and rural development in Africa.

In their turn, the European Commission and the African Union agreed the principles of their cooperation under the Eighth Partnership Action Plan (European Commission–African Union Commission joint statement, Brussels, October 2008). This new partnership is considered to be the cornerstone of cooperation policy between Europe and Africa. It particularly emphasizes the importance of science and technology for development, capacity building for stakeholders and the development of inclusive information initiatives (European Commission 2010).

In April 2009, the G8's Ministers of Agriculture, meeting in Cison di Valmarino (Italy), advocated "effective systems of agricultural innovation that link science and society and involve public, private and civil partners […], both by generating relevant new knowledge and by empowering rural communities to make use of and master new ideas and technologies" (G8 Ministers of Agriculture 2009).

For its part, the G8 meeting in L'Aquila (Italy) in 2009 led to the drafting of the L'Aquila Food Security Initiative (AFSI), in which it was declared that: "Food security, nutrition and sustainable agriculture must remain a priority issue on the political agenda, to be addressed through a cross-cutting and inclusive approach, involving all relevant stakeholders, at global, regional and national level" (G8 Summit 2009). In that declaration, the African continent receives particular consideration, notably with regard to agricultural aspects and access to water.

As for the United Nations, in 2008 it launched the first International Assessment of Agricultural Science and Technology for Development (IAASTD), a wide-ranging initiative steered by the Food and Agriculture Organization (FAO) and joined by 58 countries (mostly African). This assessment proposed a new framework for scientific and agricultural research and development that was much more sympathetic to the human population and the environment.

In reality, agricultural research and rural development initiatives, which include respect for the identity of producers, are not new in Africa. Our aim here is to raise their profile and so provide real substance in the debate on African rural development. The experiences described in this book illustrate an approach in which technical innovation is no longer central, but just one of the aspects of an innovation system, encompassing human, social and environmental aspects in the same perspective.

This book has benefited from the contributions of the African and Brazilian participants attending the APPRI[1] workshop and from the expertise of partners in the European project Agricultural Innovation in Dryland in Africa (AIDA).[2] The contributors to this book represent different sectors of rural development (i.e. research, development, farmer organizations and civil society).

Montpellier, France Danièle Clavel

[1] 'Learning, Producing and Sharing Innovations (Apprentissage Production et Partage d'Innovations – APPRI): tools for co-construction and sustainable implementation of rural innovations in dryland Africa', a workshop coordinated by CIRAD with financial backing from Agropolis Fondation and CTA.

[2] European project FP6 No. Inco-2006-043863.

Acknowledgements

I thank all the people who, in Africa, supplied the wealth of material for this book, especially the partners in the European Agricultural Innovation in Dryland Africa project, and the participants at the Learning, Production and Sharing of Innovations (APPRI) workshop.

I also thank all those people in Europe, at CIRAD, Quæ, CTA and Agropolis Fondation, who enabled the publication of this book.

Lastly, I am extremely grateful to Mrs. Khady Kane Touré, who encouraged, motivated and advised me in completing this work.

Contents

Vulnerability and Resilience of Smallholder Farms

Agriculture remains the economic backbone of most African countries, providing almost 70 % of employment. Food shortages, due to recurrent droughts and the fluctuations in price for edible cereals on the international market, make the rural populations in these regions highly dependent upon the climate and outside aid. The threat of hunger is ever present, especially in the driest regions of Africa (in the arid, subarid and dry subhumid zones), which make up 45 % of the continent's territory. Agriculture in these regions, identified as Sahelian or Sudano-Sahelian (rainfall between 300 and 800 mm, spread over 4 months), is almost exclusively rainfed. With such limited quantities of water, traditional food crops (millet, sorghum and cowpea), cash crops (mainly cotton) or dual use crops (mainly groundnut and maize) are possible, but rendered extremely vulnerable to the slightest variation in the distribution and amount of rainfall. Market gardening has to contend with wells running dry, while livestock production, usually transhumant, has to cope with drastic reductions in grazing areas. Climate change, low soil fertility and domestic off-take, amplified by population growth, are all factors proven to aggravate the cultural risk.

Limiting the Cultural Risk

In the drylands of western and eastern Africa, poverty and hunger alleviation, control of desertification and the preservation of natural resources are all closely linked. The rainfed farming systems, with limited water and input resources, deprived of technical support and often devoid of investment capacity, form the very dense network of family smallholdings, which are the largely dominant production system in Africa (Caron 2007).

These 'small agricultures' are characterized by their vulnerability to climate events or to events of economic and social origin. Food crises are frequent. Traditional management of family agriculture in these regions, where the shortage

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DOI 10.1007/978-94-017-9124-3_1, © Éditions Quæ, 2014

of water and resources is not new, is characterized by the constant worry of limiting the risk to agricultural and livestock production. The adaptability and resilience of systems and people needs to be acknowledged and encouraged as it is this that has made it possible for production levels to keep pace with population growth, in the context of a deteriorating climate and soils, and without outside help. It is worth noting that these 'risk limitation' systems, which have been abandoned in developed countries, are attracting fresh interest today, given the environmental requirements (Chevassus-au-Louis and Griffon 2008).

Powerlessness of International Aid

Serious demonstrations against food insecurity in Africa and elsewhere are on the increase. The 'foretold' famine of 2004 in Niger, then those in Kenya and Ethiopia the following year, were widely carried in the media and cast doubt upon public development aid organizations. In addition to demographic and climatic factors, one of the major causes identified is the poor account taken in most aid programmes of the role played by agriculture with limited resources. On average, the agricultural sector only receives 5 % of state budgets and highly insufficient international aid (World Bank 2008). Finally, the political institutions and organizations, notably the World Bank (WB) and International Monetary Fund (IMF), have acknowledged that poverty alleviation in countries with a low GDP calls for financial efforts clearly aimed at the sector of activity that employs the most poor people, that is, agriculture, and in the regions in which those poor people live, that is, the rural zones. The structural adjustment programmes implemented in Africa under the aegis of the IMF and WB since the beginning of the 1980s neglected the central role played by small-scale African subsistence agriculture. In addition, the major hydro-agricultural projects have often proven to be ineffectual in improving agricultural production, particularly for food crops, due to a lack of follow-up and the failure of the populations involved to accept them. Yet, if poverty is to be halved by 2015, as specified in the United Nations Millennium Development Goals (2000 and 2001), African agriculture needs to maintain an annual growth rate of 6 % between 2000 and 2015.

It is now acknowledged that, as a priority, family small-holdings need to benefit from public support and the backing of international aid. This first essential stage for establishing a consensus has shed light on the obstacles in the path of rapid action to guarantee a constant level of production. The main limitations are linked to the multiplicity of environmental and social contexts, the obligation to ensure sustainable fertility, and the fragility of the balances in food crop systems (e.g. dependence on rainfall, isolation, low technical skills, limited storage capacity, etc.). New types of intervention need to be developed to support African agriculture in order for them to become sympathetic to both the environment and the human population.

Widening the Agricultural Issue

The radical reform of development policy involves the full and total recognition of human factors, be it in the degradation of the environment or in its reconstruction. Human pressure on resources, especially woodland vegetation and water, combined with variability and decline in rainfall, are clearly major factors in rural environmental degradation, gradually leading to the – sometimes irreversible – sterilization of the land and ultimately to desertification. However, these different types of factors are closely interlocked and interactive, which means that the mechanisms that might finally guarantee stable agricultural yields over time are difficult to implement.

The recurrent food crises and famines in these regions sometimes lead to massive migrations of poorly educated populations to large cities such as Dakar, Nairobi, Accra or Johannesburg, which have now virtually reached saturation point. As the production of staple foods has been severely constrained for some time, the populations have developed risk limitation strategies, in which the agricultural policies of the last 20 years or so have taken very little interest. Moreover, mobility is one of the levers traditionally used as a risk limitation strategy in Sahelian Africa. These temporary town-country or transhumance-related migration strategies are currently being undermined by demographic and environmental pressures.

The thought given to developing the agricultural and rural sector has led to a revival of the agriculture multifunctionality concept, particularly that of small farms, which are the economic linchpins in most developing countries. The International Assessment of Agricultural Science and Technology for Development (IAASTD) assessment (IAASTD 2008) recognized the agricultural sector as being multifunctional, generating not only numerous commodities (e.g. food for people and animals, fibres, biofuels, medicinal and ornamental products, etc.), but also non-tradable goods, such as ecological services, landscaping and cultural goods.

Specifically concerning Africa, following the African Union summit in Banjul in 2006, FARA produced an operational guide (FARA 2009). This document placed producer empowerment, general capacity building for local stakeholders, and the implementation of agricultural innovation policies at the heart of the agricultural research for development process.

This new awareness on the part of international institutions culminated in the first Global Conference on Agricultural Research for Development (GCARD),[1] organized by the Global Forum on Agricultural Research (GFAR), which was held in Montpellier (France) from 28 March to 1 April 2010. This conference, heralded as "new global governance of Agricultural Research for Development (AR4D)", emphasized the urgent need to implement operational solutions based on broader and equitable partnerships. It was attended by around 800 representatives of

[1] Agropolis International, in partnership with GFAR, organized GCARD 2010 (www.egfar.org/egfar/website/gcard). The GCARD meeting will replace the triennial GFAR conference and the meeting of the Consultative Group on International Agricultural Research (CGIAR).

governments, most of the intergovernmental agencies, research organizations, agricultural development NGOs, civil society, the development banks and the main donor agencies. The global conference set itself the task of ensuring that the commitments made at the recent top level summits were turned into effective actions, capable of building agricultural research capacities in developing countries. The 'Montpellier Roadmap' presented the research and development priorities for improving AR4D efficiency. These actions involved the following major priorities:

- adopt a problem-solving approach and focus on the search for technologies suited to farmers' constraints and practices;
- improve both the equitability of multiple partnerships and the effectiveness in identifying stakeholders' constraints as well as the rapid generation of innovative responses;
- promote the production and sharing of information, knowledge and skills to reach the poor and women, and facilitate the building of individual and collective capacities;
- strengthen the inclusion of all AR4D stakeholders, particularly the representatives of male and female producer organizations, in decision-making and governance related to AR4D on a national, regional and global scale.

Thus, a veritable consensus has become established in recent years around extending the agricultural issue to that of natural resource management (NRM), and especially the necessary inclusion of the men and women who live in these deprived zones. If development and food security are to be sustainable, they must, we are told, be considered in their entirety and complexity: human, cultural, economic, social, technical and environmental. A call is going out to all 'development stakeholders', that is, rural populations, male and female producers, researchers and development officers, NGO agents, policy-makers on different levels, the African diaspora, the media, etc., all of whom need to act in a coordinated, interactive and ongoing manner.

The broad outlines have now been defined, we know a great deal about the 'what' and 'why' and we now need to focus on proposing a 'with whom' and a 'how'. This book proposes a contribution to help achieve that objective.

New Partnerships for Research and Innovation

This chapter describes the main concepts used in the new innovation and sustainable development initiatives implemented in partnership with the different partners (or stakeholders) involved. It also briefly indicates why these initiatives have been made necessary and how the role of research and innovation needs to be re-thought in order to have a social impact and ensure sustainable human progress.[1]

Research and Sustainable Development Concepts

Most of the rural development successes recorded to date have had an impact on territories, revealing a high level of local stakeholder adaptation, but that impact has been limited by the weakness or ignorance of the links existing with other decision-making levels. According to the IAASTD study, gradual depletion of natural resources could be countered by the active inclusion, on different levels, of rural stakeholders in their own development (IAASTD 2008). The major challenge would consist, therefore, in establishing an ongoing dialogue to ensure equitable development of the community as a whole, through 'mechanisms' for cooperation, mutual understanding and coordination between the different categories of parties involved (e.g. farmers, scientists, the private sector, decision-makers) and the different scientific disciplines.

We are moving towards a new concept that makes development in partnership a complex science, combining scientific knowledge with philosophical thinking (Morin 2005), where viewpoints are exchanged between the biophysical sciences

[1] Text drafted by Jean-Philippe Tonneau (jean-philippe-tonneau@cirad.fr), CIRAD, UMR Territoires, Environnement, Télédétection et Information Spatiale (TETIS), France and Danièle Clavel (clavel@cirad.fr), CIRAD, UMR Genetic Improvement and Adaptation of Tropical and Mediterranean Plants (AGAP), France.

D. Clavel, *Knowledge and Rural Development: Dialogue at the heart of innovation*,
DOI 10.1007/978-94-017-9124-3_2, © Éditions Quæ, 2014

(e.g. agronomy, biology, agrotechnology, etc.), the social sciences (e.g. sociology, human geography, economics, etc.), and the human sciences (e.g. philosophy, cognitive sciences, etc.). At a time when this field is undergoing a radical reform, it is worth specifying the most usual terminology employed in relation to research in partnership for sustainable development, involving multiple stakeholders.

Agricultural Research for Development

In a perspective of agricultural production that is sympathetic to the environment and the human population, which today is largely agreed by the international bodies, AR4D is research that incorporates the actions of all those involved in the value chain of a product. The value chain integrates all the activities linked to the product, from its initial production, notably seed production, up to its consumption. The value chain includes collection, transport, processing, marketing, etc., together with advice and regulation services.

AR4D considers that innovation and change result from an interactive exchange of knowledge, experiences and technologies between the different players in the supply chain. When it is driven by demand, research tackles the needs expressed by its users, which may arise from the public sector, civil society or the labour sector.

As AR4D targets human development, it has to be understood in the broadest sense, that is, incorporating social and cultural components. In terms of research, this means aiming for transdisciplinarity, which is not multidisciplinarity where disciplines operate separately, but a cross-disciplinary approach involving concerted and interactive operations.

Research and Innovation in Partnership

The practices found, and the successes achieved in rural development have generally involved methods and approaches from the field of research and innovation in partnership. This field of study characterizes research methods associating researchers, stakeholders, producers and technicians. The purpose of these methods is to promote technical innovations, but also organizational and institutional innovations on a production unit, village and territorial scale. Innovation in partnership is defined as an alternative to conventional research.

Research in partnership has three major ambitions: training for stakeholders, the construction of forums for dialogue, and the production and management of references and information. Why develop this type of research for development? How can partnerships be created and implemented? How can we mobilize people and the so-called ‘traditional’ knowledge of local populations? How can we assess the impact?

New Partnerships for Development

The partnership for development concept is the cornerstone, the major conceptual tool, of research and innovation in partnership. This notion stems from the view that relations and interactions between stakeholders form 'compositions of interests' (Latour 2010), which are revealed, flourish, come to an end, or are transformed through internal processes whereby their relevance and interest for the different players are assessed.

The multistakeholder concept refers to the groups, organizations and networks representing civil society and the productive sector, and working on issues of mutual interest. This question refers to technical, social and institutional innovations intended to improve the living conditions of rural populations and farmers. The partnership is an alliance or collaboration between organizations representing at least two sectors that are committed to working together to undertake sustainable research for development. Such collaboration involves sharing risks and benefits, and revision of the terms of the partnership if necessary. The partnership is a process comprising different phases and stages.

Brokerage of the partnership is the implementation of mediation, which involves identifying brokers or champions. The latter provide the link between 'good' partners relative to an issue of mutual interest, and harmoniously manage the alliance in order to achieve the collectively defined objectives. These brokers are key people in the construction and life of a partnership arrangement.

Research in Partnership and Society Project

Recent research has produced new knowledge for restoring and improving the integrity of ecosystems with limited resources and their ability to produce goods and services. However, converting those research results into practice has often failed because human and social factors were neglected due to a lack of continuity and an inadequate consideration of social and human factors. These failures have globally been characterized by:

- a limited understanding of local abilities to integrate or create sustainable innovations;
- a difference in the way researchers and local stakeholders see the issues to be dealt with;
- a lack of support policies for sustainable innovations.

In our modern societies, technical innovation is ongoing (Stiegler 1996), but it has to be admitted that (sustainable?) development has not been achieved, particularly in Africa. Nowadays, the products of science are primarily technological products profoundly marked by societal needs, hence they are related to cultures, conceptions and levels of development. The direct transfer of technical innovations from the North (designed in Northern situations) to the South merely serves to increase the dependence of developing countries. This perverse effect, which was long denied, is

condemned today, and the need to construct specific research in the South for the South has been brought to the fore.

Our societies, be they in the North or South, no longer completely control what becomes of them and how they evolve. They innovate by principle and not according to a project. The link between scientific progress and human progress has been undermined. Ignacy Sachs highlighted the fact that all societies are in a state of maldevelopment and that the race for innovation is merely a reflection of that maldevelopment, in the North and in the South.

In that context, the future of our societies will not depend on their ability to adopt novel external technology, whether imposed or not, but on their ability to master it, that is, to influence it. The challenge for research, therefore, is not to ensure that societies are supplied with technical products, but to improve the ability of those societies to think about their future in accordance with their specificities and their aptitude to control factors of change. One of the major functions of research should be to promote the construction of society projects, but nowadays the disciplinary compartmentalization of 'official' research, notably the limited integration between the disciplines of technical and human sciences, rarely allows such promotion.

Innovation System and Capacity for Collective Innovation

Innovation is the implementation of a novelty (i.e. an idea, technology or process) in a novel manner, in order to produce social and economic benefits for the stakeholders involved and, more widely, for society. The term 'system' refers to a dynamic set of multiple interactions, for example, between technology and society, science and societies, nature and society, etc. The system is dynamic because it evolves over time and modifies the sets of interactions.

Innovation is the result of a process of networking and interactive learning between heterogeneous stakeholders. The innovation partnership brings together diverse talents and complementary expertise that accelerate co-learning and the development of creativity. Collective innovation is reflected in the partnership's capacity for adaptation, particularly with regard to strategic orientations on issues of present and future mutual interests (see Box 1).

Paradigm

A paradigm is a model that translates a basic orientation in order to develop a theory. It generally involves a set of ideas or hypotheses that bear witness to a vision of the world. A paradigm gives sense to interactions between mankind and its environment. It adopts innovation systems awarding great importance to the testing of social reality.

Box 1: The Functioning of an Innovation System

The failure of more than 50 years of development aid, particularly in Africa, is now widely acknowledged. Despite some encouraging efforts to promote innovation systems for sustainable development through the inclusion of stakeholders, the results obtained to date seem to fall well short of the answers needed to address the challenges of environmental and food security.

The concept of innovation systems in agriculture and rural development has made a forceful comeback within the major international organizations, NGOs, and national research and development organizations. It is, in fact, the outcome of decades of exchanges and discussions between scientists and researchers in the social sciences on the methodology to be followed for the science of development.

Why Use the Innovation System Approach?

Formal research on innovation systems only started in the 1980s, when emphasis was placed on intensification. Innovation based on a linear model has evolved towards a notion of 'process'. As a process, it encompasses factors affecting the demand for, and the use of, knowledge in an innovative and useful way. Innovation is not a new invention or technology, but depends on the environmental and human context. Consequently, what can be shared are the principles for its adaptation, and not the innovation itself.

What Are the Possible Options?

The most widely used option is action-research. This started in the 1950s. It consists of undertaking collaborative action with local stakeholders, at the same time as studying that action as it is being implemented. It is a reflective process entered into by people working in a team or within a framework of a 'community of practices', in which theory informs practice, which in turn informs theory. Adhesion to the technology transfer system remains, even if the intention is the innovation system. Certain principles guide action-research approaches:

- use learning frameworks, such as experimental learning and social experimentation;
- be aware of the learning levels;
- use integrated concepts, theories, approaches and methods seeking to promote the innovation system;
- use a flexible methodological system, such as action-research.

(continued)

Box 1: (continued)

Methodological Shortcomings

The question of innovation systems does not fall within a precise methodological framework. Learning, or rather types of learning hold a major place in the concerns of research and development. However, these frameworks and types of learning are poorly conceptualized.

One of the main difficulties in the innovation system approach is linked to the lack of a mutual understanding between scientists and development operators regarding questions of method. The development and use of a joint language are prerequisites that should be more fully documented.

(Adapted from Beshah 2008)

Developing Stakeholder Adaptability and Empowerment

The challenge for research in partnership for development thus becomes to develop societies' capacity to adapt in order to cope with changes. The concept has been used in the deliberations on climate change, but it can also be used for other challenges (Folke et al. 2003).

This capacity to adapt first involves strengthening competencies enabling the empowerment of citizens – all citizens. Empowerment is the means whereby citizens acquire greater control over decisions that affect their lives (Laverack and Labonte 2000). Such empowerment should enable them to prepare for the future by applying scientific knowledge to produce techniques, technologies and mechanisms that will help make such a future a reality.

Constructing Competencies

All citizens, whatever their place in society, must contribute to the capacity to adapt by developing competencies. Competencies involve the ability to choose, decide and act. A competency is a 'power' to act, not in absolute terms, but in line with a given situation. They are resources for action, alongside other material or organizational resources. Competencies are not limited to the specific practical skills and know-how of a profession. They are also high-level know-how (e.g. designing, organizing, structuring, assessing, debriefing, etc.). Competencies make it possible to cope with a singular and complex situation, to 'invent', construct an appropriate response (and not to reproduce stereotyped responses), derived from either a common frame of reference, or from formal educational procedures (Perrenoud 2004).

Collective Learning

Under these conditions, collecting learning is one of the keys to the success and sustainability of the innovation process, introducing the adaptation of stakeholders to change or modification of the physical, social or human environment.

Capacity building targets the empowerment of players outside research, by strengthening their commitment and improving the equal accountability of the partnership. Stakeholder commitment is the major mechanism for capacity building. It is based on co-learning within a framework that consists of improving the impact of AR4D.

Creating competencies involves learning processes that articulate the production of different types of know-how. The economics of knowledge propose a classification of the different types of know-how according to that demand for articulation (see Box 2). These are the 'know why', the 'know what' and the 'know who' (CNRS 2002).

The 'know why' analyses the causal relations that explain a given situation. It is in the domain of theory. The outcome of this stage is an analysis framework that often takes the form of a scheme or model.

The 'know what' concerns knowledge of the facts and the characterization of situations. What is the degree of 'sustainability' of farming systems? How do the territory and farming systems contribute positively, or not, to sustainable development?

The 'know what' is a matter of informing the analysis framework applied to a concrete situation. It is a diagnosis.

The 'know why' and the 'know what' are essentially introduced into the programming and planning phases. The 'know how' concerns action, techniques and methods for acting. It refers to the proposal of possible solutions.

Lastly, the 'know who' encompasses the 'who knows what' and the 'who does what'. These are means of organizing competencies in a coherent process, which will govern the establishment of support mechanisms and services.

Articulation of Different Types of Knowledge

The articulation of different types of knowledge can be summed up by the verbs observe, understand, propose and organize (see Box 2). The architecture is that of teaching processes and learning theories (Bordenave and Pereira 1977). It is sought in research systems in partnerships that combine project elaboration, innovation production and training, in the same non-linear process that introduces knowledge, methods (analysis of situations and potential solutions), qualities (creativity and organizing ability) and behaviours (sense of collection action). Innovation resumes its place, serving a society project. It exceeds "the implementation of an invention and its integration in a social setting" (Alter 2000). Co-learning is an integrated process of invention and innovation.

Box 2: Constructing Competencies: Collective Learning and Articulation of Different Types of Knowledge

The ongoing construction of competencies is an essential lever in developing the adaptation and autonomy of stakeholders faced with a given situation. It is based on a process that engages and integrates different types of knowledge. It brings about a partnership in which all the 'constituents' learn from each other in order to develop a collective ability to innovate. The following table presents a classification of different types of knowledge based on that demand for articulation:

Knowledge	Action	Product
Why?	Observe and understand (a situation)	Dynamic and interdisciplinary analysis framework model
What?	Describe and characterize (a situation)	Participatory diagnosis
With whom?	Involve those with the knowledge: who knows what and who does what?	Identification of facilitators Operational partnership construction
How?	Design and propose a collective strategy	Methods and mechanisms for action
	Organize competencies	Tools: foresight (scenarios), role playing, etc. Support system: information and communication Governance system Participatory evaluation process

Collective Experimentation

At the interfaces of different types of knowledge, experimentation is no longer a simple verification, adaptation or demonstration; it is an ability to invent. Experimentation becomes a tool, a medium for dialogue and a comparison of different types of knowledge: "One must be convinced of the status of the experiment. It is a strategy for overcoming existing constraints to give a sense, a framework, and objectives to a development process" (Tonneau 1986).

Experimentation thus helps to bring out more complex thought processes regarding the management of production factors, the performance and relevance of activity systems, and social challenges.

Collective experimentation opens up a forum for creativity involving all stakeholders, from scientific, technical and human research, development operators and citizens, to invent new references, that is, technical references, management references, institutional references for assistance and governance systems, and political references.

Characteristics of Research Systems in Partnership

The farm field schools of the Food and Agriculture Organization of the United Nations (FAO) have been the most studied system. This system illustrates how a technical problem, in this case managing rice diseases in Indonesia, makes it possible, with groups of farmers, to raise and deal with more complex supply-related issues that go beyond local development (Röling and van de Fliert 1994). Many other such experiences exist, which are often described in the grey literature. By analysing them, we can outline a few characteristics of research in partnership and how it works.

Generally, technical experimentation easily mobilizes since it responds to (simple) targeted needs that are often decisive for activity systems. That simplicity explains why the development of technical products is often a success (easy dissemination). Experimentation tools are available for networks of farmers-experimenters (Hocdé 1998), where the production of references and technical information is collective. The choice of experiments, their monitoring and discussion of their results are subject to exchanges of information and a comparison of knowledge.

Within these systems, experiments are conducted inside farmer organizations, and introduce financial and human resources. These organizations and associations gradually integrate the research function, which they then consider as a means of converting their major autonomy options or their project into practice. In addition, they organize the production and dissemination of technical innovation, avoiding repetition, and facilitating synergies and the circulation of information. It is, in fact, a matter of professionalizing the function of farmer organizations.

Organizations are increasingly widening their field of research through strategic deliberations on the future of agriculture. The strategic vision contributes to debates on agricultural policies and the accompanying measures needed to apply selected technologies. Professional organizations then turn to development policy issues.

Training through 'learning by doing' methods is central. The process is intended to strengthen the technical skills of farmers and other players by developing their capacity to adapt and invent. The co-learning process accompanies experimental work, repositioning it each time in a broader perspective (Tonneau et al. 2003), by adding social and institutional experimentation to technical experimentation (Mercoiret 1992).

Constructing Forums for Dialogue

Another challenge is the collective construction of a forum (or, on a larger scale, platform) for dialogue, where problems and potential solutions are identified and analysed. The forum is first and foremost a place for discussion, dialogue and exchanges between the different development stakeholders. It is the place where

the subject of the experiment and the project will be defined in its complexity, spatial aspects, social relations, economic, physical and environmental components, and its chronology.

Eventually the forum can become a place to debate diverse positions, devise public policies and draw up development programmes that focus on the real problems faced by the population. The forum can then be converted into a legal and managerial body capable of setting in place and managing resources and projects.

Producing References

As with any research approach, research in partnership is obliged to produce references. Producing references means creating an awareness of successful or unsuccessful experiments (failures teach lessons) by describing them. They are then analysed and presented in such a way as to serve as learning media.

The innovation process turns knowledge and information into mediating objects, making it possible to define options and orientations for the future. The information exchanged and shared in forums provides a logical framework for situation analyses (diagnosis and evolution scenarios). Information – and its formalization in the form of information systems – is a tool that enables a group to mobilize knowledge and data that make sense for enlightening and guiding a collective deliberation process. The data are used to construct new knowledge and concepts. Information then becomes the property of social stakeholders working for the innovation process. Management of information and references is a powerful tool for building stakeholder capacities and competencies.

This brief overview of novel concepts and tools working for 'science for development' suggests that research potentially possesses the knowledge, tools and methods to produce useful references that can be used by communities faced with major sustainable development challenges.

Research, however, must also bring out problems and take into account, at all times, the issues raised by rural innovation stakeholders. Indeed, each player brings their vision and introduces the products and results of experiments with which local stakeholders should be closely associated. It is within this interactive, flexible and proactive framework that research in partnership needs to be repositioned.

The case studies presented in the next chapter illustrate how approaches that include the participation and true commitment of stakeholders have produced some tangible results, by endeavouring to link the production of innovative techniques to their specific social and cultural situations.

Multistakeholder Approaches in Africa and Brazil

This chapter sets out to be a pragmatic contribution, as positive as possible, to the implementation of sustainable solutions for rural development in Africa. The observations and lessons are drawn from case studies presented at the APPRI (Apprentissage Production et Partage d'Innovations) international workshop 'Learning, Producing and Sharing Innovations: tools for co-construction and sustainable implementation of innovations in dryland Africa' (Clavel 2008), which involved 10 countries in West, East, central and southern Africa (see Box 1). These initiatives were selected from numerous experiences in Africa. One of the challenges of the APPRI workshop was to compare them with the experience of the UniCampo Farmer University in the Brazilian Nordeste, a semi-arid region where farms display great similarities with family smallholdings in Africa.

Some of the studies develop more general ideas on the innovative methods and types of tools available, based on experience of the case studies. The description of the UniCampo pilot project in Brazil provides an illustration of a model from outside Africa that can be considered in the light of the African case studies.

The analysis of practices in the field will help to specify the methods and tools used, and identify knowledge gaps and requirements in order to develop and improve the impact of agricultural innovations. The needs identified for knowledge, research and capacity building should make it possible to define intermediate research and development (R&D) subjects, which are usually multidisciplinary, validate them collectively and produce shared knowledge and references.

This information will be summarized in the final chapter to propose the basis for a general model, a novel framework for operations designed to ensure sustainable rural development in Africa.

D. Clavel, *Knowledge and Rural Development: Dialogue at the heart of innovation*,
DOI 10.1007/978-94-017-9124-3_3, © Éditions Quæ, 2014

Box 1: Learning, Producing and Sharing Innovations: Tools for Co-construction and Sustainable Implementation of Innovations in Dryland Africa (the APPRI Workshop)

The APPRI international workshop coincided with the deliberations under way regarding innovation in the face of the global crisis.

It was an initiative of the Agricultural Research for Development (Centre de Coopération Internationale en Recherche Agronomique pour le Développement – CIRAD), in collaboration with the Institut de Recherche pour le Développement (IRD), the Institut National de l'Environnement et des Recherches Agricoles (INERA) in Burkina Faso and the Confédération Paysanne du Faso (CPF), with financial backing from Agropolis Fondation and CTA.

The workshop was held during 21–24 October 2008, in Ouagadougou, and was attended by more than 50 participants from Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, Kenya, Mali, Niger, Senegal and Tanzania, together with a Brazilian team who presented the Farmer University from Brazil Nordeste. The participants came from professional farmer organizations, NGOs, and research and training organizations working in the drylands of Africa. They contributed to the workshop either through targeted talks on the main topics, practices, concepts, tools, methods and experimental design, or by taking part in or chairing discussions.

The purpose of the APPRI workshop was primarily to analyse the conditions for implementing alternative action-research practices in partnership for development, taking into account the difficulties encountered by 'official' research and the rural world faced with the major challenge of sustainable development in the South.

Participatory Practices in Africa

Nineteen case studies illustrate how constructions in partnerships between different stakeholders and new ways of carrying out joint socio-technical experiments have managed to achieve their social impact objectives in different regions of Africa.

The Citizens' Anti-hunger Caravan: The Experience of the Rural Communities of Pouma in Adapting to Climate Change

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Type of Innovation Tested

An itinerant citizens' forum: a federation of stakeholder initiatives designed to increase abilities to intervene in public life.

Tools and Methods Used

The citizens' anti-hunger caravan: a strategy for social mobilization against hunger and poverty.

Establishment of local committees with a mandate geared towards exchanges of experience and information.

R&D Needs Identified

Institutional strengthening of the COSADER group, particularly by employing full-time salaried staff.

A communication plan and communication equipment.

Participatory evaluation and audit.

COSADER is an association that was founded in 1996 to bring together NGOs and associations working for food security and rural development in Cameroon in order to:

- coordinate their efforts to make them visible;
- ensure constant lobbying of politicians and donors in favour of the rural world;
- support rural and urban organizations in their work to alleviate hunger and poverty.

COSADER coordinates and develops the national alliance against hunger in Cameroon (a multistakeholder group following on from the appeal launched by FAO in 2003 to build an international alliance against hunger), introducing an itinerant strategy that promotes relationships of proximity and exchanges, that is, the 'citizens' anti-hunger caravan'.

The citizens' anti-hunger caravan was the strategy adopted by COSADER to unify the initiatives of different stakeholders through exchanges of experience and information. The founding members were the traditional and religious authorities and rural organizations, which were joined by the chamber of agriculture, decentralized local government, microcredit organizations and insurance companies. The town of Pouma, in the forest zone, was where the citizens' anti-hunger caravan was launched in 2008. Pouma was interesting as a place to observe the consequences of climate change, especially that year, when the rains began 3 months late. The citizens' anti-hunger caravan then moved on to Bafoussam and Sanguémelina. Local committees for food security and poverty alleviation were set up and played a key role in the system. Specifications for these committees were drawn up including identification of active rural groups, discussions about projects (the difficulties encountered and strategies adopted locally to solve those problems), dialogue with

the local, traditional, communal and administrative authorities on local development, and consideration of the needs and proposals of the groups in community development plans.

The organization in October 2008 of a dialogue between rural women, the chamber of agriculture and FAO, facilitated by the COSADER–national alliance, was one of the most significant results. That meeting was attended by 102 rural women from 10 provinces in Cameroon. COSADER also monitored five rural groups identified by the local committees, as part of a study on strategies for adapting to climate change. This study revealed that farmers had highly appropriate means of adapting to climate change, such as replacing dried seeds of root and tuber crops in the same plot with groundnut seeds (with a shorter cycle), use of the local MINADER service (e.g. advice on seed selection, sowing techniques, phytosanitary control) and diversification of farm activities (e.g. processing, small-scale trade, small-scale fishing, beekeeping, fish farming, etc.). The surveys carried out among rural farming households revealed that water had declined in the tubewells. Domestic water supplies thus became more difficult, as more distant, non-managed and less certain sources had to be used.

COSADER acts as permanent secretary for the 'Cotonou Thursdays', as stipulated in the Cotonou Agreement in 2000 between the European Union (EU) and the African, Caribbean, Pacific (ACP) group of states (Andela 2008), and subregional coordination of the Coalition of African Organizations on Food Security and Sustainable Development (COASAD). It is also the focal point for the subregional project to strengthen the capacity of civil society organizations in the prevention and management of conflicts (PREGESCO). COSADER needs to be institutionally strengthened, particularly to ensure continual staffing and promote the involvement of new players in the national alliance against hunger. The aim is to establish 20 groups per province, that is, 200 groups that will have access to funding for the launch phase. The new schedule of activities includes the drafting of an active communication plan, with all the interested parties, which means acquiring modern communications equipment, with recourse to outside appraisal and auditing.

Designing Agropastoral Innovations in an Initiative of Action-Research in Partnership: The Teria Project in the Villages of Koumbia and Kourouma in Burkina Faso

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Type of Innovation Tested

Establishment of dynamic consultation frameworks (stakeholder integration spiral) involving the integration of agriculture and livestock production.

Tools and Methods Used

Action-research in partnership methods founded on peer-to-peer learning and the co-design of innovations intended to strengthen stakeholder autonomy.

Methodology: gradual integration of local knowledge, dialogue and the search for consensus (a common sense and language).

R&D Needs Identified

Multipartite monitoring and evaluation (M&E), definition of intermediate research subjects and a common language.

Many studies have shown that village ecosystems in western Burkina Faso are reaching breaking point in terms of fertility (e.g. the disappearance of fallow, declining soil fertility, shrinkage of grazing zones, etc.). Relations between farmers and livestock breeders are deteriorating due to unbridled competition for agrosylvopastoral resources with increasing numbers of intercommunity conflicts. In addition, the questioning of top-down approaches for technology transfer and the emergence of new types of stakeholders have led to a change in the nature and types of partnership in order to reconcile economic development, sustainable management of natural resources and harmony between producers. An experiment of this type was conducted in two villages in western Burkina Faso, Koumbia (Tuy province) and Kourouma (Kénédougou province), in 2006 and 2007. The partners were CIRAD, Centre International de Recherche-Développement sur l'Élevage en Zone Subhumide (CIRDES), the village consultation committees from Koumbia and Kourouma, Institut National de l'Environnement et des Recherches Agricoles (INERA) and the Polytechnic University of Bobo-Dioulasso.

The main purpose of the Teria project (teria means friendship, a name given by the villagers themselves) was to design innovations based on the integration of agriculture and livestock through an action-research initiative in partnership. The specific aims were:

- to contribute to establishing a way of designing innovations in partnership;
- to establish a mechanism that brings together researchers, technicians and producers;
- to design innovations based on agriculture and livestock integration;
- to produce knowledge on innovation processes and agropastoral practices.

Project governance and appraisal were based on the village consultation committees, the steering committee and the scientific committee. The project benefited from financial backing from CIRAD.

Teria gave impetus to a spiral based on 'peer-to-peer learning' in which the number of producers interested and enrolled increased in each phase. The operations undertaken were mainly:

- the establishment of a framework for consultation between farmers and livestock breeders, but also between scientists and operators in the field;

– formalization of the commitments of the different partners at all stages of the research;
– the implementation of trials involving an innovation co-designing method in six stages (contractualization, diagnosis of the production unit, knowledge gathering, feasibility study, trial implementation, monitoring-assessment, results and capitalization);
– evaluation and dissemination of results.

The project particularly contributed to more efficient recycling of fodder biomass, better use of organic manure and animal energy for earlier crop planting, and better livestock productivity. The relations between farmers and livestock breeders improved, as did the involvement of village minorities in the local bodies responsible for resource management. Lastly, the involvement and autonomy of stakeholders was reinforced.

Continuing the exercise will require time as mechanisms need to be set in place and evaluated, and tools need to be created that maintain the interest of stakeholders. A change of mindset on the part of researchers is necessary to ensure greater consideration of local knowledge. Dialogue needs to be established with operators in the field, seeking a consensus that will mean defining a common language that makes 'sense' to the different partners. It is essential to define intermediate research objects to make use of the whole range of skills. Lastly, it is essential not to neglect the exploratory study where it will be possible to make the correct diagnosis and define the approach best suited to the context of the experiment.

Encouraging and Assisting Mango Producers in the Ziguinchor Region to Adopt Integrated Pest Management Methods Against the Fruit Fly

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Type of Innovation Tested

Dissemination of information, demonstrations, practical experiments and methods for controlling fruit flies.

Tools and Methods Used

Collective learning: information days, radio programmes and peer-to-peer training with the participation of all stakeholders in the supply chain.

R&D Needs Identified

Research on fruit fly control methods.

Support for publication and production of references.

With the return to peace, producers in Casamance have made great efforts to plant mangos, but the fruits "fall like stones" as soon as the rainy season begins. This is due to *Bactrocera invadens*, a fruit fly of Asian origin, which first colonized West Africa in 2003. The fly pierces the fruit to lay its eggs inside, causing the fruit to rot and leading to over 50 % production losses.

Lacking knowledge about this new pest and in the absence of effective control, many producers were disheartened, which held back development of the supply chain.

The stakeholders involved in the PASCO project were agricultural advisers from the National Agency for Rural and Agricultural Advice (ANCAR – Agence Nationale de Conseil Agricole et Rural), a student researcher from Unité de Formation et de Recherché des Sciences Agronomiques et du Développement Rural (UFR-SADR), an official from the Senchim company and technical staff from CARE (a rural development specialist and an agronomist). Each partner made a financial contribution or provided staff or equipment.

The PASCO project was launched by CARE Senegal in May 2006 in the Ziguinchor region to promote the construction of the fruit supply chain, particularly for mango. The resources introduced were used for social communication, consultation between the different players and training to enable small-scale fruit farmers to participate fully in an equitable collective marketing mechanism. The experiment carried out on mango aimed more specifically at ensuring better dissemination of information about fruit flies and ways of controlling them. Around 2,000 small-scale fruit farmers, men and women, have been assisted by 4 farmer organizations (14 leaders and 4 supervisors).

It was from the following proverb: "What I'm told, I forget; what I see, I remember; what I do, I know" that the information drive was developed, giving preference to practical sessions, demonstrations and workshops in which the stakeholders themselves made traps. A regional fruit fly control committee was created, which brought together technical services, producer organizations (POs), NGOs and farmer associations to draw up a regional action plan and harmonize interventions. The interventions covered numerous fields including communication, information, training, assistance and orchard monitoring trials.

The objectives were exceeded due to the enthusiasm of the beneficiaries of the project:

- 81 development agents were trained and benefited from extension tools (e.g. technical dossier, brochures, posters, a CD) to help them run their information days;
- 1,886 people (of whom 25 % were women) attended 1 of the 52 fruit fly information days held in the villages of the region from May to July 2008;
- radio messages in four local languages were broadcast on three community radio stations, enabling a wide dissemination of information throughout the region and in neighbouring countries (The Gambia and Guinea Bissau).

The 45 smallholder groups that received equipment and products organized themselves in such a way as to make the best use of that equipment and renewed products at their own expense, for more effective control. The farmer organizations and technical services that were partners in the project were thus better able to fulfil their assistance and advice role as the leaders and technicians had been trained for that purpose.

The training sessions and 'fruit fly' days gave rise to many initiatives by the beneficiaries, from students to producers. A fruit fly population monitoring mechanism is currently being set in place with CIRAD and the International Institute of Tropical Agriculture (IITA) as part of a regional project.

CARE Senegal made fruit fly control one of its priorities and launched an information drive in May 2008 in collaboration with the other stakeholders. It trained development officers from the region who, themselves, led the information and demonstration days. Many became aware that teaching others by passing on knowledge is the best way to master a subject. Each agent developed their own often very colourful explanations, with references and a vocabulary adapted to the producers, who, in their turn, took back the information to their villages.

Smallholder Agriculture: Factors of Change for Sustainable Maize Production

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Type of Innovation Tested

Participatory trials of the Mamaba productive maize variety, with or without inorganic fertilizer.

Tools and Methods Used

Quantitative studies (e.g. yield, etc.), qualitative studies (e.g. quality of life, etc.), and economic, social and environmental sustainability studies.

R&D Needs Identified

Construction of scenarios for a change of scale and the dynamic links between producers and the market.

Diminishing and poorly distributed rainfall worsened by climate change, limited use of inorganic fertilizers, a limited amount of organic fertilizers and the variable quality of biological resources are major factors affecting agricultural production, and hence food security, in Sub-Saharan Africa. The study carried out concerned smallholders for whom food insecurity had increased due to poverty, land degradation and a decline in soil fertility.

The project was launched in September 2002. The main stakeholders and beneficiaries were smallholders, international scientific research organizations, donor organizations, the Ministry of Food and Agriculture, extension officers, NGOs, universities and agricultural colleges, and district assemblies.

The main aim of the study was to assess the quantity and quality of organic resources to achieve stable maize yields in a semihumid forest zone in Ghana where soil fertility is declining. Integrated soil fertility management, that is, the combined application of organic and inorganic fertilizers for sustainable agricultural production, was proposed to improve the inherent fertility of tropical soils, particularly in Sub-Saharan Africa.

A participatory on-farm trial was used to compare six levels of organic resources, within a range generally available to smallholders, with or without inorganic fertilizers. A high-yielding maize variety was chosen. The trial was replicated at sites with different types of soil.

The results concerned quantitative gains (e.g. the technological options for continual production of 3–6 tonnes of maize grains per hectare over the two seasons of the year, depending on the resources of the farmers), qualitative improvement of living conditions (e.g. the ability to pay school enrolment fees and sign up to the national health insurance scheme), and the improvement of sustainable development indicators (e.g. carbon sequestration enabled by innovations and food security for all members of the family).

A dynamic analysis of change factors was carried out using a time scale to identify:

- the stage of development of the process;
- impact indicators;
- obstacles and constraints encountered.

M&E processes were implemented through weekly visits to the community. Different types of instruments were used, including stakeholder meetings, progress reports, interaction with the media and information.

The criteria used by the farmers included the availability of organic inputs, labour requirements, bulkiness for transport, yield and soil improvement.

The lessons learnt for the future (i.e. future evolution scenario) concerned the dissemination of results with a view to changing scale, and the definition of subjects or objects for study, with a view to maintaining the study over the long term at the experimental site. The sustainability of the system requires the strengthening of links between small farmers and market operators.

Technologies for the Management of Natural Resources in the Drylands of Southeastern Kenya: Successes, Opportunities and Challenges

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Type of Innovation Tested

Participatory and sustainable agropastoral soil restoration methods in drylands by re-sowing native plants.

NRM technologies.

Tools and Methods Used

Strengthening of local institutions (i.e. creation of self-help groups), the selection of technologies by communities, sowing of indigenous plants for erosion control and capacity building for communities.

R&D Needs Identified

An approach that would develop relationships between stakeholders, particularly research and development players, producers, breeders, defenders of wildlife, donors and national political decision-makers.

The lands in Sahelian and Sub-Sahelian Kenya make up 80 % of the landmass in the country and support a quarter of the population. Food shortages are frequent as poor rainfall distribution affects plant and animal production and the human population continues to increase. Members of the Kamba community in southeastern Kenya have made some sustained efforts to introduce NRM technologies to improve their livelihoods and alleviate poverty. NRM technologies had not been adopted in these regions in the past due to the inappropriateness of the extension approach taken with the population.

The project involved agricultural research players, famers-livestock breeders and development agents specialized in agropastoralism.

The experiment set out to test participatory NRM technologies and erosion control measures in pastoral and agricultural drylands, ensuring better involvement of targeted communities and the enhancement of their capacities.

A process for the restoration of plant cover using local perennial plants was followed. The approach developed for the adoption of technology involved:

– the strengthening of local institutions, taking the form of self-help groups as entry points for dissemination of the development initiative;
– the selection of technologies empowering local communities through workshops, seminars and training, and the testing of three types of technologies, that is, re-sowing of local perennial grasses, growing of multipurpose trees, water harvesting and propagation.

Among the technologies tried and adopted, the most successful was range improvement. This was made possible through the rehabilitation of denuded land, which improved primary productivity of the locally available grasses: *Cenchrus ciliaris*, *Chloris roxburghiana*, *Enteropogon macrostachyus* and *Eragrostis superba.* With the exception of *E. superba*, which tends to colonize previously cultivated areas, these grasses can withstand reasonable grazing pressure. The re-seeding method used was successful and the ability of the community to successfully carry out these activities was developed. For example, the site for re-vegetation was prepared by the community using ox-ploughs and shallow ploughing that favours microcatchments. Capacity building involved members identified by the community and was designed to empower agropastoralists, thereby enhancing rapid adoption of the technology.

A system of NRM technology dissemination in drylands is currently being examined. It should integrate a large number of different factors, notably political conflicts, the ordering of human and social needs, national policies and donors' priorities, relations between population dynamics, productive capacities and the economic value of lands, human-livestock-wildlife conflicts, the weakness of links between research, extension and farmers, marketing issues and the often limited investment capacities of producers.

Weendou Bosséabé: A Traditional and Modern Local Experimental Food Security Project for Sustainable Human Development

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Type of Innovation Tested

Collective establishment of a traditional consultation framework based on knowledge of socio-cultural, physical, economic and political contexts.

Tools and Methods Used

Design and gradual introduction of improvements by the inhabitants of the village and emigrants native to the village.

Governance ensured by community management of two groups, one male and one female.

R&D Needs Identified

Technical support linked to irrigation and technical capacity building.

Participatory formal evaluation to consolidate achievements, capitalize on them and make optimum use of knowledge and know-how to improve and validate the project.

The ultimate prospect of a change of scale by 'exporting' to other locations in Senegal and West Africa through 'peer-to-peer' exchange of knowledge.

This experiment was launched by Harouna Moussa Dia, a former emigrant and economic operator, a native of the village of Weendou Bosséabé (Matam region, Senegal). The smallholder project began in 2005. The origin of the initiative was an earlier experiment conducted by Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal (SAED), which was not completed, and the gradual impoverishment of the inhabitants of Weendou Bosséabé faced with the threat of desertification. The objective of the project was to increase and diversify agricultural production, to ensure food self-sufficiency and improve the living conditions of the inhabitants of the village. It was primarily designed and implemented by the inhabitants and emigrants native to Weendou Bosséabé with the women's group (1,000) and the men's group (500).

Governance was by community management of the two groups, with financial contributions decided by mutual agreement. The project finance primarily consisted of the financial contributions of the villagers: 12 million CFAF was provided by the women (2 million CFAF) and the men (10 million CFAF), that is, a total of €18,000, with 7.5 million CFAF (€10,000) contributed by emigrants native to the village, and gradual funding from the initiator of the project amounting to 15 million CFAF (€23,000).

The approach taken was based around establishing a participatory traditional consultation framework and on real knowledge of the socio-cultural, physical, economic and political contexts. The villagers organized themselves by affinities and gender into economic interest groups with democratically elected leaders. The main operations involved: organization of the land and fencing of the two fields (the women's and the men's); installation of two tubewells for each of the fields; the choice of maize by the men and market garden crops by the women; spray irrigation; out-of-season cropping; biological and chemical crop protection; the testing of local and modern technologies; marketing.

The inhabitants of Weendou Bosséabé succeeded in overcoming some sensitive issues, such as those of caste, land tenure and the role of women in the traditional

rural environment. The men's field produced three maize crops annually and the women's market gardening operations produced vegetables that were sold regularly to the inhabitants of nearby villages. It is worth highlighting the autonomy of the Weendou Bosséabé inhabitants, managing their plots as they wished with support from the project. The flexibility of the democratic organization of the groups by affinity facilitated project management.

The main difficulties encountered by both sets of producers were technical, mostly linked to irrigation. The positive impacts of the project were multiple on a local scale, including better access to water, better food and better working and living conditions, improved health, particularly for the women and children, revitalization of the village through renewed hope, etc. In addition, the project, known and appreciated on a local scale, is beginning to be known in the region and throughout Senegal, through the media such as RFM radio, the Senegalese press agency, All Africa, etc.

The major merits of this project lie in its being designed and implemented by the women and men of Weendou Bosséabé, without aid from the state or any NGO. The stakeholders involved in the project are satisfied with the positive results obtained and the project is now funded by the income it generates. However, they are aware that there remains much more to be done. Their perspectives are now primarily focused on the sustainability of the project, in human, physical, technical and financial terms, and on capacity building through appropriate learning, notably co-learning and peer-to-peer training.

Production of Quality Sorghum or Millet for Small-Scale or Semi-industrial Food Production in West Africa

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Type of Innovation Tested

Improved nutritional and health qualities, involvement of traditional sorghum and millet malting knowledge and practices, and the promotion of quality malt and by-product production.

Tools and Methods Used

Surveys and optimization of traditional processes.

Transfer of optimized processes to two small-scale enterprises.

Validation of optimized processes and their promotion.

R&D Needs Identified

Training in financial risk management, especially for women.

Development of mechanisms enabling the independence of small-scale enterprises and their longevity as demonstration centres.

Sorghum or millet malting is a traditional practice in West Africa. It gives the cereal numerous nutritional advantages but so far has only undergone limited development. The great variability of production conditions leads to malts of uncertain technological qualities, resulting in drinks and pap for infants of variable consistency, often of low and variable nutritional value and high health risks. The centralized production of malts necessitates targeted technological processes for specific uses, leading to stable nutritional and health properties. The development of optimized methods adapted to the needs of small-scale units in the rural environment may help to overcome these risks.

The experiment took place in Benin and Burkina Faso in small malt, drinks and infant flour production units from October 2005 to March 2008. The partnership involved the Centre of Industrial Economics (CERNA)-FSA Abomey-Calavi University (Benin), Alitech Industries (Benin), Centre National de la Recherche Scientifique et Technologique (CNRST)-IRSAT (Burkina Faso), the Ouidtinga malting unit (Burkina Faso), IRD (France) and CIRAD (France). The project brought together 26 stakeholders, including universities, research centres, NGOs, two small-scale enterprises and 17 female malt, drinks and infant flour producers in Benin and Burkina Faso. Project governance was ensured by a coordinator and steering committee comprising representatives of all the partners. Funding of €142,000 was provided by the DURAS-GFAR-Agropolis-Ministry of Foreign Affairs programme (France) and €53,000 was collected in the form of financial contributions from the partners.

The experiment to improve the nutritional and health qualities of malts aimed:

- to capitalize on local and outside knowledge of varieties and traditional malting practices;
- to develop and validate appropriate malting methods for specific uses and by-products on a small-scale enterprise level;
- to promote the production of good quality malts and by-products.

The project took place in three phases. The first was primarily devoted to surveys of traditional malting processes and by-product manufacture (alcoholic or soft drinks), and optimization of those malting and brewing processes. The second stage involved transferring procedures optimized by research to the two small-scale enterprises. The final stage consisted of validating the optimized procedures and in promoting them and the by-products to other processing units.

Through the use of the adapted procedures, the project helped to open up the market to local production and increased the competitiveness of local enterprises. In addition, it contributed to biodiversity conservation through the use of local cereals. In other respects, the project strengthened collaboration between research and private processing units: the major contribution was a strengthening of the capacity to deal with local development and the ability to work collectively.

The main difficulty was the hesitation of the women to abandon their traditional processes and distribution circuits and adopt innovations mainly because of the financial risk management. The future of the experiment will depend on financial resources enabling the enterprises, which have become demonstration and training centres, to acquire true technical, commercial and financial autonomy.

Multistakeholder Reforestation Project on the Banks of the Milo River in Kankan Prefecture, Republic of Guinea

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Type of Innovation Tested

Reforestation along the banks to protect the Milo river and create plantations for the conservation of local woody species adapted to the biotope.

Tools and Methods Used

Concerted testing of 'new' riparian and fire-resistant species, coordinated by the Programme for Integrated Management of Water Resources in the Upper Niger (Gestion Intégrée des Resources en Eau du Niger Supérieur – GIRENS).

R&D Needs Identified

Financial difficulties (initial funding from the Water and Forests Service was insufficient), technical difficulties (pests in the nurseries) and logistical difficulties (no vehicle).

No participation by research in this programme.

No formal evaluation and communication likely to ensure the continuity and dissemination of the model.

Land clearance for crops, carbonization, handicrafts, exploitation of timber and utility wood, the making and baking of bricks on the banks of water courses, overgrazing due to pastoral nomadism, demographics and bushfires are all man-made factors causing the destruction of the plant cover essential for stabilizing riverbanks in a sustainable manner. An earlier experiment funded by the WB in 2007 reforested the banks of the Dion river. As the WB project was of limited duration, reforestation was carried out with fast-growing exotic species in order to convince the donor

regarding the experiment. However, these species have none of the qualities needed for the multiple uses as practised nowadays. It is necessary, therefore, to maintain the local riparian species that are highly adapted to the local environment, particularly so that the biotope (e.g. fish, birds, etc.) can be preserved and local small-scale activities can be sustainably maintained.

The project to reforest the banks of the Milo river ran from February 2008 to December 2009. The purpose of the project was to increase the degree of plant cover to protect the river by:

- reforesting its banks;
- setting up conservation plantations for woody food species (i.e. *Adansonia digitata*, *Tamarindus indica*, *Parkia biglobosa* and *Vitellaria paradoxa*);
- creating a green curtain and installing windbreaks.

The project reforested 30 ha of riverbanks in the urban municipality of Kankan. A nursery followed by conservation plantations were set up with seeds from Lower Guinea and seeds found locally. The first reforesting rows were planted with local riparian species chosen for the purpose: *Pterocarpus santalinoides, Oxytenanthera abyssinica*, *Khaya senegalensis*, *Detarium senegalensis*, *Pausinystalia macroceras*, *Carapa procera*, etc. The fire-resistant exotic species *Gmelina arborea* and *Tectona grandis* were chosen to establish a protective strip against bushfires and strong winds.

The project was implemented in a multistakeholder partnership with the GIRENS programme for the integrated management of water resources in Upper Niger, several NGOs and other user groups. The NGOs involved were Développement Humain Durable (DHD), the Green Hand Action Foundation (GHAF) and Sourire International. The user groups involved were the Association for Sustainable Development and Environmental Protection in Guinea and Kankan (l'Association pour le Développement Durable et la Protection de l'Environnement – ADAPE), the office of (wood-fired) brick-kiln owners and the association of loggers. Project governance was ensured by the forest administration with the participation of the local population. The Department of Agriculture, Livestock, the Environment, Water and Forests provided the project with 5 million Guinea francs (5,000,000 GNF).

The results obtained have been very encouraging, as shown in particular by the very active involvement of the brick-kiln owners and loggers. The local authorities, including the mayor of the urban municipality of Kankan, took an interest in this project, together with the partner NGOs. Twenty private nurserymen were trained in seed-harvesting techniques and the production of quality planting material. The nurserymen trained were locals so they were very interested in the restoration of the degraded zones.

The operations will be assessed by the GIRENS programme. The problems encountered were mostly financial, as the initial funding was insufficient, but also technical (pests in the nurseries) and logistical (no vehicle).

Restoring Degraded Soils in the Niger Valley: Successful Experience in the Participatory Management of Fragile Natural Resources

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Type of Innovation Tested

A programme to control silting in the Niger river basin by conserving, protecting and restoring water and soils.

Tools and Methods Tested

Participatory diagnosis and planning drawn up and co-funded by PLCE (60 %) and the population (40 %), and implemented in accordance with a partnership protocol and an agreement signed between the project and 'clusters'.

R&D Needs Identified

Participatory evaluation.

Ex-ante and *ex-post* socio-economic study.

Food security in Niger mostly depends on rainfed crops, which provide over 95 % of cereal production. The soil is subject to severe climatic and human pressure. The pressure on resources, combined with drought, rapidly degrade the agricultural qualities of the soils and, if no measures are taken, leads ultimately to desertification. Each year, thousands of hectares are lost as the need for land continually increases due to high population growth. In the Niamey region, pressure is such that the river basin is silting up to a point where it stops flowing at certain periods in dry years.

In order to tackle this growing threat, PLCE was set up for 5 years (2005–2010). It covered three Sahel countries, Burkina Faso, Mali and Niger. Water and soil conservation (WSC) and soil protection and restoration techniques (SPR) were proposed and tested in partnership with inhabitants of the riverside in the surrounding villages with a view to slowing down the degradation of over-used and eroded lands, enabling their return to farming, and reducing the silting-up of the river basin.

WSC-SPR techniques combine mechanical and biological procedures. They were applied in partnership with the village communities along the banks of the Niger. The mechanical procedures consisted of establishing artificial barriers along contour lines perpendicular to the slope to slow down water run-off and facilitate infiltration by decreasing the slope. This mainly involved the construction of bunds and stone lines, and techniques to stabilize the dunes around the basin. The biological procedures consisted of re-vegetating the sites to be treated by planting or direct sowing, using traditional techniques, such as *zais* and *tassas*, and half-moons. These techniques have proved their worth but require a great deal of labour if they are to be implemented on a significant scale in the basin.

Some highly degraded soils were reclaimed on several hundred hectares and returned to agriculture in 3 years. That success was partly linked to the positive impacts these simple techniques had on the restoration of fertility, and partly to the participatory strategy of the silt control programme. The involvement and accountability of the local populations in the project occurred early in the process: the WSC-SPR operations resulted from participatory diagnosis and planning based on 'clusters' corresponding to a grouping of several villages sharing the same geographical space and wishing to work together. Participatory planning was established and co-funded by the project (60 %) and the population (40 % in the form of labour), and implemented in accordance with a partnership protocol and an agreement signed between the project and the 'clusters'.

These techniques are now being successfully disseminated by PLCE in the region of the river where soil erosion is acute. After 3 years of the experiment, the populations resumed using certain techniques, notably *zais* and half-moons, with which they were familiar. Today, these techniques are being reproduced in individual fields without the intervention of the project and the upkeep of certain community sites (plateaux and dunes) is totally ensured by the populations without outside intervention. Technical information sheets were produced with support from the Agricultural Innovation in Dryland Africa (AIDA) project (No. INCO-2006-843863).

The positive impact of the land restoration work on the environment is a tangible fact that can be objectively verified in the field, as shown by the satellite images via diachronic 'Sahel' studies undertaken by the Permanent Inter-State Committee for Drought Control in the Sahel (Comité Inter-Etate pour la Lutte contre la Sécheresse au Sahel – CILSS) in 2006. The awareness of the local communities, which has long been lacking, is becoming today an indicator of the sustainable management of natural resources and is efficiently replacing the 'top-down' approaches taken in previous years. It was necessary to engage the population, at least at the beginning of the project, by acknowledging traditional organizational methods and techniques.

Technical Innovation and Stakeholder Organization: The Case of Certified Seeds in Sanmatenga, Burkina Faso

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Type of Innovation Tested

Proposal for a way of organizing stakeholders (institutional innovation) designed to promote smallholder access to the seeds of improved sorghum, millet and cowpea varieties (technical innovation).

Tools and Methods Tested

A socio-economic study of two distinct cases: case 1 – working with the association of input distributors; case 2 – working with the union of cowpea producers.

R&D Needs Identified

Capacity building for operators in the supply chain.

Creation of an integrated organization for the seed supply chain, notably by reducing state intervention and promoting economic and institutional involvement.

There are recurring cereal deficits in the centre-north region of Burkina Faso. In order to feed a fast-growing population, production has to be intensified despite soil degradation and drought. Sanmatenga province is located in the Sahel zone (500–700 mm of rainfall annually). Sorghum and millet account for 62 % and 34 % of cereal production, respectively, and, together with cowpea, they make up 57 % of household agricultural income. There has been a cereal production shortfall in 12 out of the last 14 years. Faced with the urgent need to produce more, producers in pilot villages of Sanmatenga province turned to producing certified seeds (CS) of improved sorghum, millet and cowpea varieties, on small areas, with limited equipment. This was made possible by the experience acquired over the previous 10 years in carrying out demonstration tests and experiments on new varieties with research, the extension services and NGOs. Production levels are still low, but they are improving and the seed market is developing.

An economic market analysis study, funded by the French Cooperation and Cultural Service, was undertaken in 2008 to answer the question: What type of stakeholder organization is needed to promote farmer access to the improved seeds developed by research? The seed groups of Zikiémé and Pissila were chosen as they were contrasting cases. They differed in their characteristics (e.g. the size of the

group, technical skills, externalization of innovation and community integration), in the way they were organized and in their partnership strategy in commercial terms; in case 1, the producers turned to collaboration with the association of input distributors while in case 2, the model chosen was the renewal of relations with the union of cowpea producers.

The results revealed a gradual increase in the number of CS produced, proving the technical skills of the seed groups, the ability to incorporate CS production into village activities and their capacity to promote their use among producers. However, the state, the main procurer of CS, buys them at high prices, leaving the residual quantities of seeds to other buyers, which does not make for customer loyalty. This direct intervention has an anti-competitive effect, which disrupts the creation of a fair market and prevents vendors from achieving a margin that reflects actual production costs. The situation worsened in 2008 when the price of food products spiralled.

Collaboration between stakeholders in the supply chain, the technical services and the local administrative authorities, especially the municipalities, makes it possible to include the activities in public CS extension initiatives (e.g. state, projects, municipal initiatives, etc.). The professionals in the supply chain propose to set up an integrated organization on a provincial scale. This should facilitate operations and become a forum for negotiations, particularly with regard to seed prices, which would need to be enough of an incentive for producers, but also affordable for users, whilst enabling gains in productivity.

Consultation between farmers, researchers and input distributors for the Sanmatenga seed supply chain was established through innovating farmers. They constitute an incomparable starting point for the development of research activities and the participatory creation of new improved varieties, which will help in the diversification towards more income-generating activities in poor rural communities where opportunities are scarce.

Faced with the need to produce a quantity of seeds that meets requirements and to develop their use in order to produce more, there may be a risk that the agriculture services will be tempted to develop the national agribusiness to the detriment of local family agriculture. If an efficient and sustainable seed market is to be co-constructed, the role of the state should not be to focus on conserving the monopoly of CS production, but rather to gear itself towards coordinating and regulating seed production operations. This state intervention, inherited from an obsolete system, deprives smallholders of their autonomy and does not encourage their capacity for innovation.

Assisted Natural Regeneration of Village Forests and the Promotion of Income-Generating Activities for the Benefit of Rural Populations in Burkina Faso

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Type of Innovation Tested

Introduction of income-generating activities (IGA) by developing village groves for the natural regeneration of plant cover.

Tools and Methods Used

Participatory creation and collective sustainable management of IGA based on rational use of wood resources and non-wood forest products.

Technical and organizational training in the sustainable management of forests and biodiversity.

R&D Needs Identified

Planting of hedges inside fences.

Ways of assisting populations to continue their actions, incorporating them into their practices, limit land insecurity and prepare dossiers for international protocols.

In Sahelian countries, population pressure poses a threat to trees, which are increasingly being cut down. Over-grazing is another source of environmental degradation as young shoots are browsed. The countryside has to supply the over-populated towns with firewood, charcoal and timber. This pressure on the vegetation reduces biodiversity and rural populations are deprived of species appreciated for their therapeutic, protective and nutritional properties. Since 2003, the Swiss NGO newTree (www.newtree.org) has been encouraging the involvement and real accountability of the local population in developing simple techniques that ensure sustainable protection of over-exploited areas. Effective methods have been developed to regenerate the plant cover, protect biodiversity and reduce pressure on natural resources, through the creation of IGA based on non-wood forest products.

The initiative was intended to protect degraded village areas in order to facilitate natural regeneration of the non-wood plant cover. Specifically, this meant:

- protecting at least 60 ha of additional areas per year;
- adding value to family groves through IGA;
- providing training in sustainable forest management;
- carrying out regular inventories to measure biodiversity and estimate biomass;
- making rational use of wood resources (e.g. IGA, improved fireplaces, etc.);
- preparing a dossier to obtain Kyoto certification.

The work is based on a participatory approach and is being undertaken in conjunction with local partners, such as Groupe d'Action en Faveur de l'Arbre au Sahel (GAFAS), Tii Paalga, a local association, and Centre Ecologique Albert Schweitzer (CEAS).

The programme currently has 88 partners and 225 ha have been protected. The partner populations are families and womens' groups wishing to protect nature and create groves. The decision to protect natural resources must be made by the participating populations, who determine the zones to be protected and the activities to be implemented depending on their objectives. They provide the materials and labour to install and maintain fences and develop the site. newTree provides supervision and assistance to the populations for these activities and provides training in sustainable NRM to ensure continuity in the activities undertaken. The NGO supports the creation of IGA and the equipment effort: small nurseries are set up inside the fenced areas to enrich the sites with endangered species. Programme planning, coordination and monitoring are ensured by newTree, which provides some of the human and financial resources for the project. Due to the fenced areas, some short-term (e.g. beekeeping, fodder, etc.) and long-term (e.g. sale and processing of non-wood forest products) IGA become possible. These alternatives to woodcutting, together with the distribution of improved fireplaces (3 Pierres Amélioré – 3PA), reduce the pressure on wood resources. In the areas protected from grazing, the vegetation can regenerate, thereby safeguarding biodiversity. All the rural population find wood products for their own use and/or sale.

The main risks for the programme are land insecurity and fence thefts. The coordinators organize an annual seminar for a self-assessment of activities with the team and invite other local bodies with specific skills. In addition, the project is assessed annually by a skilled team from Switzerland and elsewhere. In the medium term, there are plans for a programme to plant hedges inside the fence. The development of village groves, in particular, is set to become a key resource if continuity is ensured by appropriate public policies.

A Review of a Public-Private Extension Partnership for Small-Scale Sugarcane Farmers in South Africa

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Type of Innovation Tested

Construction of public-private partnerships.

Tools and Methods Tested

Establishment and testing of joint ventures.

R&D Needs Identified

Specific training methods and systems to develop agribusiness skills.

Land reform in South Africa requires that 30 % of farmlands be in the hands of black farmers by 2014, which is increasing the need for supervision and training for a new generation of farmers.

Since 1996, the South African sugar industry has been engaged in a public-private partnership with the Kwa-Zulu Natal Department of Agriculture and Environment Affairs to provide extension services. The services, in the form of a joint venture (JV), are provided to 45,000 small-scale farmers who produce up to 15 % of the national production. Despite their efforts to apply practices intended to maximize the benefits drawn from research and technologies to guarantee sustainable farming businesses, extension workers are faced with a continuous decline in the production levels of small-scale farmers. Sugarcane farmers are no exception and maintaining their competitiveness is a major challenge for the national extension services.

The first step was to identify needs. The information gathered showed variable existing organizational structures at different levels: sometimes autocratic or bureaucratic operating methods, diverse autonomy levels, more or less clear divisions of responsibility and different ways of designating a champion. A JV contract, primarily based on a performance agreement, monitoring committee and staffing, was signed.

The results of an analysis of JV contracts in South Africa and contracts of this type in other countries concerned:

– the training and support for stakeholders;
– the work programmes developed;
– R&D and evaluation committees;
– consolidated land resources;
– acknowledgement of success;
– the 2003 review report ‘The JV is pushing development’.

The pressure on increased production levels is often the result of many socio-economic factors and the problem cannot be addressed by extension services alone. Some public-private partnerships need to be set up to optimize the use of resources.

The different corporate cultures are in the process of being overhauled and current discussions concern the consequences of privatization and organizational restructuring. With 11 years of experience in public-private agricultural extension partnerships, invaluable experience has been gained and lessons have been learnt that could be shared with others wishing to embark upon a similar process.

The transformation has taken place at a pace far beyond expectations, which has created a new goal to speed up the move to a larger scale and involve other key players in future agreements.

There is no rapid alternative to experience, which is lacking in many newcomers to farming and agribusiness. In South Africa, unlike the majority of African countries, new farmers need the backing of training programmes that enable them to become both farmers and economic players in the agro-industrial supply chains.

Promoting Farmer Experimentation and Innovation in the Sahel

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Type of Innovation Tested

Local innovation promotion system.

Tools and Methods Used

Participatory innovation development (PID).

R&D Needs Identified

Local-level training and learning methods and tools.

Intellectual property information training.

Despite being open to participatory approaches, the national agricultural research systems in the Sahel still remain mostly characterized by their 'technology transfer' approach, where researchers alone develop technologies that are usually passed down passively to farmers via agricultural advisers – generally too few in number. Such an approach does not stimulate the creativity of farmers and does not take into account local contexts, be it in terms of the physical environment or the socio-economic level. The PROFEIS programme has been developed in the form of a partnership between farmers, innovative farmers, farmer organizations, NGOs, researchers and agricultural advisers and was launched in Mali and Senegal with funding from the Misereor partnership (http://misereor.org). Pending future additional funds from PROFEIS, Niger and Burkina Faso continued to benefit from the financial backing of the Promoting Local Innovation (PROLINNOVA) international NGO programme up to 2010 (see Box 2).

Two basic hypotheses are being tested in the programme. The first is that one way of transforming agriculture in Sahel countries relies on the creativity of farmers, strengthening their abilities to experiment and innovate, and improving their means of subsistence. The second hypothesis is that speeding up the generation of technologies appropriate for the Sahel, which is considered to be urgent, requires a strong link between formal research and farmer innovations. To that end, the PROLINNOVA and PROFEIS programmes developed the PID approach (see Box 2).

Box 2: The PROLINNOVA Participatory Innovation Development Approach

Participatory innovation development (PID) was implemented by the programme of the NGO Promoting Local Innovation (PROLINNOVA) (http://www.prolinnova.net/) and its African off-shoot, the Promoting Farmer Experimentation and Innovation in the Sahel programme (PROFEIS).

PID is a participatory approach developed to respond more effectively to the expectations of local stakeholders and break with the so called 'top-down technology transfer' approach that proposes 'one size fits all' technologies that often lack compatibility with family smallholdings possessing limited resources. In PID, the planning and evaluation stages are carried out jointly by the different players in an innovation system. This approach includes the following objectives:

- documenting local innovations and experiments involving farmers with limited resources, and particularly encouraging the use of locally available tools and resources;
- strengthening the partnership between farmers, development agents and researchers to improve local innovations and encouraging others to try them;
- creating awareness of PID and developing PID skills through a range of learning mechanisms;
- developing and extending mechanisms enabling farmers to have a greater say in research, extension and education;
- introducing local innovation and PID approaches in the work of agricultural research, agricultural advice and training organizations.

(Adapted from Diop 2008)

The PROFEIS programme first of all proposed to strengthen the partnership (NGOs, farmer organizations, research and extension bodies) through participatory R&D and priority national topics geared towards novel and sustainable practices. Emphasis is placed on supporting the development of farmer innovation processes (technical or socio-organizational). After training in participatory technology development (PTD), a dialogue is established with decision-makers, donors and key research, training and extension bodies on farmer innovation processes and visible results. In each country, a national coordinating committee (comprising representatives of all the partners in the programme, and representatives of experimenting and innovating farmers) is set up and is responsible for guiding the programme. In each country, a 'spearhead' structure is placed in charge of steering the programme on a national level. At the local level, the experimenting farmers chosen by their community are also trained in monitoring and participatory evaluation, so that they can analyse the implementation of activities based on their own criteria.

The programme has the following targets:

- better and cheaper availability of appropriate technologies;
- better production and conservation of biodiversity by applying a larger number of novel practices in the field of resource conservation;
- the gradual introduction of farmer experimentation and innovation methodology in research programmes, training and agricultural advice and extension;
- increasing decision-maker awareness of the relevance of farmer experimentation and innovation methodology for policy-making.

The problems encountered have mostly been due to programming difficulties experienced by the consultative bodies, taking into account the constraints of the different stakeholders. They are also inherent in the slowness of the process: developing a strong partnership between stakeholders and the release of national funds to support local farmer innovation both take time. Indeed, creating local farmer innovation support funds on a national level would be a guarantee for continuing the experience. There also remains the issue of the 'intellectual property' of the innovations promoted.

Joint Testing of a Women's Innovation in Fish Smoking Using an Improved Banda *in Niger*

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Type of Innovation Tested

Joint testing of a *banda*: a fish-smoking oven, a women's innovation.

Tools and Methods Tested

PID.

R&D Needs Identified

Basic education.

Initiative to mobilize stakeholders, and political and economic decision-makers.

In Niger, there is a shortage of wood for fish smoking as three quarters of the territory is desert. In addition, thefts of fresh fish during transport to urban markets are frequent. Declining catches are also seen due to over-fishing and reduced flow

in the Niger river. The techniques used for fish smoking in the traditional *banda* are also constraints that limit production quality and quantity. These difficulties considerably reduce the income of villagers, especially women for whom it is often the main activity. The *banda* is a women's innovation seen during a field study and selected for the joint testing of 11 innovations by the participants of the innovation selection and activity planning workshop of the PROLINNOVA Niger workshop in December 2006.

The overall objective of the experiment was to help safeguard natural resources and improve the living conditions of fishers and women involved in fish smoking. The specific aims were to:

- develop a large capacity *banda* with low wood consumption;
- improve the qualities and commercial value of smoked fish and the living conditions of the users;
- identify economical wood species for fish smoking;
- strengthen the capacities of the partners and the cohesion of the benefiting populations.

A multidisciplinary team comprising innovating farmers, researchers, academics, NGO staff and technical extension services was set up. The team studied the efficiency of two novel *banda* models and compared them with traditional control *bandas*. The PID methodology developed by the PROLINNOVA NGO was used (see Box 2) and introduced a jointly planned process combining inventories, questionnaires and group discussions in the local languages, *haousa* and *djerma*. Training for those involved in the joint experiment was provided through a workshop (19 participants including 8 innovating/experimenting farmers and 11 researchers and developers). M&E of the results was participatory (four innovating/experimenting farmers, two women and two men, and one farmer leader).

The results showed that the new *bandas* were preferred because of their large smoking capacity. Cost-effective woody plant species for fish smoking were identified through the practices of the fish smokers. Wood consumption was reduced and the nutritional qualities and taste of the smoked fish were improved. In addition, fish smoking was possible during rainy and/or windy/dusty weather. There was better conservation and protection from rodents, dogs, rats and birds than with the traditional *banda*. A socio-economic analysis showed that the women used the resulting income for food, clothes, social activities and to buy sheep and goats for fattening. It was found that the quantity of fish smoked in the *bandas* run by women was greater than that in the *bandas* run by men.

The PID approach contributed to increasing confidence, learning and the sharing of experiences between the partners; it also led to faster take-up of the innovation in villages along the Niger river. The knock-on effect of the joint experiment in the experimenter's immediate circle was immediate. However, negotiation took time, patience and determination to encourage the innovators to monitor and record their experimental data, as most adult farmers in Niger are illiterate. Ways of mobilizing decision-makers and procuring the funds needed to develop and disseminate innovations remain to be found and will necessarily involve training and information.

Participatory Technology Development and Concerted Management of the Natural Resources of Agropastoralists in Northern Burkina Faso

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Type of Innovation Tested

Concerted management of natural resources for agriculture and livestock integration.

Tools and Methods Used

Active participatory research method (APRM).
PTD.

R&D Needs Identified

Basic education.
Development of appropriate training for stakeholders.

In African agropastoral regions, natural resources are limited and weakened by recurrent droughts and population pressure. Competition between farmers and livestock rearers for access to these resources is growing strongly. This conflict situation for natural resources, particularly between agricultural activities and transhumant livestock rearing traditionally engaged in by different ethnic groups, can be found in all African savannah zones.

In Burkina Faso, the strategic agricultural research plan (PASA) implemented by INERA is re-organizing its research programmes to promote a more participatory approach. It is within that framework that the University of Bobo-Dioulasso and INERA tested this type of approach to enable fair, peaceful and sustainable management of resources common to rainfed agriculture and livestock rearing. The experiment particularly set out to improve the access of young farmers and women to the local fodder products needed for sheep fattening, their preferred out-of-season activity.

The study zone was the village of Madougou (Yatenga province). A participatory diagnosis was carried out through a series of surveys using APRM. The PTD mechanism (see Box 3) was used to check the hypothesis whereby local agreements strengthen participation and NRM capacities.

The results of the first stage led to the implementation of a local agreement executed through a process aimed at rotational (over a 15-day cycle) and regulated

Box 3: The Active Participatory Research Method and Participatory Technology Development

The active participatory research method (APRM) consists of a series of *in situ* surveys designed for the participatory diagnosis of a, usually, multidimensional issue. It particularly involves participatory technology development (PTD) in response to a need for forums where knowledge, ideas and experiences are exchanged.

PTD forums incorporate the possessions-powers-knowledge trilogy centring on the following stages:

- a written question addressed to research by stakeholders (e.g. individuals, groups, stakeholders, etc.) regarding a given issue and the type of support sought;
- a diagnosis to gain a clearer understanding of the problem and translate the proposed solutions and technical action-research options;
- formalization of the collaboration protocol, specifying the context, type of support sought, the activities, objectives, roles and responsibilities, the budget, the risks, the duration, etc.;
- implementation of the joint experiment;
- M&E;
- regular reprogramming (iteration).

(Adapted from J. Gué Traoré (guejulienne@yahoo.fr), University of Bobo-Dioulasso, Burkina Faso)

use of pastoral reserves by the different groups of users. From the first phase, the experiment achieved positive technical, social, economic and institutional impacts through capacity building. In technical terms, the population saw the regeneration or reappearance of herbaceous species that had disappeared due to frequent cutting. In social and institutional terms, the stakeholders rapidly progressed in their negotiating, elaboration, implementation and evaluation abilities. Groups using grazed reserves consulted with each other to divide up the land, decide on the day the experiment should start and the type of subdivision. In cultural terms, the socio-historical realities were enhanced through a series of consultations between former ‘masters’ and ‘slaves’.

The stakeholders particularly appreciated their greater abilities to negotiate and self-plan concerted development operations. However, in order for the project to retain an impact over time, the longevity of the resources involved has to be ensured. Particular attention needs to be paid to basic education, particularly because of the low schooling and literacy levels among women, which limit project impact.

Potato Seed Production in the Niger Office Zone of Mali

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Type of Innovation Tested

Introduction of a consultation framework for stakeholders, including merchants, in the supply chain for potato seeds.

Tools and Methods Used

Agricultural research for development and the 'competitive agricultural systems and enterprises' approach (AR4D-CASE).

Matrix of producers' strengths, weaknesses, opportunities and threats (SWOT).

R&D Needs Identified

Basic infrastructures.

Training for producers and instructors.

Introduction of the potato into Mali dates back to the colonial period. From 1938 to 1940, potatoes were mostly produced at Ségou and Kayes. Demand continued to grow because of the need to supply the greatly increasing large towns. Today, potatoes are still mainly grown in the specific zones of Sikasso and Kati. However, more and more farmers are seeking to develop this crop elsewhere, notably in Kayes, Bafoulabé and Mopti, as it is of interest for several reasons: it is grown in the dry season when labour is more available, its productivity is high and it usually sells for a reasonable price.

Seed availability is one of the major factors holding back the development of this supply chain. In practice, seed accounts for 50 % of production costs. Around 1,200 tonnes of seed are required annually in Mali. The overall objective of the project, therefore, was to improve the country's potato seed production. More specifically this involved:

- producing quality potato seeds in sufficient quantities;
- improving seed storage;
- improving the seed marketing circuit and seed distribution;
- strengthening human resource capacities for seed production.

The Niger Office zone was chosen by the Agricultural Services and Producer Organizations Support Project (PASAOP) to launch a potato seed production project. This zone had a number of favourable factors for the crop including:

– production plots uncontaminated by soil-borne harmful organisms;
– the existence of cooperatives and producer groups or associations;
– the availability of suitable land and permanent water sources;
– the enthusiasm of the producers.

In 2007 and 2008, five production sites were chosen: the NDjicorobougou and Foabougou sites in the Niono zone, the Molodo site, and the Diabaly and Niensoumana sites in the Diabaly zone.

AR4D-CASE tools were used for the choice of potato supply chain and to identify producers to be supported, notably through a SWOT analysis, in their potato seed production operations (see Box 4). An analysis was carried out for each chosen producer group or association to assess difficulties and possible solutions for achieving the fixed objectives. The analysis covered three sectors:

– the varieties available and production factors;
– vehicle pool, equipment and credit;
– potential for mobilizing stakeholders.

Operations to establish partnerships between the players in the supply chain, and training for instructors to increase awareness of seed quality, are essential for promoting the crop and they need to be continued. However, the degradation of the environment, ailing road infrastructures and the producers' limited capacity for investment remain major drawbacks that are difficult to overcome merely by training and organizing producers.

Learning and Innovating Together: The Sesame Agricultural Enterprise Centre in Sissili Province, Burkina Faso

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Type of Innovation Tested

Marketing and training action plan to organize the production and sale of sesame through agricultural enterprise centres (AECs).

Tools and Methods Used

Establishment of a strategic partnership and training plan using AR4D-CASE.

Box 4: The International Centre for Soil Fertility and Agricultural Development/International Centre for Development-Oriented Research in Agriculture Subregional Project and the Competitive Agricultural Systems and Enterprises Approach

A subregional project of the International Centre for Soil Fertility and Agricultural Development (IFDC Africa) was set up in Mali and Burkina Faso (cases studies presented earlier), as well as in Ghana and Benin. The project was carried out in collaboration with the International Centre for Development-oriented Research in Agriculture (ICRA). The approach used is known as competitive agricultural systems and enterprises (CASE) implemented in agricultural enterprise centres (AECs).

The AECs were identified in the different countries and their members followed a capacity-building programme based on:

– the setting up of 'national innovation platforms' familiarized with the CASE approach. These platforms define and apply a national strategy and work on the institutionalization of CASE-type multistakeholder commercial approaches;
– the setting up of national and interorganizational teams to establish, organize and implement capacity-building services for multistakeholder teams involved in agribusiness clusters.

The clusters comprise farmers, entrepreneurs, technical development, financial and commercial services involved in a particular supply chain within a target region. Local farmers and entrepreneurs are brought together through stakeholder training modules designed to promote rational intensification of production and better integration of stakeholders from the productive sector in the trading sector.

The project led to the establishment of interorganizational national capacity-building teams in the different countries. The agricultural research for development (AR4D) tools associated with the CASE system were used to choose the supply chains to be promoted and the sectors to be supported through targeted capacity building. The implementation of activities is generally based on a market study and analysis tools, such as the strengths, weaknesses, opportunities, threats (SWOT) matrix in the supply chain involved.

R&D Needs Identified

A mechanism able to mobilize national players within a delimited territory.

Development of interfaces capable of mobilizing players over time.

A subregional project run by the International Centre for Soil Fertility and Agricultural Development (IFDC Africa), the 1000s+ project, was set up in Burkina Faso in collaboration with ICRA (see Box 4). The project set out to

develop AECs. The sesame AEC was identified in Sissili province in southern Burkina Faso. Sissili was once a major sesame-producing zone, but is suffering today from the disenchantment of farmers due to a lack of access to a lucrative market. However, over the last 3 years there has been renewed interest in this crop due to growing world demand, a local market and the positive experience of some producers in the zone.

The YAWALA sesame producers' union, established at the instigation of a fledgling marketing company (SOPAC), and FEPABE associated with the Fédération Provinciale des Professionnels Agricoles de la Sissili (FEPPASI) were identified to implement a training and action plan to improve the organization of sesame production and marketing in line with market opportunities. The training and action plan alternated between workshops for knowledge acquisition and practical work in the field based on the AR4D-CASE approach (see Box 4).

The team from Burkina Faso followed a capacity-building programme supervised by ICRA. The programme comprised the following stages:

- the setting up of a multidisciplinary team making up the project steering committee;
- training provided by ICRA in Montpellier to acquire knowledge on the key concepts and tools of participatory diagnosis;
- identification of stakeholders: setting up of interorganizational national capacity-building teams involving producers, exporters, technical support bodies and financial institutions of the Sissili sesame AEC;
- joint analysis of the challenges: this stage was used to determine the central challenge of the AEC;
- launch of the deliberation and evaluation process in a workshop to analyse in detail the results obtained, assess them in relation to objectives, compare them, improve them, etc.;
- drafting of the strategic partnership plan using appropriate planning tools.

The implementation of the capacity-building programme first made it possible to identify the stakeholders, hold discussions with them to ascertain their activities, constraints and partnerships entered into for sesame production. This stage involved discussion meetings and semistructured interviews. Then, sessions and meetings with the identified stakeholders provided a clearer picture of the environment, the relations existing between stakeholders and the prospects for the partners to work together, and revealed mutual interests. These discussions made it possible to place in sequence the major challenges for sesame development in Sissili.

The co-learning and co-innovation process, which was dynamic and iterative, provided a clearer understanding of the issues. This phase may have been long, but it was essential for the continuity of the experiment. The role of an identified and properly trained facilitator is paramount in the implementation and continuity of the process.

Videos as Analysis, Capitalization, Exchange and Stimulation Tools for the Construction of Collective Deliberations

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Type of Innovation Tested

Networking and lessons learned from stakeholder experiences by producing videos.

Tools and Methods Used

Videos as tools for discussions and triggers for collective deliberations within a family of stakeholders (e.g. a PO) or between several different stakeholders (e.g. between POs and politicians).

R&D Needs Identified

Production of video tools for development.

Training of the local media in rural development.

There are numerous initiatives in which rural development operatives, POs, NGOs, projects, agricultural services and research use videos in their work to pass on information, share experiences, increase awareness about an issue, stimulate thought, in lobbying to represent and make voices heard, or to promote a project, ideas, etc. These initiatives are rich and complex and are linked to specific and differentiated contexts and uses depending on the answers to the following questions: Who is asking for the video? Who is paying for it? For what reason? For which audiences? What are the upstream processes that culminate in the video? Who holds the camera and gives the camera angles? What are the downstream processes once the video has been made? How is it used (or not) and by whom?

It is thus important to recount the experiences of rural development operators by describing the situations they encounter in order to position the use of the video within a context and process. If such is not the case, there is a risk of remaining general, or even caricatural, and of not providing sufficient information for a real debate and for constructing collective deliberations.

Inter-réseaux attempts to create links between rural development operators who are familiar with, and have experience of, using videos in their activities with farmer organizations (e.g. POs, journalist organizations, production centres, projects, NGOs, etc.) for different reasons: within the same family of stakeholders (e.g. video as a tool for

exchanges or work within a PO or between researchers, etc.), or between different families of stakeholders (PO–politicians, PO–researchers, project–PO, NGO–PO, etc.).

Within a given field, a video lasting a few minutes can show several experiences and provide ideas, capitalization, exchanges and stimulation for the construction of collective deliberations that match specific contexts, with diverse stakeholder backgrounds (e.g. journalists, POs, researchers, network, etc.). It is an analytical tool and a powerful medium for triggering discussion.

Presentation of a video at an international workshop is a one-off event and does not really make any sense unless a process or activity is triggered by it upstream and downstream. The challenge is to produce a video that is a medium for others to prolong the debates between participants who, once they return to their respective organizations, can construct together or enrich collective deliberations. Where a video really comes into its own is when running networks.

For example, the Inter-réseaux experience involved:

- journalists from Jade Production in Burkina Faso and from the Centre de Services de Production Audiovisuelle (CESPA) in Mali;
- members of FONGS (a federation of POs and the rural world in Senegal);
- a thematic task force working on 'market access and agricultural product training', which brought together stakeholders (POs and other organizations) from Cameroon, Mali, Burkina Faso and Guinea.

Sometimes, a video may seem not to have cost anything. Yet, it was only made possible and useful through an upstream process of sharing information, knowledge and know-how (often over several months, or even several years).

Participatory Monitoring and Evaluation of New Technologies for Integrated Resource Management Developed with Farmers in Northern Tanzania

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Type of Innovation Tested

Integrated resource management of crops, cattle and trees.

Tools and Methods Used

Participatory monitoring and evaluation (PME): group discussions, brainstorming, role playing, etc.

R&D Needs Identified

A co-learning methodology involving research, farmers and local stakeholders.

PME was applied in Lushoto district, located in the Usambara mountains in northeastern Tanzania, where severe soil erosion is resulting in declining ecosystem productivity and natural resource quality, and rising poverty due to a lack of alternatives for income-generating agricultural production. The purpose of the study was to illustrate the so-called 'bottom-up' model, in which farmers take part in the PME process for soil management, and to indicate improvements and the obstacles encountered by farmers. It was more particularly a matter of strengthening positive synergies between water management and the management of other natural resources in microcatchments, and improving farmer incomes by ensuring integrated and sustainable management of system productivity (crops, livestock and trees) and fertilizers.

A comparative baseline survey was carried out with a target group in northern Tanzania before the fieldwork began. A multidisciplinary team of scientists and farmers was set up in the initial phases of the project. The farmers were the central players, being responsible for monitoring the initiatives in collaboration with the researchers. The main stakeholders were the local population, men, women and children (the linchpin of the learning process), grassroots organizations on a community and higher level, and other interested parties, such as NGOs, government services and commercial operators that generally had catalysing and advisory functions.

Participatory rural appraisals were the starting point for identifying the problems and available technical and organizational options. After this initial analysis phase, the scientists proposed an action plan and designed adaptive field trials managed by the farmers. The procedure involved eight stages:

- diagnosis;
- identification of needs and options;
- planning trials;
- implementation;
- management;
- monitoring and data gathering;
- data analysis;
- dissemination of results.

The information gathered during the experiment concerned effectiveness, efficiency, impact and follow-up indicators (see Box 5). The tools used comprised sampling methods, core M&E tools (stakeholder analysis and questionnaires), group discussions (brainstorming and role playing), spatialized information (maps and transects), time-based exchanges (diaries and photographs) and flow and linkage analyses (impact flow diagrams and problem trees).

The process, centred on a partnership, led to the definition of ways and means of establishing relations with farmers and improving communication through various information sharing tools chosen in the PME process. It also made it possible to

Box 5: Why Participatory Monitoring and Evaluation?

In 'project' logic, the planning and implementation phases are clearly distinct: preparation, submission, negotiation, release of funds, implementation, and monitoring and evaluation (M&E). In practice, from the initial idea to the release of funds, there is a gap of at least 2 years. Project progress monitoring is sometimes replaced by interim reports drafted by 'expert' researchers. If 'major research and development projects' are involved, an external mid-term review is organized, often at great expense. …The final evaluation takes place once the project is completed and its participants more or less demobilized. More seriously, in the best of cases the 'beneficiaries' are only involved to provide, often biased, information through not particularly relevant standard questioning. Under these conditions, further mobilization of stakeholders, based on the evaluation report, with new objectives and fresh funding, will take at least another 2 years, a time lapse that is incompatible with the need for continuity.

As in a conventional appraisal, participatory monitoring and evaluation (PME) gathers information that answers the five major questions of any evaluation: relevance, effectiveness (achievement of the objective), efficiency (optimization of means for achieving the objective), impact and monitoring of sustainability. However, monitoring processes and indicators differs considerably. In PME, the parties involved at different levels are committed to monitoring and evaluating a project, have shared control over the content, processes and results of the activity, and participate in taking or identifying corrective measures. PME operations must provide the opportunity for interactive co-learning between researchers and the targeted communities.

The main differences between conventional M&E and PME are summed up as follows:…

Characteristics	Conventional ME	PME
Who plans and manages the process?	Researcher or outside experts	Local populations, researchers, development agents, often assisted by a facilitator
Role of the main interested parties (called 'beneficiaries')	Provide the information requested	Design and adapt the methodology, gather and analyse data, share results and link them to action
How is success measured?	Defined externally, often by quantitative standard indicators	Indicators defined internally, including qualitative judgements
Approach	Predetermined	Adaptive

The PME approach is centred on partnership quality. Interaction between the different stakeholders and producers is intended to improve the ability of

(continued)

Box 5: (continued)

each to learn from the other. Developing the ability to design and take PME action provides a powerful boost for autonomy training among local stakeholders. It also provides the opportunity to bring together citizens, citizen associations or the media and political decision-makers able to take action on another scale, be it regional or national.

involve a selection of farmers for the evaluation and to test a certain number of methods. The process enabled systematic M&E of the results, challenges, experiences, lessons and changes in behaviour occurring during the experimental period.

The degree of farmer participation was high, but the process worked well and resulted in a high level of autonomy in terms of identifying, clarifying and choosing objectives, indicators to monitor these objectives, and the action needed to achieve them.

Apart from the co-learning of scientists and communities, this study provided feedback on the merits of the tools that were used to assess the new technologies for integrated NRM on a small scale. The interaction between farmers and scientists was clearly improved, with each of the parties learning from the other.

The UniCampo Pilot Project in Brazil

Family agriculture in Brazil was for a long time neglected due to the adoption of liberal policies, particularly during the military dictatorship from 1964 to 1985. Social movements developed in consequence, seeking to promote policies capable of solving the problems faced by family agriculture excluded from the 'green revolution' (Sabourin and Caron 2001). This process led to the creation of the Ministry of Agrarian Development, which took measures in favour of agriculture with limited resources (SDT-MDA 2005). These actions gradually led to the emergence of a type of education more specific to the context, to provide farmers with information and knowledge enabling them to influence those policies (Molina and Santos 2004).[1]

It was in this context that the pilot project for a 'Farmer University' originated through a training programme called 'UniCampo', at the initiative of the Federal University of Campina Grande, CIRAD and the Ministry of Agrarian Development, through the Dom Helder Camara Project (DHCP) (Caniello et al. 2003). This experiment was conducted in the semi-arid Nordeste region of Brazil in the Cariri

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territory, Paraíba State, between 2003 and 2006. This territory had been particularly weakened by drought and the lack of support mechanisms for family agriculture, as indicated by the low human development indices (Bazin and Cardim 2003). It was, therefore, a real challenge to test training that enabled the generation of knowledge adapted to that region.

A University to Produce Knowledge Adapted to the Territory

The UniCampo programme was one of the programmes of the Farmer University network (www.ufcg.edu.br/~unicampo). Its purpose was to train community leaders so that they were able to propose their own sustainable development projects and take part in drafting and implementing public policies in their territory. The general objective was to promote dialogue between universities and farmers through the interaction between the knowledge and know-how of family farmers and the scientific disciplines (Coudel and Tonneau 2010).

Experimental training was organized on a sandwich course basis, so that participants could continue their professional activities. The teaching process, inspired by Paulo Freire (1974), was organized around seven questions: Who are we? What resources do we have? What farming systems do we have? How can we improve things? What projects do we have? How can we organize ourselves to implement them? How can we manage them? Three approaches were taken: the social sciences (identity, culture and development), ecology and agronomy (resources, technical aspects and systems), and political sciences (powers, governance and collective action) (Caniello and Tonneau 2006).

Training was structured by projects, both collective and individual. They were chosen according to the main challenges in the region, that is, agrarian reform, agroecology, ecotourism and education for development. Drawing up and implementing the projects called for basic knowledge, such as Portuguese language, theoretical knowledge (e.g. mineral nutrient cycles or the history of social relations), and technical knowledge, such as accountancy. This called for methods to analyse situations for qualities, such as creativity and organizational skills, and for behaviours, such as a sense of collective action. Training was theoretical, methodological and practical, particularly including artistic activities, craftsmanship and manual activities related to the identity of the Cariri territory.

The Farmer University Students' Association

During UniCampo training, the students founded the UniCampo Students' Association (Associação dos Alunos da Universidade Camponesa – AAUC) to help to continue this experiment in the territory and set up various projects.

The AAUC, which was initially founded to bring together former students, has become an NGO, which has gradually developed various activities on a territorial scale: social mobilization in different communities, development of ensiling sites, action-research projects for *Caatinga* (native forest) management, support for water tank construction and participation in the Territorial Forum. The association now involves numerous partners: the Brazilian Agricultural Research Corporation (Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA), CIRAD, DHCP, Semi-Arid Network (ASA), Arribaçã (local NGO) and the Federal University of Campina Grande.

The AAUC acts as a middleman between organizations (DHCP and Territorial Forum) and farming communities. The AAUC members, who are themselves farmers, are close to the concerns of rural communities. Thus, the AAUC has, itself, adopted the principles that were defined for UniCampo training. It attempts to draw up projects with communities and improve the lot of farmers by encouraging them to develop alternative knowledge to that conventionally proposed and to question 'prefabricated' projects.

The AAUC has gradually developed different types of action as and when opportunities have arisen (e.g. social mobilization with the DHCP, training with Arribaçã, water tanks with ASA), whilst also trying to launch its own projects, particularly focusing on silage. In the case of silage, the strategy used was to begin on a small scale (three farmers), then gradually expand (several communities). There have even been plans in the Forum for a territorial project.

The AAUC ensures project governance with around 20 members, of whom 10 or so are active. Although it has proposed to incorporate new people (from outside UniCampo students), few new members have joined since the end of training.

Results and Impacts

A thesis was written to assess the UniCampo experiment and its contributions to territorial development (Coudel 2009). The method adopted was based on an analysis of individual and collective skills acquired during training, taking an accompanying research approach.

The evolution of the skills acquired by those who had taken part in the training was considered positive (Coudel et al. 2008). It was reflected in the increased dynamics in the Cariri territory, notably with:

- novel or experimental projects set up by the students on their farms and in their communities;
- stronger participation of former students within community associations, improving the elaboration and management of projects;
- a large number of students taking part in territorial development governance bodies;
- acknowledgement of the former students' association by the different partners, which has enabled institutional participation in the territory and the implementation of service activities (e.g. social and agricultural leadership and popular education);

– federal investments to ensure the continuity of the project: a family agriculture training centre was constructed by the Ministry of Agrarian Development in 2008; then, in 2009, a branch campus of the Federal University of Campina Grande was set up in Cariri, bringing new training to the territory.

The dynamics of the association were particularly worth assessing to analyse how the learning processes developed during training enabled the students to act in their territory. Based on organizational learning theories (Argyris and Schön 1996), the analysis showed that the learning processes developed during training made it possible to bring out common values between the students, on which they could base new practices, but also construct a strong organization. However, training remained too isolated from the rest of the territory, which caused problems for the AAUC in establishing partnerships once the training ended. The organizations already operating in the territory did not always look favourably upon its arrival. Nevertheless, the AAUC has gradually acquired legitimacy, as it is appreciated by the communities. It is gradually becoming an unavoidable contact for the other organizations in the territory, which could enable it to step up its actions, develop interactions and contribute to a territorial project (Coudel et al. 2009).

As far as the UniCampo students are concerned, one of the main contributions made by the AAUC is the opening up of a new political space, which they can truly control and use to influence territorial dynamics. This makes it possible to develop new agricultural practices and deliberate on matters that are of interest to family farmers.

Although this involves subjective criteria, the reactions of people in the territory demonstrate the interest created by this new space for learning and collective action:

> Today the students are making a stir. (Severina Duarte, former head of the Sumé agrotechnical college)

> Before, some made a noise, but without foundation. Today they have the foundation they need to be confident. Today, they give cause for concern. (Auxiliadora, former facilitator of the Territorial Forum)

> The students have gained the power to make demands. But to make demands, it is necessary to conserve a base. (Antonio Alberto, Director of the Cariri agricultural advice body, EMATER)

Conclusion and Prospects

The AAUC has become an acknowledged operator in the Cariri territory. Its main challenge now is to ensure its continuity by becoming an association that widely incorporates people who wish to defend a new project inside the territory, or in its interactions with other levels of territoriality.

From the outset, the UniCampo training project had an experimental pilot status. It set out to explore new ways of approaching rural training and then disseminate ideas through a Farmer University network. The network was meant to unify independent projects sharing the same philosophy for action. It is important, therefore, to identify the strategy that will now make it possible to consolidate the current experience and bring out new similar initiatives to truly create a living network of exchanges. In order to act on a global scale, political decision-makers will have to be convinced, as much for funding as for institutional legitimacy. On a local level, it will have to be ensured that, in each new experiment, the partnerships with local stakeholders are sufficiently defined and the stakeholders sufficiently committed, so that the project really belongs to them. Partnership construction, therefore, seems decisive for the sustainability and development of the experiment. The quality of the partnership is linked to the presence of key individuals ensuring that knowledge is passed on and applied, particularly with:

– skilled trainers able to work with a teaching process involving questioning and debate, in line with local realities;
– committed partners, not only financially, many of them local to enable incorporation of the students.

In the event of further Farmer University training, the challenge will be to bring out a collective dimension such as the students' association. The AAUC was born out of the intense experience shared by a small number of strongly motivated people, which is its strength but also its weakness, as it is not easy to extend the values developed collectively beyond the initial group. That motivation arose from the teaching process, especially during student identity building. The fact that the entire process arose from their own questioning led them to act and forcefully commit themselves to defending their ideas and projects.

Case Study Analysis

Innovation Practices in Partnership

These examples reveal a multiplicity of more or less participatory innovation practices. It can be seen that the innovation process is always mixed (e.g. new technology, new type of organization, new commercial opportunity, etc.); it is a result of a dynamic interaction between factors of several types, that is, technical, institutional, organizational and commercial.

The main beneficiaries and users of the innovation have proved to be very active in designing and implementing the innovation as soon as they are properly informed and associated with the different phases of designing, implementing and M&E. If the innovation is only technical and external to the stakeholders, the dynamic and multidimensional process of innovation is difficult to trigger. If it is triggered by

external artefacts (e.g. subsidies or discretionary advantages), it will only last as long as those advantages are granted and will subsequently fail for lack of take-up by local players.

The private sector is still only weakly involved, just as the presence of state representatives among the stakeholders is rare. Yet, the socio-economic and political environment is one of the main determinants in perpetuating and disseminating innovative improvements.

An examination of the different types of stakeholders involved in the case studies shows that research is not present in all cases. Nevertheless, efficient tools and methods exist, but the methods are linked more to the diagnosis and organization of participation than to creating durable and recognized skills.

Stakeholder training is provided or sought in all cases, but there is no reference to existing conceptual training models, except in the case of the Farmer University described above. This need for training was identified in all the case studies.

Requirements: Role of Research for Innovation in Partnership

Requirements differ and depend on the political, economic and social contexts, and on cultural and human potential. They raise questions as to the role of research and training and the merits of setting in place PME mechanisms making it possible to pinpoint failings and capitalize on successes.

The absence of official research does not prevent the success of an operation locally, but it increases the difficulty in solving major problems holding back the broader positive social impact of change. The main contributions of the 'R&D' player should lead to benefits on at least four levels.

- Local perpetuation of the experience: R&D should provide stakeholders with the means to be ready for future difficulties.
- Production and comparison of references, whose analysis will enable meta-analyses (a meta-analysis enables a more precise analysis of data by increasing the number of case studies, so that a global conclusion can be drawn).
- Dissemination of a model operating outside the main intervention zone (in other regions, other countries, etc.).
- Change of scale, that is, from a local to a higher scale (e.g. regional, national, etc.) through *ex-ante*-type socio-economic studies incorporating different dimensions.

The tools and methods for information (producing, exchanging and sharing), communication (local and beyond) and training cannot therefore be separated from the continuity and development of the innovation process (Kane Touré and Clavel 2010). The construction of new abilities and competencies for all the stakeholders involved is a core issue, but suitable tools are lacking. The ways for stakeholders to influence their political, economic and social context will be all the more powerful if they possess accessible means of training, information and communication. It is

precisely in developing types of innovative interactive learning, exchanges and production of 'workable' knowledge and information, together with methods and tools adapted to stakeholders' expectations, that research has a major role to play.

Overview

The field practices and tools presented, and the multistakeholder collective analyses carried out during the APPRI workshop, helped to forge a new vision of how to achieve sustainable development in rural zones. Research for sustainable development should be guided by the following observations:

- practices are varied and contextualized, that is, specific to a given environment;
- it is necessary to connect and coordinate local, territorial and global approaches;
- it is essential to construct fair and balanced partnerships, associating research and non-research players: producers, both men and women, development operators and NGOs, researchers, political decision-makers and civil society;
- a core role must be awarded to education and capacity building for all stakeholders;
- renewed learning methods suited to the backgrounds of stakeholders and users must be developed;
- needs have arisen for new information and training tools adapted to the backgrounds and expectations of the different stakeholders, involving the use of local knowledge;
- communication, information dissemination and M&E mechanisms enabling access to, and sharing of, know-how and knowledge should be systematically associated with all interventions;
- there must be a strong requirement for initiatives to be flexible to allow for adaptation and creativity;
- substantial research needs can be seen for methods that allow sustainability, continuity and up-scaling to influence the drafting and implementation of rural development policies.

The debates engaged in, and the collective analyses of, the case studies highlighted the need to have both global and contextualized approaches in order to convert technological innovation into human progress. This oxymoron sums up the core challenge for R&D, which is to provide a complete diagnosis (multidisciplinary and multidimensional) of the context and propose a methodology for action. Research needs to accompany the process whereby innovations are produced, accepted and disseminated, so as to generate references for proposing common analysis frameworks. Such common frameworks should make it possible to use the maximum of information for analyses and comparisons, but be flexible enough to propose an operational model.

Development Models at the Crossroads of All Knowledge

Successive and ongoing crises have precipitated a process of reflexive scientific thought, questioning the role that research should be playing in generating a new development model, be it for the North or the South. That thought process is all the more substantial in that the raised awareness and mobilization of civil society, decision-makers and politicians herald greater funding, particularly in the agriculture and food sector, with priority going to Africa.

Thus, by attracting the attention of civil society, the global crisis has been an 'opportunity' for agricultural research and development (Conway 2010), which is being asked to produce a framework for novel and inclusive strategies to fight food insecurity, particularly in Africa.

The aim of this chapter is to help in establishing a framework for action and research, and to organize support for African family smallholdings, taking care to build on what already exists. There have, in fact, been numerous African initiatives, either internal or with temporary outside support, but they have been of limited impact, be it geographical or institutional. Being fragmented or lacking coordination, they have had little influence over public policies. Our proposal is based on the impacts, constraints and needs identified in the case studies presented above, enriched with the experience of the participants at the APPRI workshop. It has proved to be in phase with the general guidelines defined by the first Global Conference on Agricultural Research for Development (GCARD 2010), the conclusions of which were reported in chapter "Vulnerability and Resilience of Smallholder Farms".

The challenge for AR4D today is to create favourable conditions to develop stakeholder competencies in order to improve their ability to adapt and collectively innovate, and to influence rural development policies. Three principles and two concepts-tools were adopted by the APPRI workshop participants to promote viable and sustainable systems.

D. Clavel, *Knowledge and Rural Development: Dialogue at the heart of innovation*,
DOI 10.1007/978-94-017-9124-3_4, © Éditions Quæ, 2014

Constructing Equitable Links

The right partnership is a putting together of interests between parties in order to implement jointly sustainable research for development. Such collaboration reflects shared interests. It involves a sharing of risks and benefits, and a revision of the terms of the partnership if necessary.

In practice, it is individuals – not institutions – who act, men and women who are committed over the long term. These will include facilitators, identified champions, who will be the guarantors of sharing and the conveyors of confidence.

Defining a Shared Vision of Innovation in the Rural Environment

Innovation needs to be tackled in its broad sense as defined by the United Nations Development Programme (UNDP). The UNDP definition is based on human development (e.g. right to health, access to knowledge, etc.) and the social role that must be granted to any individual. That role means reaching a decent standard of living in order to be in a position to take part in community life.

Consequently, innovation goes way beyond the technical aspect; it has a social, cultural and political role. This is why it is necessary to define basic principles for partnership construction and functioning. All of these rules and principles jointly established by the different parties form a shared vision or 'charter for rural innovation', which will be the common bedrock of all jointly undertaken initiatives and enterprises.

Developing Competencies

It is paramount to educate stakeholders in order for collective intelligence to develop, which will lead to their empowerment and ability to influence their environment.

Capacity building will be based on new learning frameworks, which must enable the formulation of real needs, and civil and political expression. This improvement of competencies will involve:

- evolution of the social role played by research, the approaches of which should incorporate the biotechnical, social and human sciences;
- developing access to knowledge: create appropriate forums, develop teaching materials and appropriate contents;
- improving communication between stakeholders, and between civil society (e.g. media, groups, associations, etc.) and stakeholders;

– supporting actions that bring competencies into play;
– creating links and relationships, particularly promoting community-based systems;
– identifying and supporting facilitators or mediators in forums;
– implementing initiatives that are co-constructed at all levels of the operation;
– taking into account the continuity and sustainability of innovations and interventions.

The common framework embodying these partnerships for development objectives could be based on open and flexible tools, such as the Farmer University in Brazil, whose concept was born in Africa (CIRAD-Réseau APPRI 2009) and the citizens' anti-hunger caravan developed in Cameroon.

Concept-tool 1 The model adopted is that of the Farmer University, seen as a social innovation, a focal point for knowledge, or forum, bringing together research, rural development staff, farmer organizations and producer groups, rural communities and municipalities. The corresponding example is that of UniCampo developed in the arid Nordeste region of Brazil (see chapter "Multistakeholder Approaches in Africa and Brazil").

Concept-tool 2 The model is that of the citizens' anti-hunger caravan launched by the COSADER NGO group in Cameroon. The caravan for innovation could be a travelling forum designed for the collective mobilization of all stakeholders (Clavel et al. 2009). The core objective would be to improve the access of communities to information, particularly on communal development policies, in order for them to become a force for proposals in the defence of their interests (see the first case study in chapter "Multistakeholder Approaches in Africa and Brazil").

Conclusion

The global crisis has led to a radical change in paradigm when defining priorities and public policies for rural development in the poorest countries. Virtually all the organizations working in agriculture, food and development aid are currently heavily engaged in these deliberations, notably in the African context, where strong population growth is threatening natural resources weakened by drought.

The major strategic priorities defined by these recent initiatives for agricultural research and rural development consider that an increase in agricultural production is needed, but they have dismissed the models based on technological progress, intensification and 'blind' growth that guided the 'green revolution'. These new priorities are intended to sustainably improve production, whilst remaining sympathetic to the human population and the environment. Consequently, the core objective for all rural development players in the African drylands, particularly for research, is to organize, manage and support innovation systems that improve rural living conditions without damaging the environment.

Improving the capacity of rural populations in poor countries to design innovations collectively and control their development has become a vital need on an African scale, and also a global scale. This great challenge will necessarily involve developing novel approaches and new technical learning and communication tools that will introduce new technologies, as well as local know-how, whilst respecting the cultural context.

This renewed vision of the role of research for development grants a core role to 'stakeholders', to 'competencies', to 'dialogue', and to the 'sharing' of knowledge and information. It is in this objective of accompanying stakeholders and developing competencies that research is awaited. The new face of research for development and food security presupposes that it will implement transdisciplinary approaches combining the technical sciences with social and human sciences. Research should take a much greater part than it has so far in strengthening the competencies of all stakeholders in the rural world, seeking to increase their empowerment and ability to act. Our contribution to that objective stands out through an interchange of views involving recent, or ongoing, experiences in the field, presented

D. Clavel, *Knowledge and Rural Development: Dialogue at the heart of innovation*,
DOI 10.1007/978-94-017-9124-3_5, © Éditions Quæ, 2014

and discussed by the people involved in those experiences, be they from the world of research, development, farmer organizations or civil society.

As the global food, financial and environmental crisis takes hold – or maybe owing to it – we would seem to be moving towards a model arguing in favour of 'true human development', which, as Edgar Morin highlighted in *Les sept savoirs nécessaires à l'éducation du futur*, will involve joint development of individual autonomy, community participation and the feeling of belonging to the human race (Morin 2000).

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