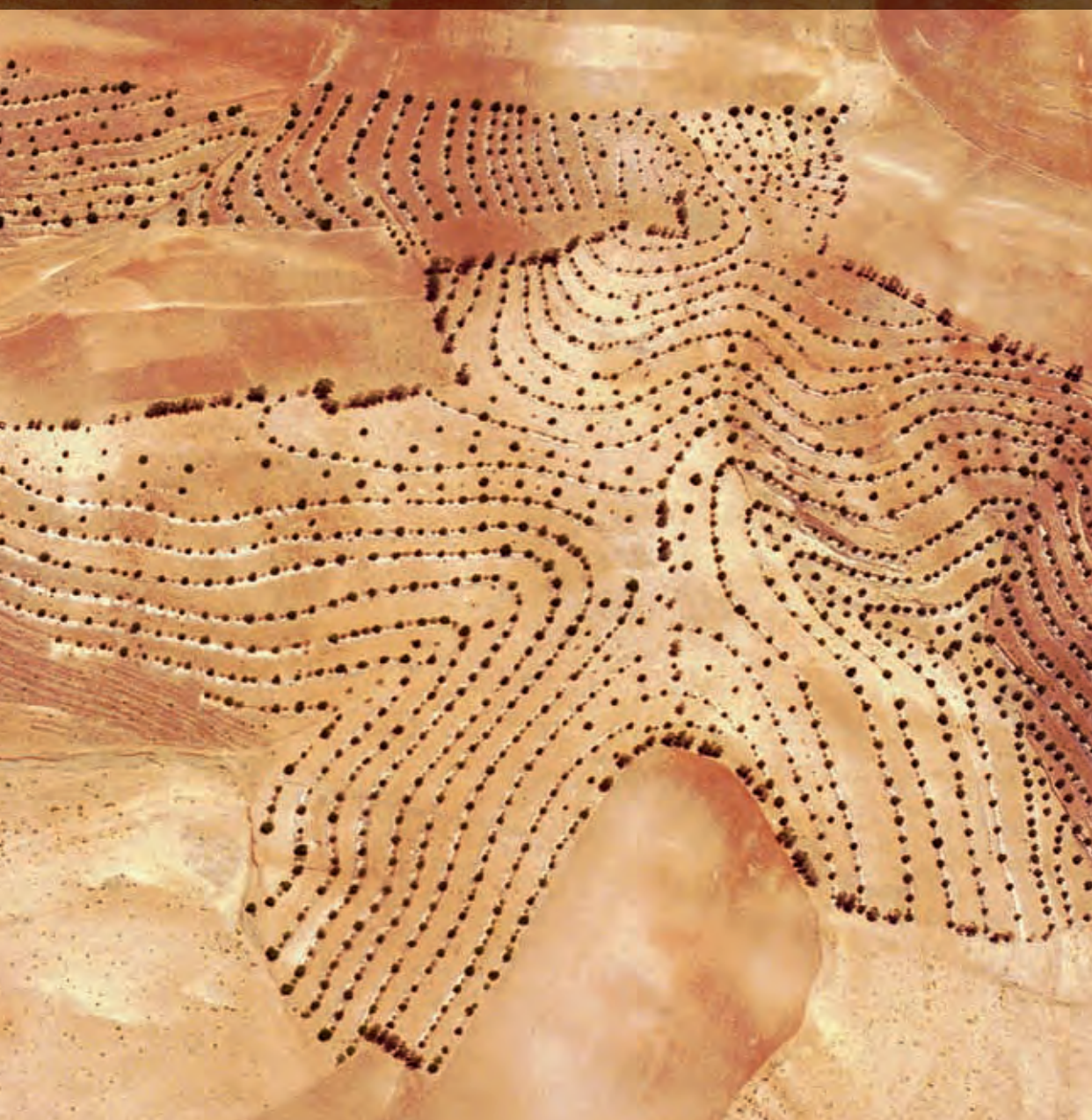
Dynamics of Rural Innovation

A PRIMER FOR EMERGING PROFESSIONALS

Rhiannon Pyburn and Jim Woodhill (eds.)



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About the Royal Tropical Institute

The Royal Tropical Institute (KIT) in Amsterdam is an independent centre of knowledge and expertise in the area of sustainable international development, founded in 1910. KIT aims to improve livelihoods in low- and middle-income countries through social and gender equity and sustainable economic development. KIT's 30 professional advisors work with public and private sector partners internationally to find sustainable solutions to the development challenges they face related to inclusive value chains, sustainable agribusiness development, rural innovation, land tenure, food and nutrition security, and gender and rights. KIT works in the global south with extensive networks of partners and clients.

KIT acts as a bridge between different kinds of knowledge-holders situated in academia, policy and practice. The Institute works with partners to co-create knowledge and generate new insights that improve efficiency and the effectiveness of organizations, enhancing impact. To support improved performance and impact, KIT brings key competencies including contemporary and relevant global knowledge and thinking, access to international networks and innovations, and applied research capacity. KIT has demonstrated experience in effectively translating and communicating knowledge to different audiences including policy-makers, academics, government agencies, non-governmental organizations (NGOs) and practitioners in the field of development. All this is done with the aim of improving businesses and organizations, and supporting evidence-based decisions-making both in policy and in practice.

About the Centre for Development Innovation

With over 20 years of experience in providing innovative agri-food, environmental and international development services, the Centre for Development Innovation (CDI, part of Wageningen University and Research Centre - UR) has an international reputation as a leading organization bridging science and society. CDI works with field practitioners, the public sector and businesses to develop responses to cope with an increasingly complex and unpredictable world. By helping clients achieve better outcomes, CDI not only contributes to the sustainability of their organizations but also addresses broader global challenges, such as access to natural resources, protecting biodiversity, enhancing food security, and strengthening local communities. Working in countries with developing and transitional economies, CDI supports the development of capacities, strategies, and learning processes needed to be creative, adaptive and responsive in such a rapidly changing environment. CDI offers services in six core fields of expertise with a group of over 40 staff that help connect clients to Wageningen UR's latest knowledge and expertise. CDI supports clients through processes of society-wide learning and innovation in the inter-related areas of: secure and healthy food; sustainable markets; adaptive agriculture; conflict, disaster and reconstruction; and ecosystem governance.

Writeshop participants

The Innovation Dynamics writeshop took place in January 2010 in the Netherlands. It involved 13 external authors, four KIT advisors, four CDI experts, two editors, an artist and on-site secretarial support.

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Contents

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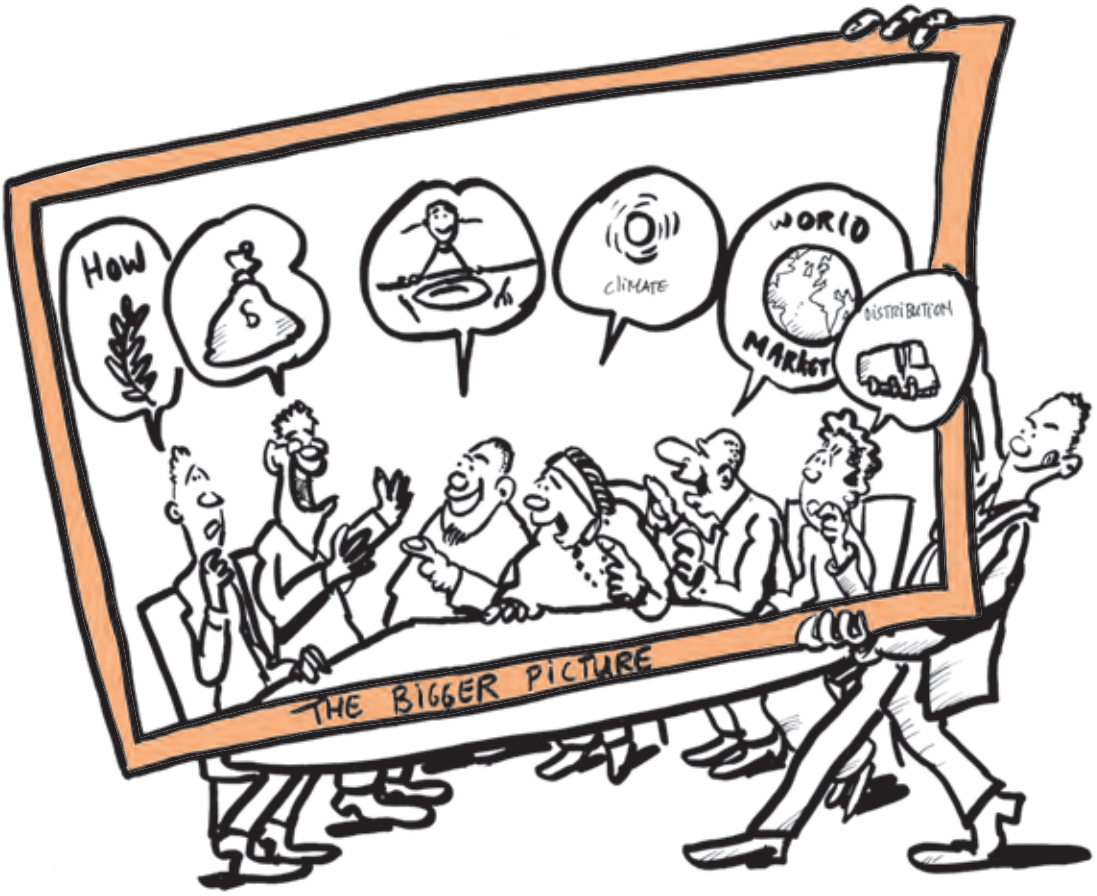
Chapter 1

Dynamics of rural innovation

Rhiannon Pyburn and Jim Woodhill



The innovation challenge

A capacity for innovation enables farmers, businesses, communities and societies to cope with change and prosper by effectively responding to problems and new opportunities. Agricultural research and the technologies it developed and adapted have enabled a dramatic increase in overall global food production over the last 50 years. Yet more than 1 billion people remain hungry and impoverished and, with declining natural resources, our capacity to sustainably feed 9 billion people by 2050 is a serious concern. An estimated increase in food production of 70% globally is required to meet this demand; up to 100% in developing countries (Ashley *et al*., 2009). This is a book for a new generation of agriculturalists: young graduates who, over the coming decades, will have to broker and facilitate innovation on an unprecedented scale if we are to feed 9 billion people in a sustainable way by 2050.

The future challenges for the global agri-food system are vast – responding to climate change, dealing with dramatic shortages of water, tackling soil degradation, and managing pests and diseases. Alongside these production challenges are the issues of equitably distributing food to growing urban populations and overcoming poverty and hunger for those at the bottom of the economic pyramid. There will also be great opportunities, the demand for integrated solutions will be high, massive new markets will open up, and scarcity of resources will likely drive up the returns from agricultural enterprises. Responding to such challenges and opportunities calls for not just technological innovation, but innovations in how societies understand and value their food systems; innovations in the market; incentives that can drive agricultural and food systems toward equity and sustainability; and innovations in the way farmers, government, business and civil society work together to govern good systems and natural resource management.

Seventy per cent of poor and hungry people live in rural areas and depend on agriculture for their livelihoods. In sub-Saharan Africa over the coming decades, the population will nearly double. Many will be in rural areas, but there will also be a growing drift towards urban centres. For Africa, the dynamics of rural innovation must be a central policy issue. Increasing the productivity of small-scale producers is critical. Rural economies need to become more resilient and innovative. Transition strategies are needed for those who can no longer survive and support their families from subsistence and semi-subsistence agriculture. Ways of feeding growing urban populations are needed. Creative means to making rural areas economically vibrant need to be found. This includes making them more entrepreneurial,

offering new jobs and generating new opportunities so that cities do not become over-burdened with an influx of people seeking work that will not always exist.

To cope with these challenges, a new generation of agriculturalists will to need a whole new 'backpack' of ideas, ways of working, skills and leadership abilities. Drawing its inspiration from 'innovation systems' thinking, this book gives an insight into what this 'backpack' means in practice. However, the language describing 'innovation systems' is often quite academic and abstract, which leaves people wondering what it is really all about and struggling to know what to do in practice. So, this book is about bridging theory and practice in an accessible and digestible way. As Kurt Lewin, the founding father of social psychology once said, "There is nothing as practical as a good theory." So we won't shy away from introducing some key theoretical ideas, but we want to bring these to life with real stories about how innovation actually happens.

Innovation is not a top-down or controlled process. Rather, innovations often emerge from the bottom-up, in an evolutionary way. This book is about how agricultural and rural development professionals, and especially young ones, can be enablers and facilitators of such 'bottom-up' innovation. It is a book of inspirational stories about how different people from farmers to extension officers, business leaders, traders, NGO staff, and policy-makers have collaborated to make new and successful things happen. The book is targeted towards undergraduate (BSc) and masters (MSc) students in Africa, as well as development practitioners aspiring to use innovation systems thinking in their work.

Innovation dynamics and other key concepts

To start at the beginning, taking the title of the book, let's unravel the dynamics of rural innovation. An **innovation** is a new product, process, service or management approach that is adopted on a significant scale because it is useful. It may solve a problem, increase efficiency, meet consumer demands, or open up whole new ways of doing things. Agricultural innovation has a number of dimensions – social, technical, organizational and institutional - and can take different shapes and forms. It is the process whereby individuals or organizations bring existing or new products, processes and forms of organization into social and economic use (Rajalahti, 2012). Scientific understanding, a new technology, an invention or a new idea is not *innovation* until it is put into use. There has been some criticism of traditional agricultural research and development approaches in that they have focused too much on science and technology and not enough on getting the new thing used. This is where the systems idea comes in. The innovation challenge is not only for the traditional researcher-extension worker-farmer trio. It broadly implies participation by other actors, like processors, marketers, transporters, input suppliers, policy-makers and more.

So that's innovation, but what do we mean by an '**agricultural innovation system'** (Box 1)? The system refers to all the different actors (farmers, businesses, researchers, policy-makers, NGOs, etc.) who, in some way, need to be involved in an innovation process[1]. But what does it mean to be innovative? How is innovation facilitated and by whom? From the 1960s to the 1990s innovation in agriculture was largely seen as a technological process involving a process of technology transfer from government-funded researchers to government extension officers and on to farmers, who were seen as passive recipients of technologies and knowledge. Over the last two decades, innovation systems thinking has gradually evolved as a response to the limitations of the technology transfer model. In today's world, market innovations are as important as technological innovations. Much research and extension is carried out by the private sector. Crucially, it is also recognized that innovation is not a linear process driven by research but rather a highly dynamic learning process that happens when all the different players in the 'system' interact.

Box 1. Agricultural innovation system
A network of individuals, organizations and enterprises focused on bringing new products, processes and forms of organization into social and economic use, together with the institutions and policies that affect their behaviour and performance, to achieve food and nutrition security, economic development and sustainable natural resource management.
FAO working definition (Rajalahti, 2012).

What do we mean by **innovation dynamics** and why is this our focus? Dynamics refers to movement, change and flux. Agricultural innovation is about multi-stakeholder processes – working with networks of people in a changing context. The nature of both the context and people involved is fluid. Flexible and adaptive responses to change are key. In the agricultural sector – particularly related to research and extension as vectors for innovation – innovation

1 For a fun explanation of agricultural innovation systems, watch this short film on YouTube (http://goo.gl/Tk4LjX) or scan the QR code in the margin using a smartphone with a QR code scanning application. The film was made by KIT and uses *Playmobil* figures and simple language to convey the idea to a lay audience.

systems thinking has developed into a very specific analytical lens for understanding problems related to development. A robust and thorough analytical framework has emerged and innovation systems analysis has indeed become a touchstone for both policy-makers and development practitioners. However, in recent years, there has been growing recognition that this analytical tool, while useful, does not provide sufficient clues as to how to stimulate innovation, nor does it explain the dynamics of innovation processes, and the way to facilitate such processes.

Sometimes innovation emerges 'organically', without outside facilitation or action. More often, orchestrated opportunities trigger innovation. For example, such opportunities may emerge from markets, changes in world market prices, or linkages with niche markets, but they can also be created through changes in policies or institutional arrangements (e.g. relations between service providers and users, financial regulations and subsidies, or changing human values). These shifting innovation dynamics demand new roles for the various actors in the innovation system. For research, this may mean a shift from focusing on new technologies to developing new processes and new ways of doing things. Or it may mean a shift from the concentration on production level to that of agro-processing and markets. These changing dynamics are also evident in approaches towards advisory services from teaching or disseminating information to facilitating learning and processes that give space for innovation. Another shift in advisory services is towards privately operated business development services. The dilemmas to address include: Are new roles or new actors required? Are the 'old actors' (the traditional and one-way research-extension-farmer trio) able to learn 'new tricks'? The interplay of successes and challenges, as well as the interactions between different stakeholders, are what we refer to as the dynamics of rural innovation processes.

Background to this book

KIT and CDI bring more than 30 years of experience working with partners in developing countries on innovation processes and social learning. This book, *Dynamics of Rural Innovation - A Primer for Emerging Professionals,* capitalizes on these experiences to better articulate lessons learned by bringing together conceptual thinkers and practitioners in the writing process.

Input *from* students *for* students. Before delving into innovation systems in more detail, a word on the process of the writing of this book, which is the collaborative effort of many authors and co-authors from around the world. To identify potential contributors and themes, KIT worked with students from Wageningen University as part of their 'Academic Consultancy Training' (ACT, 2009). The ACT team undertook initial research to help us figure out what students need in order to get started in the world of innovation systems thinking and innovation dynamics. They also provided input as to a useful format for the book. To do this, the ACT team interviewed foreign and Dutch students as well as key thinkers on innovation systems who are based in the Netherlands, and reviewed literature. We were especially keen to support the ACT process because of the target audience of the book. Who better to get student perspectives on a book targeted towards BSc and MSc students than other students?

The writeshop. Unlike most edited books, we did not ask potential authors to write chapters from afar for submission and editing. Instead, we asked authors to enter into a learning process with us. Initially we asked for chapter abstracts related to the three sections of the book. For each chapter, one of the authors was invited for a five day writing workshop in the Netherlands in January 2010. We refer to this process of co-writing as a 'writeshop', which is a term coined by the International Institute for Rural Reconstruction (IIRR) in the Philippines. A writeshop entails editing, re-writing, critiquing by peers, as well as plenary discussion on the most relevant concepts and themes for inclusion in the book. Writeshops are commonly used as a means to get thoughts onto paper, especially for practitioners who spend more time doing than writing. Editors support authors in structuring and communicating the desired message.

By the end of a writeshop, the aim is to have a solid draft text for each chapter that can then be further edited and finalized.

KIT and CDI. KIT has a lot of experience when it comes to coordinating writeshops and providing content and analytical leadership. CDI has used the writeshop process in their training courses for mid-career professionals, amongst other ways. In this case, we worked with in-house editors. CDI and KIT together facilitated the process of the writeshop, as well as guiding the content development. A mix of 'reflective practitioners'[2] (Schőn, 1983) and more academic contributors came together for the five-day writeshop and, by the time they left, the bulk of the draft book was written. The editors worked to simplify and make more accessible the scientific contributions without losing their essence and subtleties. For the more practical chapters, the editors worked to bring cases and experiences of these practitioners to a more abstract or generic level of analysis. After the writeshop, the editors pulled together the various chapters and asked additional contributors to fill in some gaps. A list of writeshop participants is provided at the back of the book as well as a list of all authors who contributed.

Reading the book

'The innovation of innovation' (Chapter 2), provides an overview of innovation systems thinking and is a conceptual foundation for the rest of the book. It explores agricultural development in Africa and looks at the changing understanding and changing practices of research and extension over the past 50 plus years. This background chapter sets the scene for emerging professionals and sketches the challenges they will face, while also ensuring that they know the history of the field. It is an important foundation that refers to the key thinkers and schools of thought characterizing rural innovation dynamics.

The core of the book is divided into three parts, with each one tackling a different set of issues, as outlined below. Each section begins with an introduction to the topic and a set of real-world reflections on innovation processes. The end of each section summarizes the key messages from the section chapters.

Part One – *From Principles to Practice* – addresses the questions '**what**' do we mean when we say 'innovation dynamics' and '**why**' is it important. Over the last decade much has been written about the theory of innovation systems. The first section introduces some of these main ideas and illustrates them in practice. It also introduces the main terminology that will be used in the book.

Part Two – *Getting the Process Right* – addresses the questions '**how**' can we accompany and enhance an innovation process and '**who**' plays this role. A very central idea in the innovation systems concept is that of facilitating engagement and learning between different players and that this requires people with the appropriate position, necessary skills and trust to be able to do so. Section two explores this in detail and looks at how to develop the capacities needed for facilitating innovation.

2 In his seminal 1983 book, *The Reflective Practitioner – How Professionals Think in* Action Sch n argues for reflection-in-action, that is to say, as you are acting, rather than after an event. A reflective practitioner is regularly reflecting on his or her work to improve it and learn from it.

Part Three – *Dealing with the Context* – explores the questions '**when**' can we enhance innovation and under '**which**' conditions. While innovation often emerges from the 'bottom-up', the wider environment is an important determinant of the types and level of innovation possible. Government policies, research funding, education programmes, and private sector strategies are all important in creating an enabling environment for innovation. Equally, these factors may hinder or restrict innovation. Section three looks at the key issues in the enabling environment and explores cases where enabling conditions have been particularly important to driving innovation.

The *Conclusions* look at what's next and the implications for agricultural education research and education institutes when it comes to supporting emerging professionals to meet the challenges ahead. Finally, we leave the young professional, ready to embark in this field, with a handful of 'take-home messages'.

A *Glossary* of key terms can be found at the end of the book as well as an *Annotated Bibliography* of key publications in the field, which will equip the young professional as they delve more deeply into the field of agricultural innovation systems.

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Chapter 2

Innovating innovation

A perspective on the evolution of innovation processes in agriculture and rural development

Jim Woodhill

A new generation of African agriculture and rural development professionals has a profound set of challenges before them. On the one hand, Africa has great opportunity given its natural resources and its potential for sustainable economic development. On the other hand, Africa's population will at least double before 2050, poverty will remain an enormous problem, climate change will play havoc with agro-ecosystems and there will be a massive increase in urban populations who need to be fed. These challenges will demand a pace of innovation and adaptation of which previous generations of professionals didn't even dream.

And yet, looking back over the last 60 years, since the end of the Second World War and the beginning of the post-colonial era we have already seen a massive shift in how processes of innovation are understood and practised. This chapter offers a perspective on how innovation has been understood and how this understanding has changed over time: innovating innovation. The intention is not to provide a rigorous historical account but rather to put the evolution of some key ideas in this field, into context. As mentioned in Chapter 1, the concepts and language around innovation can easily become a fog of jargon. When strung together as a historical story, we hope that a set of core ideas will come to life and make a lot more sense.

This book is about 'rural innovation dynamics'; which is a recent expression of the forerunner 'agricultural extension'. This shift in language reflects stages in re-thinking how farmers learn and the relationships between different knowledge-holders, including researchers, farmers, policy-makers, and consultants. We hope that by the end of this chapter you will have a good grasp of how the thinking behind the terminology has evolved.

We have little idea as to what the dynamics of innovation will look like in 10, 20, 30 or 40 years time. But innovation rarely starts from scratch. Instead, it links onto, builds from, and reshapes, ideas and experiences from the past. So, knowing something about the past is key to future innovations: this is the contribution of this chapter.

The boundary of this chapter is the agri-food system. In other words how we produce, consume and market food and other agricultural products and how these human activities interact with the natural environment.

The chapter begins with brief sketches of prominent drivers and trends in the context of agricultural development. It then looks at a set of 12 key ideas and approaches to innovation before exploring thoughts about the critical elements of innovation processes going forward.

The changing context for rural innovation

As a broker of innovation or facilitator of change, especially when young, enthusiastic and full of energy, the difficulties of realizing change and the slow pace of change can be wildly frustrating. Yet if we stop and look back, for what in the grand scheme of things is a short period in history, we can see how radically change is happening. Population growth is an example. In 1950 the world's population was 3 billion and most people lived in rural areas: by 2050 the population will be 9 billion and 70% will live in cities. A rapidly growing middle class will dramatically change consumption patterns and significantly increase demand for food.

Prior to the Second World War, there were essentially two worlds of agriculture in Africa: colonial plantations and small-scale subsistence agriculture. From the 1950s, with independence and the establishment of development cooperation, the role of agriculture as a driver of national economic growth and a mechanism for pulling people out of poverty became central. The post-war period in Western countries saw a rapid expansion in the use of agricultural technology (mechanization, agro-chemicals, fertilizers and breeding) leading to substantial increases in both production and productivity. This occurred largely through publicly-funded agricultural research and extension. The American land grant system of linking research, education and extension was a much acclaimed pioneering model. The seemingly obvious logic was to use the same technology-driven and publicly-funded approach to drive agricultural growth in developing countries.

This thinking led to the establishment of the Consultative Group on International Agricultural Research (CGIAR) in 1971 and the associated development of national agricultural research institutes. This occurred alongside the work of the United Nation's Food and Agriculture Organization (FAO) and significant investment in agricultural ministries, national extension programmes and rural development projects by the World Bank and bilateral aid agencies. The geopolitical context of this support is also important to bear in mind. This was the Cold War era where there was a battle between the West and the Communist Bloc to gain allegiance from developing countries. This drove a level of development funding that had as much to do with geopolitical interests as it did with overcoming poverty.

The 1960s saw the Green Revolution, whereby new varieties and high external inputs of fertilizer and pesticides led to striking yield increases in Asia, which spurred the technological approach forward. Technology was king – and technologies were pushed on farmers with the belief that these were the missing piece to the food production puzzle. There is no doubt that this contribution of agricultural science and innovation led to a much higher level of overall food security than would have otherwise been the case. But there is another side to this story.

The Green Revolution and technological advances proved not to be the anticipated miracle solution. Population rose very rapidly in developing countries, as did poverty levels, despite strides taken with the Green Revolution approach in Asia and to a lesser extent Latin America. In Africa, the Green Revolution hardly took off and today yields in Africa are still abysmally low. It also turns out that tackling poverty and hunger is not simply a matter of producing more food but of distribution and of economic empowerment. In the 1950s and 1960s, the degree to which natural resources would become scarce and how quickly

ecosystems could be degraded by human activity was hardly considered. Today it is a compelling issue. Male scientists, who dominated the work of the Green Revolution did not think too deeply about the substantial role that women played in food production and consumption, yet how marginalized they remained. This continues to be a massive challenge, though we see some positive currents underway. With population growth and increasing resource scarcity the dozing giant of land tenure has also rapidly woken up – a key factor that was not a big part of the Green Revolution approach. And, at that time, the consequences of global warming on agriculture were not yet on the radar.

The need for an approach to innovation that tackles production, social, environmental, market, political, and economic issues in an integrated way may seem obvious today. However, it has evolved very gradually over the last half century. By the early 1980s, more and more voices were calling into question the technology push paradigm. In particular, researchers were starting to realize that an external expert's view on what would be a good idea for increasing production often just did not fit with local social, environmental and market realities. Farmers were not quite as ignorant and non-thinking as the experts sometimes assumed. They usually had very good reasons, developed from generations of local knowledge, for doing what they did, and for not adopting outsiders' advice. This led to a new era of participatory development that focused on how external experts and local people could work together to address development challenges. Just as these ideas and approaches were gaining momentum, and perhaps before they had time to really prove themselves, the 1990s arrived and with that a dramatic drop in foreign aid investments in agriculture.

Why this happened is complex. However two factors are probably critical. One was a growing disillusionment with the results. Poverty and hunger were not going away despite all the investment and effort. The second was a view that more attention needed to be given to education, health and non-agricultural economic development. Agriculture was losing favor with economists as a motor of development. Between 1990 and 2005, investment in agriculture dropped from about US$ 8 billion to under US$ 2 billion: a striking drop from 15% to 3% of the Official Development Assistance budget. This also coincided with a period of structural adjustment wherein the International Monetary Fund (IMF) and World Bank drove countries towards restructured finances, open markets and, in many cases, significantly cut public expenditure. Whatever the merits of publicly-funded agricultural research, education and extension, by the mid-2000s little capacity and innovative drive remained.

From the late 1980s to the first decade of the new century, Western countries also shifted dramatically from public to privatized extension and advisory services. This came at the tail end of a big consolidation of farming enterprises with the proportion of the workforce involved in agricultural production dropping dramatically. The end result was that production was dominated by larger highly commercialized farmers.

From the 1990s onward, a very rapid growth in supermarkets was seen with considerable consolidation and the globalization of supply chains. Health and environmental concerns have led to the wide-scale development of public and private standards to which suppliers must adhere, along with the demand for bulk supply to improve cost efficiency. A highly

globalized agri-food system is now in place that procures from wherever needed to get quality supply at the best prices for year-round availability on store shelves.

By the early part of the 21st century, the stagnation of agriculture in most parts of Africa was becoming very apparent and a major concern for national governments and the international community alike. In 2003, as part of the Africa Union's New Partnership for Africa's Development (NEPAD), the Comprehensive African Agricultural Development Programme (CAADP) was established, which has set targets for greater investment by African governments in agriculture.

In 2006, the Bill and Melinda Gates Foundation entered the agricultural scene in Africa, initially by supporting the establishment of the Alliance for a Green Revolution in Africa (AGRA), along with the Rockefeller Foundation. The Gates Foundation – which has radically expanded its support for agriculture – and organizations that act as intermediaries, like AGRA and the International Center for Soil Fertility and Agricultural Development (IFDC-Africa), are also changing the landscape of support for agricultural development.

On the back of an increasing number of reports raising concern about the limited attention and funding for agricultural development, the World Bank published its *World Development Report* in 2008 on 'Agriculture for Development'. This report recognized that agricultural development had been mistakenly neglected as a driver of development, particularly in countries with economies dominated by agriculture. Further, the report emphasized the critical importance of agricultural development for helping to overcome the inequalities

associated with economic development. It outlined six changes in the context for agricultural development that highlight the need to examine how innovation occurs in the agricultural sector (World Bank, 2008):

1 Markets, not production, increasingly drive agricultural development.
2 The production, trade, and consumption environment for agriculture and agricultural products is becoming more dynamic and evolving in unpredictable ways.
3 Knowledge, information, and technology is increasingly generated, diffused, and applied through the private sector.
4 Exponential growth in information and communications technology has transformed the ability to take advantage of knowledge developed for other purposes.
5 The knowledge structure of the agricultural sector in many countries is changing markedly.
6 Agricultural development increasingly takes place in a globalized setting.

Then, in 2008/2009, a series of sudden and relatively unexpected food price rises shocked the world and very rapidly raised the level of concern about global food security. The food price crisis was in part blamed on the Arab Spring – the political unrest across the Middle East. This – on the back of the World Bank *World Development Report* – put agriculture and food security firmly back on the global agenda, where it remains a high profile issue. The food price crisis also led to a significant turnaround in development funding for agriculture. However this new trend was quite quickly curtailed by the global financial crisis and much of the funding that was originally pledged during the food price crisis never materialized.

The evolution of innovation thinking – from technology transfer to complex systems

The following section provides a sketch of the key schools of thought and approaches that have shaped innovation thinking over the last 50 years.

Technology transfer: The first wave of approaches for agricultural innovation and extension focused essentially on the transfer of technology. The basic logic was that increased agricultural production would help to drive economic development. The main objective was to get new technology and research findings (mostly Western-inspired) out to farmers *en masse*. Hence, the notion of extension whereby extension agents act as a 'go-between' from research to farmers, which was essentially a one-way flow of information from the 'expert' researchers and extension staff to the 'uninformed' farmers. This approach was dominant (and problematic) in the agricultural development policies of both Western and developing countries. It also gave rise to the Training and Visit (T&V) approach strongly supported by the World Bank that existed through to the end of the 1990s when it was finally abandoned. While in hindsight this rather narrow approach is easily criticized there was, and still is, a place for ensuring that farmers have access to, and know how to use, new technologies. Certainly T&V has played its role in the rapid growth in agricultural productivity experienced in many parts of the world (Chambers & Jiggins, 1987).

Farming systems research: Developing parallel to and often bumping into the technology transfer thinking of the 1960s and 1970s was farming systems research. This approach recognized that stand-alone technologies often failed because the functioning of the entire farming system was not taken into account. This approach marked a shift from a reductionist to a holistic perspective on agricultural development, research and extension. There were two variants of farming systems research. One looked primarily at biophysical systems and was heavily focused on the quantitative modelling of farming systems. The other looked more widely into the social and economic conditions of farmers to understand what constrained and enabled change. While farming system research was a much more holistic way of approaching agricultural systems, its shortcoming was that it was unfocussed and resulted in information overload, which could not be prioritized in terms of how to address the problem at hand. The development practitioner was left with an unclear starting point (Collinson, 2000; Dixon *et al*., 2001).

RRA, PRA and PLA: By the early 1980's plenty of mistakes had been made by well-meaning, often white, male experts trying to bring 'good' ideas into cultural and environmental situations that they knew very little about. From these sobering lessons emerged Rapid Rural Appraisal (RRA), which evolved into Participatory Rural Appraisal (PRA) and finally Participatory Learning and Action (PLA). RRA started as a relatively simple idea: to design new agricultural projects by using a multi-disciplinary team. These teams would work together intensively in the field over a short period of time (about a week) to explore the situation on-the-ground, talk closely with local people and come up with an integrated proposal that was more likely to 'fit' with local realities. The relative success of RRA then led to the idea of involving local people themselves in the problem analysis and in taking charge of their own development planning. PRA required the creation of a whole raft of 'participatory tools' to enable often illiterate people to analyze their own situations and engage in collective problem solving and planning. These tools, which were highly visual, included techniques such as mapping, diagrams and matrix ranking using pictures, symbols and often physical objects rather than numbers. It was soon realized that these approaches had much to offer not just in the appraisal (beginning) phase of interventions but throughout the entire development process. Hence, the shift to PLA, which eventually developed much deeper levels of awareness and thinking about participation, the empowerment of poor and marginalized groups, and gender issues. Much attention was given to PLA in the 1990s and many development practitioners were trained in these techniques. The idea of participation in development essentially became institutionalized – at least in rhetoric. However, the investment in capacity development for participatory approaches has fallen markedly over the last decade (Chambers, 1990; Chambers, 1994; Pretty, 1995; Pretty *et al*., 1995; Chambers, 1997).

AKIS and RAAKS: Also emerging in the early 1980's was the idea of Agricultural Knowledge and Information Systems (AKIS), which was the precursor to innovation systems thinking. AKIS was concerned with the system of how different actors generated and shared knowledge and information. It looked at both the knowledge institutes and the different actors involved in agriculture, as well as the forms of communication between them. This new conceptualization of extension was given prominence by the work of Röling and others at Wageningen UR (Röling & Wagemakers, 1998; Leeuwis & Pyburn, 2002). In the 1990s,

AKIS also became popular within FAO and some of the CGIAR centres. A practical application of AKIS was the Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) approach that combined the conceptual thinking of AKIS with the participatory methods of PRA (Engel & Salomon, 1997).

Farmer field schools: An offshoot from the PRA experience was farmer field schools. They emerged first as part of an integrated pest management approach to dealing with pests in rice and to reducing pesticide use. Under guided facilitation, farmer field schools bring around 25 farmers together who meet regularly to learn from each other and exchange experiences with the core idea that farmers are teaching each other. In the right circumstances, and with the right leadership, farmer field schools have been very successful, which has seen the approach taken up in many different countries and across many different agricultural sectors. Farmer field schools are high practical and give farmers the knowledge and skills they need to deal with their immediate production issues (Fliert, 1993; Pontius *et al*., 2002; Mancini, 2006).

Innovation systems: By the mid-1990s a gradual discarding of the term extension was underway. Innovation systems began to emerge as an overarching alternative concept. This was driven by a range of factors, including the critique of technology transfer, the emerging new ideas and practices that did not fit the 'extension' image, the growing lack of enthusiasm for traditional extension services, and the often large disconnect between research and real world problems. The innovation system concept was given prominence by a 2006 World Bank publication which defined it as "*a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance. The innovation systems concept embraces not only the science suppliers but the totality and interaction of actors involved in innovation. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways.*" (Hall *et al*., 2006; Hiroven, 2008).

Livelihood strategies: Towards the end of the 1990's a big investment by the UK Department for International Development (DFID) led to much attention in the Sustainable Livelihoods Approach (SLA). The idea behind the livelihoods approach is that what is important in tackling poverty and hunger is not just increased income, or increased food production, but the entire way in which families and communities make their livelihood. It was recognized that too often development had not taken this broader perspective. Two ideas were important: one, that livelihood strategies depend on people having balanced access to five capitals – human, social, physical, natural and financial; and two, that households and communities need to manage their assets to be resilient against external shocks to their system (IDS, 2006).

Value chain development: The last decade has seen a major focus on value chain development with the central thrust to better connect poor small-scale farmers to new market opportunities. This has occurred, in particular, in the export sectors, such as coffee, cocoa, cotton, fruit and vegetables, where there is strong demand. Innovation efforts have been to improve coordination and efficiencies along the entire value chain and to help farmers become organized so that they can meet the volumes and quality demanded by the market. Associated with this market-oriented approach has been the development of labelling,

certification and premium systems. Considerable attention has also been focused on niche markets, in particular for organic and fair trade products.

New public and private food standards, such as EurepGAP, fair trade, UTZ, Rainforest Alliance and organic standards, have also created a whole new dynamic for how the product has to be managed and traced throughout the supply chain. These standards have offered niche and higher value markets to some farmers. However, they also create significant cost and organizational challenges. Much of the early value chain work focused on export commodities such as coffee and cocoa. With growing urban and middle class populations in emerging and developing economies, more attention has been directed to domestic and regional markets and trade in staple crops. Also, the reality is that for most farmers, it is these markets that are most important and to which they will be supplying. Donors have invested heavily in value chain programmes and many NGOs have tried to take an intermediary role in assisting farmers to link with markets. Associated with this interest in value chains has been the production of a whole set of books, guides and manuals on value chain development (KIT *et al*., 2006; KIT & IIRR, 2008; KIT & IIRR, 2010; KIT *et al*., 2012). (Lundy, 2012; Springer-Heinze, 2008; Vermeulen, 2008; Woodhill, *et al*., 2012).

Multi-stakeholder processes: The earlier stages of participatory development (PRA, PLA) focused mainly at a local level. By 2000, it was becoming increasingly clear that many problems required actors from the government, business and civil society sectors to work together at national, regional and global scales. In the agri-food sector, icons of such multi-stakeholder engagement have become global 'round-tables' on palm oil, soy, sugarcane and cotton. At national and regional scales, many multi-stakeholder processes have been established, often associated with value chain development. (Woodhill and Vugt, 2011; Centre for Development Innovation, 2014).

Monitoring, evaluation and theories of change: Prior to the end of the Cold War, development assistance was driven strongly by both the poverty/development agenda and by geopolitical interests. After the Cold War, donors started to ask more rigorous questions about the impact of development and value for money. With continuing high levels of poverty and hunger many started to question the fundamentals of development aid and tax payers in donor countries, particularly in more recent years, have become much more critical. All this has led to rapidly growing demands for greater accountability and more stringent monitoring and evaluation systems. Within this context, there have also been strong calls to make monitoring and evaluation 'learning' oriented so that the process effectively feeds innovation and improvement. This concern over monitoring and evaluation has also given rise to greater attention for the 'theory of change' behind an organization's approach to development. This means being much more explicit and clear about the underlying assumptions as to how a particular set of interventions and investments will lead to desired results. While still in its early days, this sort of thinking has much to offer innovation processes (Kusters, 2011; Guijt & Woodhill, 2002; Mierlo *et al*., 2010; Guijt 2008).

The web and ICT: For the new generation of professionals, the web and social media hardly needs an introduction. However, the point does need to be made that, compared to 30 or 40

years ago, these contemporary forms of communication have fundamentally reshaped the dynamics of innovation. The way mobile phones are now being used for banking is just one illustration. Banking is just the beginning as mobile technology is taking off in terms of participation, citizenship and governance , and it allows farmers to have ready access to real time market prices for their products, which is revolutionizing their power to negotiate with buyers. The potential for quickly sharing and mixing ideas – the core of innovation – is now at a level hardly even imagined just a few years ago. Of course, the reality that many in Africa remain disconnected from this revolution remains a major development challenge.

Sustainable and inclusive business: The advocacy work of NGOs combined with hard scientific evidence has led to a new climate of engagement by business in sustainability issues. This is partly driven by consumer demand for 'responsible' corporate citizenship, a concern over securing a supply base, and a genuine concern by business leaders. It is also being realized that tackling issues of sustainability and inclusive growth open up new business opportunities. Inclusive growth or inclusive business development refers to the inclusion of both men and women, as well as people from more vulnerable or marginalized social categories (resource-rich/resource poor, rural/urban, from different ethnic or other social categories). Governments and NGOs have also realized that significant change can only be brought about by constructively harnessing the power and influence of corporate players (KIT, APF & IIRR, 2012; Woodhill *et al*., 2012; Pyburn & Laven, 2012; Verhart *et al*., 2012).

Complexity: This brief story about innovating innovation started with the idea that spreading technology would lead to development and overcome poverty and hunger. Quite quickly people began to see that it was a much more difficult and complex task. In part the history of innovation in the field of rural development has been about coming to terms with this complexity and the need to think and act from a systems perspective. However, a core belief has strongly persisted – that with better knowledge and understanding and more rigorous (linear) planning, explicit results and targets can be set and achieved. Paradoxically, while development professionals in the field were increasingly recognizing the need for adaptable, flexible and learning oriented processes of change, funding agencies on the other hand, driven by a political demand for accountability, have pushed in the opposite direction. Over more recent years, dialogue around the need to take complexity seriously, particularly in the design and administration of public sector programmes, has gained much momentum. An approaches to innovation based on a deeper understanding of the implications of complexity for change in human systems is the new frontier.

The changing role of actors

One critical observation from this short history of innovation, is how much the role of different actors has changed. In the early days of extension and technology transfer it was almost entirely publicly funded, managed and implemented. It consisted in essence of publicly funded research and education institutes and government extension agencies.

Today we see a totally different landscape. In member countries of the Organisation for Economic Cooperation and Development (OECD), extension has been almost completely

privatized. In countries with developing and emerging economies there remains a great diversity in the scale, effectiveness and policies of government funded and managed extension. Extension and advisory services are provided by a mix of input suppliers, traders, agribusinesses, private consultants, NGOs, producer organizations and government extension agencies. Research also occurs in a much more pluralistic way with seed, chemical, processing and logistical companies having significant research and innovation programmes. Formal graduate and undergraduate programmes are still largely run through government institutes. However, there is a wide variety of training and capacity development now being provided by businesses and NGOs.

It is in part this diversifying set of actors that has led to innovation system thinking, as it has become increasingly apparent that tackling problems and bringing about change requires coordination between many players. This shifting landscape questions what are legitimate and appropriate roles for the different actors. Is government fundamentally unable to provide good advisory services, or is it a lack of funding? Who can and should play a more neutral brokering function? What are the implications for farmers and public good issues, such as the environment, when advice is provided largely by agribusinesses and input suppliers? What roles can NGOs effectively play?

There are no simple answers to these questions. However, being able think clearly about the different actors, and the roles they play is a key competency for agricultural professionals. This stakeholder analysis involves exploring different interests, assessing the legitimacy of different functions and understanding how to tackle issues of power and conflict.

Innovation 3.0 – an emerging agenda

Looking at the ideas, approaches and practices outlined above we have a rich menu indeed from which to shape the future dynamics of rural innovation. We now find ourselves at the beginning of what we will refer to as 'innovation 3.0' or systemic innovation. To adapt rapidly to the consequences of resource scarcity and the risks of climate change, this is the type of innovation we are going to need. Facilitating and brokering this third era of innovation will be the job of the next generation of the agri-food professionals.

But before moving ahead of ourselves, what were 'innovation 1.0' and 'innovation 2.0'? Innovation 1.0 was essentially about technology: the view that most problems could be solved by technical solutions. The main innovation tasks were seen as creating a scientific understanding that would enable technological development and then encouraging as much adoption of these technologies as possible. The focus of innovation 2.0 was participatory learning. It became broadly recognized that the complexity and messiness of rural development issues required a multi-disciplinary approach and close engagement and cooperation with all the different players – improvements needed everyone learning together. During the evolution of innovation 2.0 a wide diversity of participatory and systems thinking emerged.

Innovation 3.0, at its core, is about emergence in complex adaptive systems. Whereas in innovation 2.0 there was a tendency to use systems thinking to try and understand and control the whole system, like we mentioned in describing the shortcomings of FSR, innovation 3.0 starts with the recognition that we are working in changing contexts on complex problems

that do not necessarily have clear cause-effect relationships (Mur & Kusters, Chapter 13). Building on innovation thinking, we see seven core features of innovation 3.0 which are outlined below. (Woodhill, 2008, 2010).

Systemic – This is an overarching principle to which the other principles link. Being systemic means three things: one, recognizing the interconnected nature of all aspects of human and natural systems and hence the need for holistic and integrating perspectives on change; two, that un-sustainability is a systemic issue, it affects everything and its causes are deeply embedded many problematic aspects of our social, political and economic systems; and three, it is impossible to engineer and directly control any grand scale change in a complex system. We have to work with the adaptive way complex systems evolve – this has profound implications for how we look and try to guide innovation processes.

Value driven – Innovation will increasingly need to be driven by a deeper appreciation of what collectively, society values. Coping with issues of climate change, resource scarcity, poverty and hunger require values to be openly discussed. Emerging ideas such as inclusive

business, shared value, triple bottom line, patient capital and social entrepreneurship all point to a stronger role for values based innovation. Different groups, cultures and societies with different interests and different perspectives will still clash over differing values. The innovation challenge is to work with these differences to find higher order common interests and to help people reshape values in ways that will better align with the realities of a resources scarce world.

Interdisciplinary – Much of the evolution in innovation thinking described in the previous section relates to bringing different perspectives, ideas and knowledge from across the biophysical and social sciences together. This will become even more critical and will need to take on new dimensions. Research and development still remains largely structured around disciplinary foundations. Further, real innovation often occurs when the worlds of art, science, sport, business, spirituality and politics are able to inspire and feed-off each other. Creating spaces for creative collaboration will be part of the innovation challenge (Giampietro, 2003).

Market Oriented – Markets and new market opportunities are a great driver of innovation. Finding innovative ways to better use markets to drive sustainability and inclusive growth will be critical. Key here is turning problems into opportunities. For example, seeing the cost reductions from creating low carbon use value chains or the market opportunities from inclusive business. This market innovation will require creative engagement between government and business to find the right incentives and right public private partnerships so that pursuing private business interests also means contributing to wider public interests.

Participatory – If one thing has been learned over recent decades it is that government, business, researchers, farmers, NGOs and community leaders all need to work together. Finding ways to do this more efficiently and more effectively will be a significant innovation challenge. One for which the social media offer exciting possibilities. (See Farrington 2000 on the difficulties with the practicalities of participatory approaches).

Learning-centred – If innovation is to happen, people and organizations need learn, often deeply. Continuing the trajectory of PLA approaches – that enable people to reflect on their experiences, encourage critical questioning and challenge old assumptions and preconditions – will be foundational for innovation 3.0.

Empowering – Who innovates what, for whose benefit and at whose cost will always be an issue of power and control over resources. It remains critical to remember that small-scale producers and rural communities are often in a marginalized position where they are 'price takers' and often have limited and dwindling assets. Innovation aimed at improving the livelihoods and food security of these groups must look at issues of power.

Conclusion

When we talk of innovation the common association is often the creation of a new technology. This chapter has framed innovation differently - as a process of bringing about change on a significant scale. The development and introduction of a new technology is often an important even critical aspect, but equally important are social, market, economic and political innovations. This book will illustrate that to solve problems and create improvements technical and institutional innovations mostly need to go hand in hand.

What drives innovation is not simply a smart researcher dreaming up new ideas in isolation, although this may be an important contribution, rather it is the interactions between different actors with different perspectives and interests. It is no accident that cities and places like Silicon Valley are hotbeds of innovation. The most valuable thing a new agriculturalist can bring to the challenges they will face is the ability to engage different actors in constructive and informed dialogue. Doing this requires a systemic and interdisciplinary outlook combined with the social and political savvy to facilitate the new lines of communication and the new alliances that drive change.

As this chapter outlined, the fields of agricultural extension and innovation systems have a rich history of conceptual thinking, practical methodologies and field experience on which to draw. In shaping the future dynamics of rural innovation new graduates will do well by understanding and making use of these foundations.

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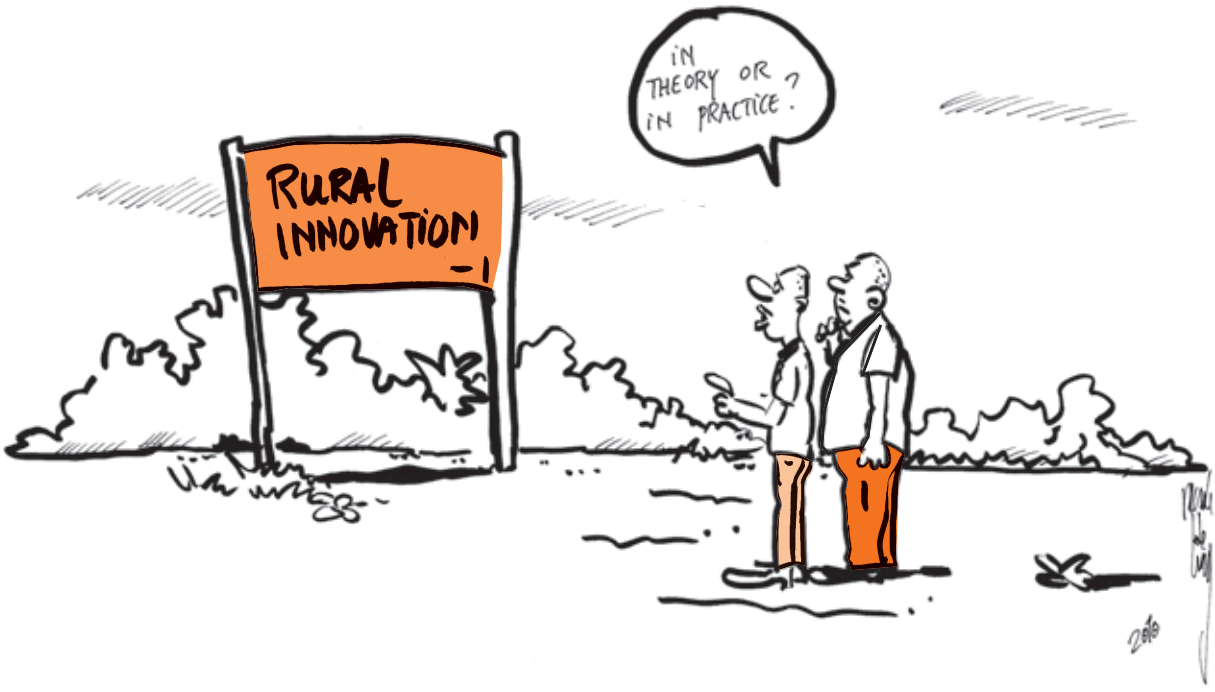
Part One

From Principles to Practice



From Principles to Practice

Jim Woodhill and Bertus Wennink

> *"For every complex problem, there is a solution that is simple, neat, and wrong." (H.L. Mencken).*

This section offers five chapters that explore the dynamics of innovation in practice. While each chapter has its own focus and theme, there is a strong connecting thread: that innovation is not about a single invention or single technology but rather about how change happens in the 'whole system'. From experience, the stories in the chapters illustrate some key principles for an innovation systems approach to be effective. These reflect the agenda for innovation 3.0 introduced at the end of Chapter 2.

In the first chapter of this section (Chapter 3), Day and Romney use four short stories that illustrate how innovation is not simply about the adoption of a particular technology by farmers but rather how it involves a whole series of changes across input, production and marketing processes. By definition, this means that many different actors are involved, and mechanisms are needed for effective communication and joint learning. The stories illustrate the need for integrated solutions to problems.

One of the implications of innovation being an integrated 'complex' process involving many different actors, picked up by Ode in Chapter 4, is that innovation is also an evolutionary process. Because of all the different stakeholders involved, innovation processes cannot be planned from A to Z in a linear fashion. This chapter illustrates how an innovation that sounds technical, for example biotechnology for banana breeding, turns out to be a process of managing many different relationships between stakeholders. The chapter illustrates the evolving understanding of stakeholders about the linkages between technological and institutional innovation.

Drawing on the work of the Technical Centre for Agricultural and Rural Cooperation (CTA), Francis, Bolo and Critchley take an overall look at agricultural science and technology innovation (ASTI) systems in African Caribbean and Pacific (ACP) countries (Chapter 5). They emphasize the importance of public policy, public investment and coherent institutional arrangements for effective agricultural innovation. Further, they underline that the enabling environment also involves interaction, learning and facilitation: these elements are critical to creating a robust context in which innovation is more likely to occur. Significantly, they conclude that in many ACP countries, ASTI systems are dysfunctional. Part 3 of this book looks in more depth at the context and how to create a more enabling environment for innovation, building on some of the issues raised by the authors in Chapter 5.

Klerkx in Chapter 6 puts many of the issues raised in previous chapters into a theoretical perspective on complex systems. In particular he raises the issues of how small 'niche' changes can lead to larger 'regime' changes. This is important when we recognize that tackling many of the emerging issues for agriculture will require bringing about system-wide changes in markets, policies and social attitudes, which reflects back to the issue raised by Francis *et*

al. (Chapter 5) that effective innovation requires an enabling environment.

In Chapter 7, Hawkins brings us back to the important reality that innovation requires diverse stakeholders to engage with each other to explore, learn and solve problems. This requires facilitation and brokering that in turn needs people and institutions with the necessary capacities to initiate and support such multi-stakeholder learning processes. Facilitating innovation is explored more in Part 2, linking back to some of the points raised in Hawkin's chapter.

Finally, in Chapter 8, Pyburn brings our attention to the critical and often overlooked gender issues in innovation systems thinking and practice. She draws on recent literature, which offers some guidelines and indications as to entry points for addressing gender in this field, and strongly asserts that the time is now for integrating gender into research, development, extension and advisory services, as well as throughout the value chains involved. She puts the challenge of this to the emerging professionals reading this book and provides some indications for starting points. The principle here is one of inclusion and equity and, thus far, practice on this front has been limited, so there is much room for improvement.

Kinds of knowledge. Across the chapters, we see that even when starting with what might seem like a simple technical problem, the solutions often lie in an interlinked mix of new technology, different management strategies and institutional change. So other stakeholders come along and bring in other ideas about the way to improve farming practices. This means that there are working relationships between the stakeholders involved; in such a way that each of them can bring in their knowledge and contribute to the innovation process.

Each of the stakeholders has relevant knowledge. Yet, the knowledge is available in different forms, either codified/explicit knowledge that is easily available or tacit/implicit knowledge that needs to be made available for all stakeholders involved in the innovation process (Box 2). Learning through interaction among stakeholders is an appropriate way to exchange and discuss the knowledge available and develop new knowledge. Related to this, it is critical that more vulnerable or excluded stakeholder groups (e.g. landless, widows, female household heads, more marginalized ethnic groups or other socio-economic categories) are heard and included; their knowledge may come from a different standpoint but is equally relevant and valid.

Box 2. Tacit versus codified knowledge

Tacit (implicit) knowledge is informal, internally-held knowledge that is often hard to capture in words or written language so difficult to transfer. **Codified (explicit) knowledge** is formal or written knowledge that is easily passed on and based on theory (Foray & Lundvall, 1998). Accessing tacit knowledge may require facilitation or guidance to draw it out from the minds and experience of the knowledge holder . Codified knowledge transfer is more akin to teaching and quite readily transferable and explainable through written or spoken words.

Innovation as a multi-stakeholder process. Different stakeholders also have different expectations about the outcome and impact of innovation that are largely shaped by the policy and institutional environment in which they operate. While the outcome/impact of agricultural research was, for a long time, assessed according to technology adoption and/or enhanced productivity for food security, nowadays innovation should also contribute to economic growth, sustainable use of natural resources, social inclusion and equity. This requires

continuous integration of these dimensions during the innovation process. In particular, the growing emphasis on economic growth has led to the insight that farmers need to integrate into markets while increasing their share of the profits, which has brought in new stakeholders, such as processors and traders, outside the traditional realm of researchers and farmers.

Finally, going back to the supposed 'central' role of research, successes in agricultural innovation demonstrate that other actors (e.g. farmers, policymakers, processors, etc) and factors (e.g. supportive policies) are often more influential for innovation than research as such. In that respect, policies, rules and regulations are to be taken into account when striving for agricultural innovation. Technological innovation often takes place when specific institutional conditions have been met. In fact, changes often are needed at other levels whether they are spatial, economic or societal. Therefore innovation comprises technological innovations as well as organizational or institutional changes. In particular, institutional changes require networking for making change happen. Creating an 'enabling environment' for innovation and the institutional changes required at that level are taken up in Part 3, *Dealing with the Context*.

Innovation involves different stakeholders working, learning and dealing together in various forms of multi-stakeholder, dialogue, learning and change processes within a given policy and institutional context. Researchers and knowledge institutions are therefore one set of actors amongst those from business, government and civil society. Furthermore, innovation goes beyond knowledge (or technology) generation to include processes of change that bring new ways of doing things, new technologies and new institutional arrangements into use. This focus on change requires balanced attention for hard (technical) issues and soft (institutional) issues. For researchers and knowledge institutions an innovations systems perspective involves complementing research functions with engagement in, and support for, societal innovation and change processes.

The chapters in *From Principles to Practice* touch on different aspects of the agricultural innovation systems (AIS) concept. From this we draw out some key principles:

Chapter	Elements of AIS and how used
3. Day and Romney	Different knowledge systems – tacit versus explicit knowledge. Linkages between researchers and other actors. Use of AIS elements for enhancing innovation depends on the context.
4. Odame	Combination of different knowledge systems, i.e. scientists and farmers. Link production of technology with other sectors, i.e. marketing system. Innovation as a never-ending, evolutionary process.
5. Francis et al.,	AIS concept translated into a methodological framework to analyze sectors. Policies and institutions are often not conducive to making innovation happen
6. Klerkx	Niches made up of groups (referred to as clusters) of innovation networks. Innovators challenge existing socio-technical regimes. Need: clear vision, monitoring of the environment and reflexivity.
7. Hawkins	Design of multi-stakeholder learning programmes is context-related. Learning (stakeholders) and innovation (often research driven) are linked.
8. Pyburn	Gender issues and dynamics have been largely overlooked in AIS work and theorizing. Gender dimensions need consideration at different levels in different ways. Addressing gender issues leads to more effective, robust outcomes/impacts.

Guiding principles for innovation processes:

- Innovation is a **multi-stakeholder process** involving not only researchers, extension workers and farmers, but many other value chain actors and value chain supporters.
- Different stakeholders hold different **kinds of knowledge**.
- Innovation is an **on-going**, evolutionary process.
- The **context matters** in terms of enabling or constraining innovation processes.
- Context refers to both concrete policies, institutional frameworks and research, and development programmes, as well as the infrastructure which allows stakeholders to interact and the mechanisms to facilitate and foster the interaction.
- Innovation happens at **different levels** – e.g. local and national, or niche and regime.
- **Learning** is integral to innovation processes.
- Learning processes can be **designed and facilitated** and are context dependent.
- **Power imbalances** between stakeholder categories (e.g. gender, age, caste, health, economic status etc.) need to be actively managed throughout a multi-stakeholder learning process for innovation.
- **Gender equity and inclusion** need to be addressed not only in multi-stakeholder processes, but throughout the whole AIS.

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Chapter 3

Putting innovation systems approaches into practice

Roger Day and Dannie Romney

Key Message: Innovation requires both scientific knowledge and dynamic learning networks between users of the knowledge. Coalitions of stakeholders contribute in different ways to making an innovation successful. Tackling problems and responding to new opportunities requires an integration of technical solutions and institutional changes such as mind-sets, policies and laws, organizational arrangements and flows of information.

Whether you are a university graduate with a degree in agriculture who is thinking about going into research, an established researcher, a technical expert in agri-business, or working for an NGO; if you want to have an impact on agricultural research and development, an innovation systems perspective will be a great help. But what does this mean in practice? What could you be doing next week that you were not doing last week? This chapter tells some stories of people like you, and what they did to make change possible.

Stories of innovation

Story 1. Commercializing farmers' kale varieties

Sukuma wiki (kale) tastes good to Kenyans. Brassicas are grown by over 90% of smallholders in Kenya, but kale is the most important, providing food and income from sales to urban centres. Researchers from CABI and the Kenya Agricultural Research Institute (KARI) worked with farmers and extension workers to develop integrated pest management (IPM) for *sukuma wiki*, and discovered farmers in the Kinale area had already developed a type of kale that was tolerant to a major disease. This type only flowers well in that particular area, so farmers came from other places to obtain the seed so they could grow the disease-tolerant kale. However, availability was limited so research activities shifted to addressing how to facilitate farmer access to this seed (WREN*media*, 2007). This created a business opportunity for farmers in the Kinale area to generate the much needed disease-tolerant kale seeds and sell them locally. Together, farmer groups and scientists identified and characterized five uniform kale lines, and produced enough clean seed for evaluation by 1,000 smallholder farmers in different kale-growing regions. Farmer groups were trained in clean seed production, including learning how to prepare and maintain disease-free plots, as well as how to store and package seeds safely. However, it became clear that it would take more than the farmer-research-extension coalition for the business opportunity to bear fruit.

In Kenya, only registered organizations are able to sell seed, and seed must be certified. The farmers wanted to commercialize their *sukuma wiki* lines but they did not have the capacity to register as producers or sellers. So the research team linked up with other organizations to address these issues. Kenya Plant Health Inspectorate Services (KEPHIS) is the regulatory body

for seed certification. They showed the farmers how seed plots are inspected, what standards must be met and how to achieve them. KEPHIS also helped develop seed characterization procedures for kale, and assisted with the required multi-locational trials (Phiri *et al.*, 2009). Two out of five lines were, at the time of writing, in the process of being registered so they can be traded legally. Community development authorities and the Ministry of Culture and Social Services helped to register the groups growing the kale. But registering as a seed merchant is expensive, so the research team also linked up with a registered seed company. This private company saw the opportunity to commercialize varieties for which there is already market demand, while the farmer groups benefitted by generating income through bulking the seed and selling to the private company.

The outcome of the research programme was not what was expected. But, by taking farmers' knowledge and preferences into account, recognizing existing policies, and working with different actors, scientists were able to support an overall innovation process that linked the development of new seeds with institutional support.

Story 2. Producing better quality coffee in Ethiopia

The world coffee market has become more sophisticated and pays high prices for high quality coffee. So, if farmers use the right production and processing methods, they should be able to earn more income. This was the starting point for a joint intervention in Ethiopia by coffee scientists, extension agencies and European buyers. Farmers learned how to pick only the mature coffee cherries; how to sun-dry the beans properly on raised drying beds; and how to process the beans using simple hand pulpers, machines that coffee farmers in some other countries use but not in Ethiopia.

At that time the policy in Ethiopia was that all export coffee was sold through central auctions, and only registered suppliers, such as the middlemen collecting from farmers, cooperatives or large estates, could take part in the auction. Cooperatives are still associated with the unpopular communist Derg regime of the 1970s and 1980s, so farmers often choose instead to sell their beans to local traders, as they need cash (every day or so). But local traders usually mix coffee of varying quality from different farmers, so rarely pay based on quality.

Initially, the intervention was directed towards technical issues related to coffee quality, as marketing of the product was considered to be a private sector responsibility. However, the people involved soon realized that integrating the two components was essential. The marketing system did not allow farmers to move up the value chain, so if they couldn't get higher returns for high quality and better coffee, why should they use new methods and machines? The Ministry of Agriculture and Rural Development and other partners therefore organized a special auction in which project farmers sold their coffee directly to exporters, who paid over 70% more than the average price, recognizing the good quality of the coffee being sold. This frustrated local traders as the farmers no longer sold to them, so eventually they started offering higher prices to the farmers.

In this case, recognizing and working on the institutional issues related to markets and trading made it worthwhile for farmers to invest in and use new processing technologies (Negussie *et al.*, 2008).

Story 3. Community-based armyworm forecasting in Tanzania

Armyworms are not actually worms – they are the larvae of moths (*Spodoptera exempta*). In East Africa they materialize as sudden outbreaks, which devastate cereal crops and pastures. In Tanzania a central forecasting unit issues weekly updates as to where outbreaks are likely to occur that week so that people can prepare for controlling the pests. The forecasters use weather information, moth trap data, and reports of outbreaks; many years of research have been devoted to improving this system. In 1975, scientists discovered and synthesized the scent, or sex pheromone, that female moths produce to attract males. The synthetic pheromone is used as the lure in traps for monitoring armyworm moth populations, and the Ministry of Agriculture and Rural Development runs a national network of over 100 pheromone traps.

Another project to improve centralized forecasting started in 2001. Farmers, agricultural input dealers, extension workers, district authorities and researchers met in a stakeholder workshop and reviewed the whole forecasting service. They proposed a new approach in which each village would use a pheromone trap to make forecasts for their own community (Knight, 2001). Villages were keen to try the new approach and preferred farmers rather than extension workers serving as community forecasters. This is how the system works: a community elects its forecasters who then receive 1-2 days training. The community then decides how to communicate forecasts within the village, so that farmers know when to inspect their crops for the tiny armyworms to control them before they cause serious damage (Mushobozi *et al*., 2005).

Facilitating interactions between different stakeholders at the community level is essential, as was illustrated when some early trials of the approach failed because local authorities were not involved. When there is a positive forecast, communities also alert district authorities and pesticide dealers, so that they can organize control activities and supplies. Farmer forecasters have acquired status within the community because their forecasts are accurate, and some villages reward the farmer forecasters for their services. Nationally, the approach is supported because it complements the existing centralized system.

In community-based forecasting, central forecasters and extension workers support communities rather than play a leading role. Tanzania has a policy of decentralization, so the political context favoured this change. But it also required institutional change in the mind-set of government staff to realize that the system they set up and controlled could be more effective if they 'let go' and involved a wider group of stakeholders.

Story 4. Building plant healthcare networks

The Global Plant Clinic (GPC) is a consortium of organizations funded by the UK Department for International Development (DFID) to provide plant disease diagnostic services to developing countries (Boa, 2009). Countries send specimens to laboratories in the UK and then receive a report with information on what to do about the disease. But the GPC realized that farmers were not really benefiting from the diagnostic services. So, they reasoned, if there are clinics for sick people and sick animals, why not clinics for sick plants? The initial idea was to hold regular 'plant health clinics' in public places frequented by farmers, such as a market. Farmers would come to the clinic with their sick crop plant and receive a diagnosis and prescription from a 'plant doctor'.

Since the first clinic opened, the approach has evolved. Now, clinic doctors operate within a network that includes technical experts, diagnostic laboratories and input suppliers. Plant doctors request advice and alternative control options from experts, and in some cases research projects have emerged to address problems with no known solution. Samples can also be sent for diagnosis to national laboratories, or, as a last resort, samples are sent to GPC laboratories in the UK. Linkages with local input suppliers ensure that plant doctors only recommend solutions that are locally available.

Training programmes for plant doctors teach them to look closely at symptoms and listen carefully to farmers. They only make a diagnosis and give advice if they are confident they know what the problem is. Recommendations include traditional as well as new methods, and fact sheets are prepared to capture unwritten knowledge and local knowledge, which can be shared more widely. Plant clinic records provide the basis of a quality control system in which data is shared at monthly meetings of plant doctors and technical experts.

Clinics have been run in four Asian countries, nine in Africa and five in Latin America. A 'learning by doing' approach is used to identify key factors affecting success. For example, clinics operated by organizations with direct accountability to farmers are more likely to run effectively and consistently. Interaction at all levels within organizations is essential for the clinics to become a part of daily activities. Clinics provide a mechanism for communication between different actors, and help them to understand farmers' needs. Sometimes this requires attitudinal change: plant doctors must be vigilant in not dismissing farmers' explanations; and laboratory staff must avoid being patronizing towards extension staff.

Experience underlines the importance of understanding local contexts. For example, there are different attitudes between men and women farmers in how they engage with plant doctors in different parts of the world, and how they perceive, use and deliver the service. In countries emerging from conflict, skilled staff may be in short supply, so more training is needed. And, in some countries, plant doctors are more likely to need financial incentives.

Innovation systems approaches

Researchers and scientists often find themselves in projects that have been designed and set-up without reference to theories as to how innovation occurs. This was the case in the stories above, but in all of them the actors did things and used approaches that helped the process of innovation. Such successes have been reviewed by various authors to identify the approaches that promote innovation, and the following is a list adapted from Barnett (2006) and Jones *et al.* (2009), illustrated with examples from the four stories.

1. Use **system diagnosis** to understand the different actors, their interactions and power relations, and to determine constraints and identify opportunities. Only in the armyworm forecasting story was there an organized diagnosis, and it did not follow a formal innovation system diagnostic methodology. But it did consider the actors, their habits and practices, and their objectives. The result of the diagnosis was a new approach to an old problem. In the other cases, system constraints were identified as the scientists learnt from experience.

2. Recognize that the **institutional context** (local policy, culture, ways of working and social values) strongly influences behaviour and therefore innovation. Past and current policy, and its effect on the behaviour of actors, is clear in the kale and coffee stories. If policy had been ignored, progress would have stalled. In both cases scientists found ways of working within existing conditions but, in some cases, the institutional context may need to be addressed and modified directly.

3. Facilitate **networks** and **linkages** between actors to provide channels for information flow. Informal links, in which actors trust one another, can be particularly effective, though relationships can be both collaborative and competitive. All of the stories show scientists helping to create linkages between different actors, often as and when the need arose. Building actor linkages was an intentional aim when setting up the plant healthcare systems.

4. Balance power relations between the **supply push** of the research community and the **demand pull** of the users of new knowledge. Usually the demand pull needs strengthening because small-scale farmers lack purchasing power and the ability to influence the research agenda or the allocation of research resources. In the armyworm story, farmers have more power because they now use the forecasting 'technology' to their own benefit. In the plant clinics story, farmers have more power because they decide what information they need and through the plant healthcare network, scientists can respond to that demand.

5. Strengthen **intermediaries** between the suppliers and users of new knowledge. Intermediaries find out what producers (and their customers) want, search through existing and new knowledge, and find options that best meet farmer needs, often on a continuing basis. The plant doctors are formal intermediaries, as their role is to help farmers find ways to solve their plant health problems. But researchers can also perform an intermediary role, as was evident in all of the stories.

6. Create **incentives** that motivate people and organizations to play their role in the innovation process. Removing disincentives is part of this. For example, initially farmers were not interested in producing high quality coffee because they could not get a higher price for it. There are many kinds of incentives apart from financial ones. In the plant clinics story, a motivation for people to work as plant doctors was to do their job better.

7. Use both **tacit** and **codified knowledge**. In the first story, farmers' knowledge of disease-resistant kale was not written down, but it was in their heads and in their kale lines. It is easy to forget or downplay tacit knowledge, but in this case it was the most important. In the final story, the plant health fact sheets translated tacit knowledge into codified knowledge by writing down what farmers or other actors knew to be true in practice.

8. **Experiment** and invest in **learning** so that individuals and organizations continuously improve their performance so that learning becomes an evolutionary process. This includes analyzing and responding to new constraints and opportunities as they arise. In all four stories, scientists worked with other actors, experimented together, and learned from their failures and successes. And, in all cases, this resulted in activities and outcomes that were not envisaged when the initiative or project was designed.

Conclusions

The four stories illustrate eight elements of an innovation systems approach. Although examples are highlighted, most, if not all the elements will be relevant in most situations. Researchers, scientists and other actors need to think about how the different elements can be applied in their own specific context (Rajalahti *et al*., 2008). For each element there are various tools that can be used (Hall *et al*., 2007, for a description of several). Building linkages and facilitating learning between and amongst different actors is always important.

In the first three stories, innovation systems approaches facilitated the application of particular knowledge or research outputs. Such situations are common and they provide an entry point for individuals or organizations seeking to increase the impact of their work through using innovation systems approaches. The plant clinic story is about building the capacity of a system to respond to emerging challenges and opportunities – to innovate – on a continuing basis.

In all four examples, scientific expertise was essential. But it was the way that different parts of the system were brought into play that really made the difference rather than the creation of new knowledge alone (Arnold and Bell, 2001). This 'bringing into play' of different parts of the system captures the essence of what a facilitator or enabler of innovation needs to do – to make strategic choices as to how and when to catalyze different actors into action.

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Chapter 4

Where's the innovation? Harnessing biotechnology for Kenyan smallholders

Hannington Odame

Key Message: Innovation is an evolutionary process. For technological innovation to be effective, it must be embedded in a wider process of stakeholder learning to create an enabling environment of market, service, finance and policy conditions that enable the potential of the technology to be realized. In any innovation process, there are a wide range of actors with different roles and interests, which must be understood in order to create an effective innovation process.

This chapter looks at how a new technology – tissue culture (TC) banana – was introduced to farmers in western Kenya. It is a fascinating story as it offers a dynamic view of an innovation process, illustrating how the TC banana biotechnology initiative was not just about developing a biotechnology, but also about an interactive learning process, bringing together scientific and local knowledge vis-á-vis banana production. It is one of the few successful examples of using biotechnology to address low production of smallholder farmers in Kenya. Looking at how the case evolved, what worked and what didn't, provides good insight into innovation processes.

Banana production in Kisii district. Kisii district is a leading banana producing region in western Kenya with an average farmer production of 17 t/ha, well above the national farmer average production of 12 t/ha. The area under banana production in the district is about 11,400 ha, with a total production of 229,600 t. But the average yield achieved in the district is still below the potential yield of 60 t/ha (MoA, 2005). This yield gap is attributed to semi-

subsistence farming systems characterized by a limited use of inputs and low yielding banana cultivars that are susceptible to pests and diseases. Traditionally, banana farmers use young plantlets (or banana suckers) for propagation, but these suckers are infested with soil-borne pests such as banana weevils and burrowing nematodes (Mboya, 2005; MoA, 2006).

Low yields and low incomes. In the early 1990s, banana production in Kenya declined significantly. This decline is partly associated with disease, pests and environmental degradation such as declining soil fertility. Declining yields have also been blamed on farmers' poor agronomic practices, such as minimal mulching and pruning, wrong spacing, sourcing planting materials from older stools, and failure to renew stools for improved yields (Qaim, 1999). In addition to declining yields, incomes realized from banana sales are significantly below the potential due to poor quality of post-harvest products (poor handling and processing) and socio-economic problems, such as a lack of market access and high costs of transporting and storing this perishable produce (Wambugu *et al*., 2001).

Project: banana biotechnology to benefit small-scale producers

In 1996/1997, the Kenya Agricultural Research Institute (KARI) launched an international collaborative programme to provide smallholders with pathogen-free banana planting material through the use of TC biotechnology (Qaim, 1999). It is within this framework that the project known as, "Diffusion of tissue culture banana technology to smallholder farmers in former Kisii district through micro-credit schemes" was prepared and implemented. The project aimed to establish a self-sustaining system of production, distribution and utilization of farmer-preferred varieties of TC banana packages with suitable micro-credit via K-Rep (micro-finance bank) (Wambugu *et al*., 2001). TC technology is defined in Box 3.

Box 3. TC technology defined
Plant Tissue Culture is a practice used to propagate plants under sterile conditions, often to produce clones of plantlets. The plantlets are then subjected to hardening conditions before being transferred to farmers' fields. The process can take up to a year to produce a stable and viable group of plants.

The project is coordinated by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) and funded by the Maendeleo Technology Transfer Fund (MATF)[1]. ISAAA, in collaboration with KARI-Kisii, implemented the first phase of the project through the use of micro-credit from K-Rep. The TC banana plantlets were purchased and transported to Kisii from a private TC lab, Genetics Technology International Ltd (GTIL) and a public university, Jomo Kenyatta University of Agriculture and Technology (JKUAT), both located in Nairobi. As the project implementation progressed, other actors were brought in to address particular challenges; in this chapter we refer to this as *evolving partnerships* (Table 1).

Evolving partnerships. ISAAA, in its efforts to deploy the TC banana technology to farmers' fields, encountered challenges which could only be addressed through partnerships with both public and private sector actors (Hall, 2006). Table 1 illustrates these evolving partnerships.

1 Maendeleo Technology Transfer Fund (MATF) in East Africa was established by Farm Africa in partnership with the Gatsby Charitable Trust (UK) and the Rockefeller Foundation.

Table 1 Actors and their roles in TC banana biotechnology

Objective	Key actors	Roles	Remarks
Coordination	ISAAA, MATF.	Seeking funding and coordinating linkages by ISAAA.	ISAAA had limited capacity to manage complex networks.
TC production	Genetic Technology International, JKUAT.	TC banana production and extension training in nursery management.	Source of poor or diseased planting material.
Strategic/adaptive research	KARI, ISAAA, farmer groups.	On-station and on-farm trials and feedback.	Infrastructure and incentives required.
Distribution	KARI, ISAAA, farmer groups.	Channels: individuals and farmer groups.	Challenges of group dynamics.
Micro-credit	K-rep.	Provide micro-credit for purchase of TC banana planting material.	The credit recovery failed due to mismatch with the banana production calendar.
Linkages with farmers	KARI, ISAAA, commodity interest groups.	Needs assessment, technology-needs matching, procurement and distribution, demos and micro-credit.	Required participation, access to affordable credit for seed purchase and product market.
Marketing/selling of products	KARI, ISAAA, Kenya Agricultural Commodity Exchange (KACE), farmer groups.	Market research, provision of ripening equipment and training on value addition.	Weak market linkages, packaging and standards, and KACE lacked capacity.
Expansion of options (indirect benefits)	Micro-entrepreneurs, NGO's, K-rep.	Manure business, micro-irrigation, dairy raising, etc	Incentives required for private investment. Spanning boundaries.
Technical backstopping	KARI, MoA extension service (coordinated by ISAAA).	Appropriate field management packages, commercialization strategy, disease diagnostics and training.	Public-private collaboration, networking and experience-sharing required.

Source: Fieldwork

Market constraint. The increased yields due to adoption of TC banana technology posed new challenges. With an oversupply of bananas on the local market, prices were driven down. And, because bananas are perishable, farmers could not wait to sell their output and were forced to sell even when prices were low. Most farmers are small-scale: they have little market information and few options for value addition (Simiyu, 2007). To respond to these challenges, ISAAA began collaborating with the Kenya Agricultural Commodity Exchange (KACE) to link farmers to urban markets for their products. However, KACE ultimately lacked the resources and capacity to deal with the scale of the problem so ISAAA started looking for alternatives.

Value addition. Alongside production efficiencies and effective marketing, value addition (in this case banana ripening) is another avenue for increasing incomes. In order to set up a pilot banana ripening chamber, ISAAA mobilized technical advice from KARI and resource contributions from the farmer group members to buy the necessary ripening equipment from the

Kenya Industrial Research Development Institute. This allowed members to earn money by selling ripened bananas, which led to the establishment of a saving and credit scheme through revenue obtained from participation in TC banana marketing.

Expanding options. Despite all of these improvements, farmers began realizing that banana growing is not enough to support their livelihoods. As a result of the TC banana initiative, farmers (especially local entrepreneurs) diversified into dairy farming, a manure business, micro-irrigation, and formed the Banana Growers Association (BGA). The BGA lobbied K-rep to provide micro-credit to banana farmers that would enable them to expand into dairy production. This demonstrates the dynamic nature of innovation: having introduced a simple technological innovation, a cascade of new developments took place as people began to innovate in all kinds of ways, and 'think outside the box'.

Scientific-farmer knowledge interactions. Farmers in Kisii have vast local knowledge of growing various traditional banana varieties but faced declining yields in their old banana orchards. The TC banana technology was set up to address this problem but the interaction between this scientific knowledge and traditional knowledge needed some mediation.

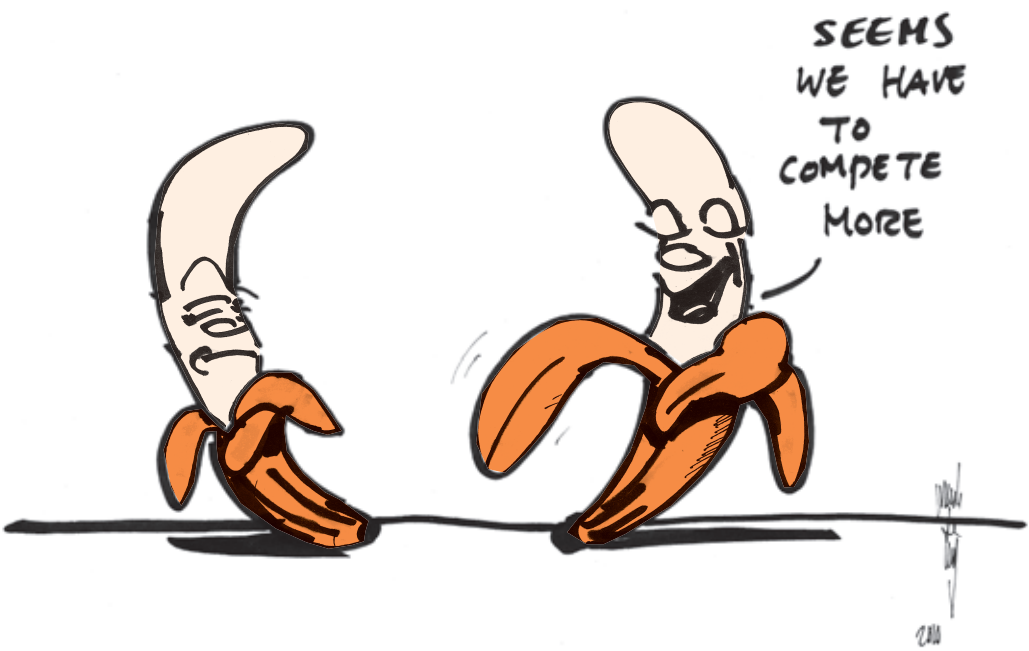
TC technology requires that farmers change their agronomic practices (watering, fertilizing) and start to use inputs (fertilizer, manure) but many farmers buy the TC plantlets without changing how they manage their orchards. This means they fail to achieve the higher yields possible with TC bananas. In addition, many farmers lack access to credit to buy fertilizer or pay for hired labour. As illustrated in Box 4, the cost of the new technology is another barrier to technology uptake. Some also lack technical information about TC banana production and about marketing and value addition. An additional challenge is gaining access to plantlets and the proximity of nurseries. TC banana plantlets are very delicate. Ideally, they should be cultivated near to the farmers' plots in the local communities, which calls for setting up community satellite nurseries to harden the young and tender plantlets for selling to farmers to plant in their fields.

Box 4. 2 Input cost barrier
Most farmers are resource-poor and the cost of TC plants (US$ 0.8-1.2 per plantlet) is far above that of the traditional varieties (US$ 0.3 per plantlet). Most farmers are not able to purchase enough plantlets to break-even. On average, a farmer buys 8-10 plants, yet to break-even they require 0.25 ha of land planted with 80 stems (W ambugu *et al.*, 2001). A certain production level is needed in order to recover the costs of investment. Consequently the potential impact of TC banana on poverty alleviation is yet to be realized.

Dynamics of introducing a new technology: successes and challenges

The project is considered successful for a number of reasons below:

- Disease and pest-free planting material is available.
- Higher annual yields (40-60 t/ha) are observed.
- TC bananas mature uniformly and within a relatively short time period (approximately nine months).
- Uniformity and simultaneous 'plantation' development promises easier marketing and coordination of the whole production process.
- Ease of introducing and disseminating superior germplasm through institutional partners.
- Benefits derived through ISAAA include: farmer-to-farmer exchanges, linking farmers to markets for their products and institutional building of farmer organizations.



Despite its successes, the TC banana project has not fully achieved its goal of reverting declining banana yield (Kwach *et al*., 2005), which is attributed to the following factors:

Socio-economic conditions. Farmers' socio-economic conditions affect technology adoption. They include financial constraints, land constraints, farmer habits and practices, marketing constraints, and little value addition activities (Smale & de Groote, 2003). Some farmers have not adopted the technology holistically, which means that they buy the TC plantlets but maintain poor management practices in banana fields.

Technology deployment. The supply of TC plantlets has also been found inadequate and expensive relative to farmers' own suckers which are freely sourced from their own farms, or borrowed. Moreover, the plantlets require very good care while in transit and while transplanting to the main farm. Farmers have resorted to old ways of sourcing planting materials from older suckers and from neighbours, which increases disease spread on the farm and in the community.

Weak markets. Markets for planting materials are poorly developed, which explains the poor distribution of TC plantlets. This is partly due to the lack of a commercialization strategy by public institutions, which are involved in technology development, and also partly due to poor linkages between producers and other actors in the banana value chain (Smale & de Groote, 2003).

Old banana stools. TC banana stools should be renewed every five years to maintain good yields. However, farmers – including TC banana adopters – rarely renew stools. This could either be due to ignorance, lack of technical information or support from TC material

providers. Furthermore, TC bananas mature evenly and the early adopters are faced with marketing problems which include low farm gate prices, high post-harvest losses for bananas either during transit or awaiting sale, poorly regulated market structure and exploitation by middlemen (Okoko, 2007).

Lessons learned and conclusion

This interplay of successes and challenges – what we refer to as the dynamics of innovation – provides a number lessons for participants in any innovation process. TC banana biotechnology is a technology which has been relatively successful in terms of deployment and use. Although this initiative has reached the farmer, its potential impact is far from being realized. This chapter not only sought to identify missing links in the innovation system for TC bananas, but also highlights what would make it work more effectively in developing appropriate technologies for poor farmers.

Spurring new options. The TC banana initiative has addressed some aspects of food security (household consumption) but increasing incomes through sales is not yet optimal. As a result, banana farmers are diversifying into other small enterprises. This demonstrates the dynamic nature of innovation: having introduced a simple technological innovation, a set of new local initiatives emerged as people began to innovate in all kinds of ways (Klerkx & Leeuwis, 2009).

Learning as an evolutionary process. The TC banana initiative serves as a good example of a technology where learning is the key to innovation success. What began as a simple technological innovation evolved over time, bringing in different actors each with their own knowledge, competencies and resources. An array of actors are involved to ensure technology delivery and uptake by farmers: institutions of higher learning for enhanced research and training; farmer groups for demonstrations and awareness; micro-credit institutions to provide credit for acquisition of seed and other technology requirements; and sensitizing micro-entrepreneurs to provide the technological requirements (Hall *et al*., 2006).

Managing linkages. With so many actors involved, an organization like ISAAA becomes vital for coordinating and facilitating interactions. The complexity of innovation means that it cannot be assumed – it requires mediation. The diversity of actors, each with their own mandate and interests, needs to be managed (Spielman *et al*., 2009). At a micro-level, the facilitator of this can be an individual; as you move up into larger processes, facilitation needs to be taken up by networked individual(s) and/or influential organizations – also known as innovation brokers (Klerkx & Leeuwis, 2009). For more on facilitating innovation, see Part 2, and for more on innovation brokering/coaching, see Chapter 12).

In conclusion, for any agricultural innovation to be successful a holistic approach to technological innovation is required; one in which farmers' needs are addressed through interactions and linkages with various institutions, not through top-down approaches. Equally important is the coordination of linkages within the system where all key actors work towards achieving the same goal, appreciate the learning process and respond to feedback received from other stakeholders in the system. It is important to note that rarely, if ever, are all the actors present

at the start of the innovation process. The art of innovation is in managing the process as it evolves, and creating the space, opportunity and incentives to bring in different actors at different stages.

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Chapter 5

Innovation systems and policy learning: African, Caribbean and Pacific country case studies

Judith Ann Francis, Maurice Bolo and William Critchley

Key Message: Improving agricultural performance requires an enabling environment, including an effective national system of agricultural science, technology and innovation (ASTI). However, an enabling environment is more than just policies, institutional frameworks and research and development (R&D) programmes; these alone are not enough. An enabling environment must encourage and support collaboration and learning between all the different public and private sector players that make up the system, facilitating and fostering interactions among the actors. Collaboration and stakeholder interaction are critical for learning, and thus, innovation.

What makes innovation possible? The mindsets of people, their capacities, the linkages and effectiveness of communication between different players, well-focused scientific research and development, market incentives and investment are all contributory factors. A lot of agricultural innovation is about public goods and this requires effective public policies. The next generation of agricultural graduates will have the important task of helping to rebuild effective public policies for innovation that in many ways have been eroded over the last few decades. Understanding the role of public policy and having the tools to analyze it will be important. This chapter gives an insight into the issues to be considered and the methodological approaches to be followed.

Box 5. Acronyms to look out for

ACP - African, Caribbean and Pacific (countries)
AKST - Agricultural Knowledge, Science and Technology (infrastructure)
ASTI - Agricultural Science, Technology and Innovation (system)
CTA - Technical Centre for Agricultural and Rural Cooperation
GDP - Gross Domestic Product
ICT - Information and Communication Technologies
R&D - Research and development

Background

Sustainable agricultural development hinges on continuous networking, learning and innovation. This requires, among other things, a so-called 'enabling' environment, which refers to a mix of robust policies, institutions, infrastructural investments and interactions among system actors. However, in African, Caribbean and Pacific (ACP) countries, the agricultural sector has experienced a significant period of underperformance. The science and technology community has often been too disconnected from policy-makers, who have had insufficient information for informed policy-making. In response to this situation, the Technical Centre for Agricultural and Rural Cooperation (CTA) began a process of competence building to enhance the participation of ACP researchers in science, technology and innovation policy

processes. This followed a multi-pronged strategy for mainstreaming innovation systems thinking in ACP agricultural and rural development through sensitizing decision-makers, training key experts on innovation processes, analyzing the agricultural science, technology and innovation (ASTI) system, and communicating the results to policy-makers and other agricultural stakeholders. This chapter reflects on the methodological framework that guided CTA's capacity building initiative and draws out the key lessons from the ASTI system case studies.

Generating and acquiring scientific knowledge and technological capabilities, and using them creatively and competently for addressing societal needs, is an integral part of national development strategies (IAC, 2004a) and hence a key policy issue. Achieving sustainability goals in agricultural and rural development requires a long-term commitment from decision-makers, greater public and private investments in agricultural knowledge, science and technology (AKST), a re-valuing of traditional and local knowledge, supportive policies and institutions and an interdisciplinary, holistic systems approach to knowledge production and sharing (McIntyre *et al*., 2009). Thus, science, technology and innovation are important for agricultural and rural development (IAC, 2004b). However, the biggest challenge is how to translate policy prescriptions into adequately resourced, well-executed and effective national programmes that contribute to the realizing of development goals.

How can developing countries, with a prolonged history of under-investment in agriculture, address the complex policy issues that revolve around building the necessary AKST infrastructure (human, physical and financial) to facilitate innovation? This chapter argues that, given the critical role of the agricultural sector as an economic foundation in most developing countries, evaluating innovation performance and supporting evidence-based policy and decision-making around AKST must become higher national priorities.

The innovation system approach is based on the premise that innovation is an interactive process in which learning is central. This requires individual competence building, linked with research and development (R&D) and effective organizational learning. The competencies, behaviours, habits, practices, and quality of interactions among system actors impact on their capacity to innovate (Cooke *et al*., 1997). Specifically, these competencies include: the ability to routinely search for new knowledge, to adapt the direction of this search as needed, to use research results created elsewhere, and to stimulate the emergence of new knowledge. However, the "competencies needed for innovation cannot simply be acquired or imitated by rote" (Mytelka, 2003); competencies have to be built through a decisive, focused approach.

Although national strategies were an initial reference point for innovation studies, comparative analysis of regional, continental, and sectoral innovation systems[2] have also emerged as important (Cooke *et al*., 1997; Freeman, 2002; Lundvall *et al*., 2002; Malerba, 2002). As such, the policy and institutional framework, as well as the knowledge base, competencies,

2 Malerba (2002) defines a sectoral system of innovation as "a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production and sale of those products". He includes the "specific knowledge base, demand, technologies, and input" in the choice of elements to be analyzed.

behaviours, habits, and practices of key actors (for example, researchers and farmers, and the nature and quality of the linkages between and among the actors), are relevant when analyzing the agricultural innovation system (AIS).

Methodological framework

The approach adopted by CTA in building capacity of ACP experts over the period 2003-2009 included: (i) sensitization and training workshops; and (ii) case studies analyzing the ASTI system using an innovation systems approach. The units of analysis were sub-sectors or commodities that were: (a) important for food security; (b) important for export diversification; or (c) under threat from loss from emerging competitive markets. The case studies generated both quantitative and qualitative data. The results were disseminated at national and international levels to enhance knowledge and understanding of AIS and to inform science, technology and innovation policy processes for creating an enabling environment for agricultural innovation and rural development.

The standardized methodological framework[3] (CTA *et al.*, 2005) for analyzing the ASTI system was comprised of[4]:

(i) Desk research to identify and review the performance of the agricultural sector and the sub-sector or commodity under study, as well as the policy environment and the key actors in the system;
(ii) A stakeholder sensitization workshop to introduce innovation theory and concepts, gain buy-in for the study, and identify any missing key actors;
(iii) Semi-structured interviews with key practitioners to fill in any gaps in the literature and desk reviews, surveys using pre-tested questionnaires, and focus group sessions targeting key actors (at least 50 actors based on the agreed sampling plan);
(iv) Functional analysis, which involved grouping the actors into five clusters (demand, enterprise, diffusion, research and training, and infrastructure) based on their key function, and then mapping the linkages within and among the clusters based on the results from the surveys, interviews and focus groups;
(v) Assessment of habits, practices, competencies and performance of key actors;
(vi) A stakeholder workshop to discuss and refine the results and recommendations and sensitize policy-makers.

The following statements articulate our assumptions. The ASTI system exists; an innovation systems approach for analyzing ASTI systems is appropriate; there is a disconnect between the science and technology community, and policy-makers, and; case studies will generate policy relevant information and provide lessons for sustaining agricultural innovation.

Research questions covered: the historical performance of the agricultural sector and commodity under study; the policy and domestic environment for innovation; key actors and their competencies, habits and practices; linkages within and between the groups of actor and

3 Developed by CTA/UN-INTECH/KIT

4 For further details on this methodological framework, refer to CTA et al. (2005)

the quality of the linkages; the conditions for innovation to take place; and recommendations for improving the ASTI policy framework to enhance innovation performance.

Table 2 Overview of ASTI system country case studies by commodity (2004 -2009)

Countries	Commodity for diversification	Export commodity under threat	Commodity for food security
Cameroon		Cocoa (*Theobroma cacao*)	Cassava (*Manihot esculenta*)
The Gambia	NERICA rice		
Ghana			Fisheries Plantain (*Musa spp*) Maize (*Zea mays*)
Grenada		Nutmeg (*Myristica fragans*)	
Jamaica	Ginger (*Zingiber officinale Roscoe*) Mango (*Mangifera indica*)	Sugar (*Saccharum officinarum*)	
Kenya	Floriculture		
Malawi			Maize (*Zea mays*) Fisheries
Papua New Guinea			Banana (*Musa spp*) Rice (*Oryza sativa*)
Senegal			Rice (*Oryza sativa*) Maize(*Zea mays*) Fisheries
St. Vincent & The Grenadines		Banana	
Tanzania			Banana
Samoa & Tuvalu	Noni (*Morinda citrifolia*)		
Zambia			Dairy

Author's summary (2009)

Results

The five main findings of the selected case studies are presented under the following categories:

1. Performance of the agricultural sector and targeted commodities.
2. The policy and domestic environment for innovation.
3. Key actors and linkages.
4. Competencies, habits, practices and learning.
5. Assessment of key functions and innovation performance.

1. Performance of the agricultural sector and targeted commodities

The overall contribution of agriculture to the Gross Domestic Product (GDP) either decreased or remained almost constant while sub-sectors/commodity performance was mixed. For example, while the real agricultural GDP in Papua New Guinea declined by 0.4% over a 20-year period (1980-2002) (Omot, 2005), agriculture as a percentage of real GDP declined from 21.2% (1990) to 9.3% (2006) in St. Vincent and the Grenadines. Also observed was little or no

growth in the value of typical export commodities, such as banana, cocoa, nutmeg, sugar (in St. Vincent and the Grenadines, Cameroon, Grenada and Jamaica, respectively) mainly due to changes in international trade regimes (Ngou Ngoupayou *et al*., 2004; NCST, 2005; CARDI, 2006; CARDI, 2007). The per capita production of food security commodities also varied; for example plantain production in Ghana increased from 0.05% to 0.1% over the period 1990-2000 (Owusu-Bennoah *et al*., 2007), while cassava production declined (Ngou Ngoupayou *et al*., 2004). However, production and export of non-traditional commodities – the floriculture industry in Kenya and the noni industry in Samoa – were substantial and this was reflected in increased export earnings (Bolo, 2005).

2. The policy and domestic environment for innovation

Most countries had policies related to agriculture, science and technology, Information and Communication Technologies (ICT), trade and investment, and other policies directly relevant to supporting innovation. By contrast, intellectual property right policies were either non-existent or in-development. However, where they did exist, for example in the Kenya floriculture case study, there seemed to be a positive effect on learning and innovation. Some commodities that were considered important for food security and a main staple food for significant portions of the population, for example plantain (ranked as the fourth most important food in Ghana, a staple for 4 million Tanzanians, and third among the seven staple food crops in Papua New Guinea), were not emphasized in government policy (Kambuou and Gwabu, 2007; Maerere *et al*., 2007; Owusu-Bennoah *et al*., 2007).

Bolo (2005) reported that government policies contributed to the performance of the Kenya floriculture industry, although there were other contributing factors including Kenya's climate and a robust private sector. Some of the policies, which facilitated innovation in the Kenya floriculture industry, included the protection of intellectual property under the Seeds and Plant Varieties Act (cap 326) which confers plant breeder rights on people who breed or discover new varieties. Enacting and operationalizing this legislation has enabled flower farmers to access internationally bred varieties of cut flowers. This was complemented by the Science and Technology Act (cap 250) which provided for the coordination of science and technology research, and establishment of five research institutes, including the Kenya Agricultural Research Institute (KARI). Regarding interaction and innovation, Bolo records that sessional paper no. 1 of 1994 encouraged "the industry to develop mutually beneficial contractual links with research institutes for generating viable technologies and foster stronger linkages between the farming communities and the agro-industries". The need for actor linkages was further featured in the Poverty Reduction Strategy Paper and other policy instruments "which advocated for pluralism and building a participatory technology development and transfer system and collaboration among extension service providers" (Bolo, 2005). The major limitations identified were lack of credit and incentives, insufficient financing and human resources, and inadequate physical infrastructure.

Structural adjustment and trade liberalization policies contributed to underinvestment in R&D and the erosion of extension services in several countries. Iese (2007) reported that, although there were no specific policies in Samoa and Tuvalu to support the noni industry, existing policies were not implemented due to a lack of communication and underestimation of the services that public organizations could provide to support the private sector. On the

other hand, large flower businesses in Kenya were able to take advantage of the available policy instruments, whereas the smallholder flower farmers did not have access to the organizational infrastructure nor support from public sector agencies.

Key informants on the domestic environment for agricultural innovation found the intellectual property rights regimes and availability of venture capital to be weak or very weak. Government incentives for innovation, the quality of scientific and skilled manpower, and competences of local universities for technical collaboration and R&D were poor. ICTs, water and electricity services ranged from weak, to average and strong (only in the Caribbean). Policy coherence, sensitivity to the needs of smallholder farmers and funding for spurring agricultural innovation were identified as priorities.

3. Key actors and linkages

The key actors were present in each of the ASTI systems and many of them performed multiple roles. The linkages within the actor groups and between clusters were mapped based on information provided in the surveys and interviews. These linkages were then collated and validated during stakeholder workshops. A pattern emerged across all the case studies which showed that the linkages between universities and research institutes and the private sector actors, including farmers were generally weak. A few examples are highlighted:

Fall (2005) noted that "universities are more interested in academics and basic research and do little in development-oriented research. Most collaboration with research is connected to teaching (courses and supervision). There are very few applied research projects being carried out together with the rural communities."

In Papua New Guinea, Omot (2005) explained that, "there's a strong research base in the country but there is poor coordination and weak integration between research and the productive sector and other relevant sectors."

In Jamaica, NCST (2005) concluded that, "the activities of the R&D and science and technology institutions were not geared towards enhancing competitiveness and expansion of the Jamaican ginger industry."

In the floriculture industry in Kenya (Bolo, 2005), there were supportive policies with explicit provisions encouraging interactions and joint initiatives between the different players, yet there were very weak interactions between the national R&D system (comprising research institutes and universities) with the farmers. Instead, there was a corresponding stronger linkage between the (large-scale) farmers and the international R&D actors (laboratories, private consultants and university departments).

In the rare case where collaboration between public research and the private sector was found to be stronger (rated average to strong), there was external international funding, which stipulated collaborative research as a requirement for accessing funds. Collaboration within actor groups was more common, for example between R&D actors and between companies or farmer-to-farmer.

4. Competencies, habits, practices and learning

The educational level and training of researchers and other professionals was considered adequate (BSc, MSC and PhD levels) but their knowledge of the production, processing and marketing of specific commodities was limited. Most smallholder farmers had little education beyond primary school and their additional training was limited mainly to improving agronomic practices and pest and disease management. Omot (2005) noted that the majority of researchers in the rice innovation system were agronomists and entomologists but there was only one post-harvest specialist and no agricultural engineers.

Learning was taking place at the level of the farming business. For example, banana farmers in Ghana adopted new techniques for rapid multiplication of planting material, improving soil fertility and weed control (Owusu-Bennoah *et al*., 2007). In St. Vincent and the Grenadines, farmers planted new banana varieties using tissue culture (TC) plantlets, but did not adopt other aspects of the technical package and, as such, did not achieve the projected yields (CARDI, 2007). All reports confirm that there was underinvestment in research, training and extension, with a negative impact on research and the technical support provided.

5. Assessment of key functions and innovation performance

The key functions of the innovation system can be summarized as follows: create new knowledge, direct research, supply resources (e.g. capital and competence), facilitate information and knowledge flows, enhance networking, create new markets, and facilitate market access and development. Individually, actors were executing their core functions as prescribed in their mandates; however this had little impact on the overall performance of the ASTI systems either in terms of innovativeness, growth in agricultural GDP (except for floriculture in Kenya), food and nutrition security, or market competitiveness. Research organizations and universities were conducting research but there was little linkage between the research that was being done and the challenges faced by the sub-sector. For example, banana and nutmeg, although important export commodities, were not research priorities for the major regional universities or regional research organizations in the Caribbean (CARDI, 2006; CARDI, 2007).

Maerere *et al*., (2007) noted that although the banana sub-sector in Tanzania faced several challenges (pests and disease, low soil fertility and low yielding varieties), there was little public research and extension services on the crop. With respect to training, the knowledge institutes were fulfilling their roles: yet many countries did not have the necessary competencies to respond to the challenges faced by the sub-sectors. Growth of the Kenya floriculture industry was dependent on external knowledge. National governments were not investing in public research or making financing available to the farmers and private sector companies for adopting new technologies.

Little attention was being paid by researchers and other organizations to the strong farmer-to-farmer networks for strengthening research capacity and output or for identifying new areas of research to address their specific needs. International funding was available to support some research projects but this contributed to limited collaboration and friction between national and international actors because the level of financing for internal research was considered higher.

Smallholder farmers, and small to medium agro-processors, were finding new market opportunities for fresh and processed foods, but there were no coordinated national initiatives to develop domestic markets or provide services to improve product quality to take advantage of new market opportunities. The problems faced by the noni industry in Samoa and the inability of smallholder farmers in Kenya to meet international market standards serve as good examples of system failures.

Conclusion

The results of the case studies indicate that the ASTI systems were dysfunctional. First of all, although there were several good policies – at least on paper - they did not translate into innovation and competitiveness in the agricultural sector because they were under-resourced and lacked coherence. Secondly, there were several R&D actors and, although some were doing research, the findings/technologies did not translate into economic/social benefits in most cases. Thirdly, individual actors in AIS were carrying out their various functions, but the interactions/linkages between the various actor groups were generally weak. The priorities of the research community and the weak interactions between the R&D actors (universities and research institutes), the private sector and productive sectors were of concern given low investments in research and extension, and the importance of the commodities to the various countries. Indeed, the weak interactions among R&D actors and enterprises were undermining the functioning of ACP AIS. Fourthly, the domestic environment for innovation based on a number of key indicators measured across countries was ranked as weak to average.

The key functions of an innovation system are to create new knowledge, direct research, supply resources (capital and competence), facilitate information and knowledge flows, enhance networking, create new markets, and facilitate market access and development. As these case studies show, ACP countries need to strengthen knowledge networks, develop competencies, achieve policy coherence, improve institutional frameworks and make resources available to support continuous learning for spurring and sustaining agricultural innovation. Having a robust policy and institutional framework and ongoing R&D programmes, while important, are not enough for agricultural and rural development. An enabling environment that facilitates and fosters interactions among the actors – especially between R&D and other system actors – is critical for learning and innovation.

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Chapter 6

How innovation networks interact with their environment: a complexity view on innovation systems

Laurens Klerkx

Key message: Innovation is not just about bright ideas, but putting them into use. A critical dynamic to understand is the relationship between small, emerging innovations and larger-scale change in systems (niche-regime relationships). How small niche innovations influence larger scale change is related to network dynamics. All of this can be creatively facilitated, but not controlled or managed.

Being an innovator is not easy. Take people who wear avant-garde fashion: they are often laughed at when they sport new-fangled outfit combinations. But after a while some of those same styles are worn by other people as well, or at least parts of the look are taken on. In time, what begins as avant-garde becomes mainstream fashion. The same process happens with an innovation. Someone may have a great idea, but it is usually a struggle to establish the innovation; they need supporters to help develop and realize their idea. The innovator has to convince cynical non-believers who may think that they are crazy! They have to face opponents who do not want to see the innovation become a mainstream technology or practice because it threatens their own interests. This is because innovation challenges the status quo.

In this chapter we look at how innovation networks – consisting of innovators and the like-minded people who support them – interact with their environment in order to achieve innovation goals. The chapter looks at theories about interaction between innovation networks and their environment. Furthermore, it presents essential issues that innovation networks need to be taken into account as they endeavor to realize innovation goals.

Long-term technological change: a tale of niches and regimes

Long-term historical analysis demonstrates that innovation is a co-evolutionary process on multiple levels; technological change is always accompanied by social and institutional change. In the study of technological change, clusters of innovation networks that work on a similar theme are often referred to as *niches.* These niches are spaces in which new ideas develop (e.g. an *avant-garde* fashion designer's workshop) and these ideas challenge an existing *socio-technical regime* (e.g. current mainstream fashion – the trends, shops, advertisements, accessories). This socio-technical regime is a coherent package of technologies and social practices which have evolved with the technology. For example, we use cars that run on fossil fuel, and we have built a whole infrastructure around this (car manufacturers, fuel stations, roads, mechanical services) as well as habits and rules (road regulations, habits or norms, dependencies, literature on cars, entertainment based on cars). If you want to change this system, change has to happen at many different levels and in many different places. While some parts of the existing fossil fuel car socio-technical regime may also serve an electric car situation (for example, the roads), other parts would have to change (for example, the mechanics of the cars themselves). Making the switch is not easy because many actors in the prevalent regime do not support the change: it threatens their position. Also, these electric car niches have to compete with other niches that are developing other types of alternative cars (such as hybrid cars, hydrogen engine cars, solar energy cars). Through a process of evolutionary selection (like the ecological idea of 'survival of the fittest'), only one or a few niches will form the new socio-technical regime (Figure 1).

Given the complex interaction between technological and social features, niches have to deal with many enabling and constraining factors in pursuing their goals. Innovation is influenced, for example, by consumer preferences, government policies, and market factors at regional, national, and global levels (Blay-Palmer, 2005). These factors may relate to the socio-technical regime in question (for example, to the position of car manufacturers, or tax measures on car use), but may also relate to higher level factors influencing several socio-technical regimes. For example, former US vice-president Al Gore's contribution to the climate change debate and the credit crunch influences different kinds of socio-technical regimes that strive for more sustainable energy use, not just the car industry. These are known as 'landscape factors' (Figure 1). This means that innovation systems need to be conceptualized as complex systems, which *self-organize*, so they cannot be steered centrally in a pre-set way. The implication is that these are systems "whose properties cannot be analyzed by studying its components separately […] formed by many agents of different types, where each defines his/her strategy, reacts to the actions of other agents and to changes in the environment, and tries to modify the environment in ways that fit his/her goals" (Spielman *et al*., 2009: 400). In our fashion example, the implication is that you never really know whether *avant-garde* fashion will actually become mainstream fashion until it happens (or doesn't).

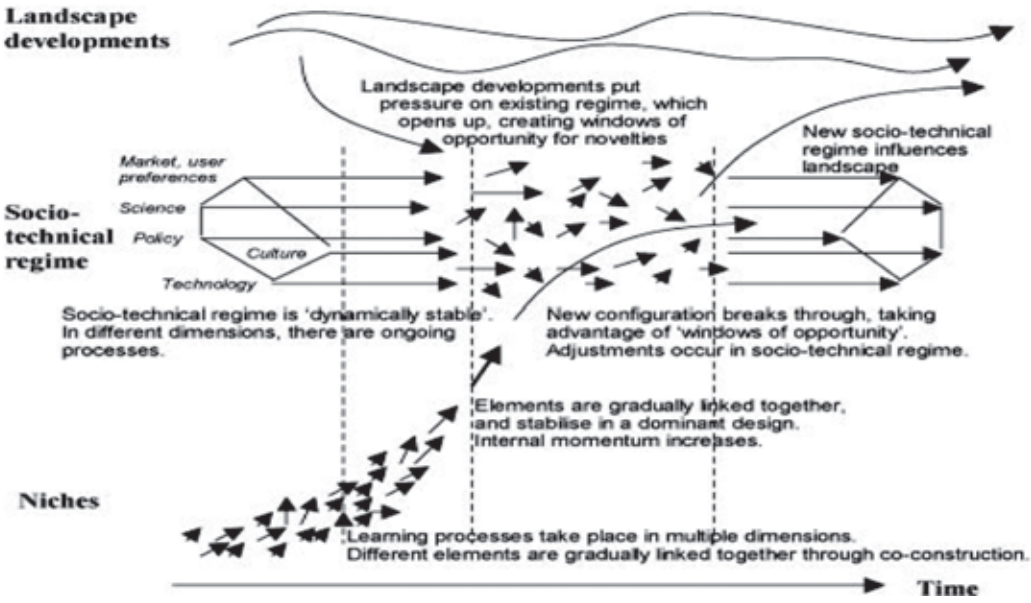

Figure 1: The multi-level perspective on socio-technical transition (Geels, 2004)

Niche-regime interaction at the micro-level

While the idea of niche and regime is about long-term change processes and macro-level transitions that tend to depend on many different innovation networks, there are also similar processes at play in a single innovation project. The question is: how can innovation networks (i.e. niches) effectively deal with the opportunities and challenges offered by their environment (i.e. the socio-technical regime)? This question brings us to the importance of agency.

Agency is the ability to take action and make a difference to a course of events (Giddens, 1984). Agency is determined by the resources and competencies that an actor or organization has at its disposal for innovation (i.e. knowledge, skills, material and financial resources). But it also has institutional features such as the norms and rules governing action and the rationale that orients and legitimizes action (Edwards, 2000). The self-organization perspective that is central to complexity thinking, acknowledges that no single actor can pursue innovation goals without taking into account other actors, because individual actors lack sufficient power and resources to do so (Ekboir, 2003; Aarts *et al*., 2007). In this view, an innovation network is a kind of support network comprised of different actors (Harrisson & Laberge, 2002) who come together to achieve individual and collective goals and obtain resources, the nature and source of which is unknown beforehand (Kash & Rycroft, 2002)[2]. The idea of a support

2 A national agricultural innovation system (AIS) is defined by the World Bank (2006) as "a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge". For specific innovation processes, flexible and dynamic innovation networks are formed from the network of actors present in a sectoral or national AIS or across different national AIS. These networks have been referred to as innovation coalitions by Biggs and Smith (1998), multi-stakeholder platforms by Röling (1994), innovation c onfigurations by Engel (1995), or as public-private partnerships (PPPs) by Spielman and Von Grebmer (2006) and Hall (2006).

network presupposes voluntary membership. However, innovation networks depend on many other peripheral actors (their environment) whose involvement may not be voluntary but rather, unavoidable due to existing or future mutual interdependence. Persons or organizations in the innovation network's environment, such as governmental agencies and civil society organizations, can play important enabling or constraining roles in realizing an innovation.

This brings us to the relationship between agency and structure. In Giddens' structuration theory (Giddens, 1984), actors and the structures in which they are embedded (i.e. environments) have an iterative relationship because the "structural properties of social systems are both medium and outcome of the practices they recursively organize" (Giddens 1984: 25). The pattern of social practices reflects a 'virtual order' of rules, resources, and transformative relations that *constrain* and at the same time *enable* social activities (Alexiou & Zamenopoulos, 2008), and which is constantly changing through social action itself. Everyday interaction between people and their environment brings about change in the environment. In an innovation process, changing this environment to enable the realization of the innovation is a principal objective. In the study of innovation systems, this reflexive relationship between actors and the institutional environment that may be adapted, changed, or complemented is known as *mutual embeddedness* (Markard & Truffer, 2008). Innovation networks constantly need to monitor the actions and aspects of the environments within which they move, taking into account past, present, and future events (Edwards, 2007). In so doing, they are able to reach their goals and reduce uncertainty in the process of achieving them (Geels & Schot, 2007). For innovation networks, the environment tends to show itself in the form of uncertainties that need to be dealt with and for which solutions must be found (Meijer *et al*., 2007) - Table 3.

Table 3 Uncertainties in innovation processes (adapted from Meijer et al., 2007)

Type of uncertainty	Issues on which there is uncertainty
1. Technological uncertainty	- characteristics of the innovation (such as costs or performance) - relation between the innovation and the infrastructure in which it is embedded - uncertainty to what extent adaptations to the infrastructure are needed - possibility of choosing alternative (future) options
2. Resource uncertainty	- the amount and availability of raw material, human and financial resources - how to organize the innovation process (e.g. in-house or external R&D)
3. Competitive uncertainty	- behaviour of (potential or actual) competitors and the effects of this behaviour
4. Supplier uncertainty	- actions of suppliers as regards to timing, quality and price of the delivery
5. Consumer uncertainty	- consumers preferences with respect to the innovation - consumers' characteristics - long-term development of the demand over time
6. Political uncertainty	- current policy (e.g. regarding interpretation or effect of policy, or a lack of regulation) or future changes in policy, as well as reliability of the government

The next question is: what important issues should innovation networks take into account to uncover uncertainties and realize their goals?

Key issues in effective innovation network-environment interaction

A first key issue is that innovation networks have a solid and shared vision of where they want to go to. For an innovation network, such a vision serves to guide, convince, bind, and mitigate uncertainty (Berkhout, 2006). It is useful to be guided by a shared vision. But sticking too tightly to a pre-determined vision can also mean that a process comes to a dead-end when circumstances change if the innovation network is unable to adapt its vision (albeit only slightly) to accommodate these changes. A vision needs to be adaptable. Also, such a vision needs to have appeal beyond the innovation network. To enhance its appeal, the vision must not just exist in the heads of the innovators, but needs a concrete, tangible form; for example, convincing stories, designs, visualizations, plans, and scale models. These serve for promoting the idea and creating mutual understanding around it.

A second key issue is therefore that innovation networks constantly have to monitor what is happening in their environment. In doing this, they need to take past, present, and future events into account (Edwards, 2007). Although innovation networks may deliberately try to influence their environment to reduce uncertainty and achieve their goals, their influence is always limited. Serendipity, in the form of unintended consequences of their actions, as well as exogenous events (the earlier mentioned 'landscape factors') that lie outside the sphere of influence of innovation networks, plays an important role in determining further activities. This could mean that an innovation suddenly takes off because all the pieces of the puzzle fall into place (it gains *momentum*); likewise, it could also mean that several things go wrong and conditions become so unfavourable that the whole process stagnates.

Given the unpredictability of innovation processes, a third requirement is that the innovation network be flexible in its composition. Sometimes new people will need to be brought in to complement the existing capabilities of the network (in terms of knowledge, resources, ideas, and contacts). Some are specifically needed to interact with the innovation network's environment. Also, this may imply that people who were previously at the periphery of the innovation network (the environment), become part of it. Examples include:

- influential advocates in policy, business or civil society circles, such as politicians, directors of important companies, and NGO leaders;
- (scientific) experts to corroborate the underlying vision and feasibility of the innovation;
- independent network builders and network mediators acting as innovation coaches and brokers, who can help forge contacts and help facilitate the communication between different kinds of people (For more on innovation brokering/coaching see Chapter 12).

But innovation is not just about making friends, or convincing people to be your friend and embrace your idea. Some people will never become friends, and may be an obstacle for the innovation network and slow down the innovation process. Therefore, it may be necessary to exclude people from the environment, albeit temporarily.

Conclusion: what complex systems mean for policies and support

From a complex systems view on innovation systems, we can see that innovation networks have to be flexible, with a keen eye on their environment. Going back to the example that opened the chapter: fashion keeps on evolving, so *avant-garde* designers can never rest on their laurels. Shaping an innovation requires that innovators interact with their environment with the aim of modifying it to favour their innovation. The necessary ingredients include: a good 'story' (e.g. visions, discourse) told by the right people (with conviction, credibility, power) at the right time, in the right place, and to the right audience (acquiring complementary resources such as knowledge, capital, political support), in a way that builds and capitalizes upon momentum.

The notion that innovation networks self-organize, limits the possibility of fully steering them (Aarts *et al*., 2007; Spielman *et al*., 2009). However, recognizing and accepting self-organization may also increase opportunities for innovation. This requires adequate facilitation by organizations that can help innovation networks to create productive relationships with their wider environment: so-called 'innovation brokers' (Klerkx *et al*., 2009). It also requires monitoring and evaluation methods that are aimed at learning (Horton & Mackay, 2003). Given the interaction between innovation networks and their environment, a promising approach may be to continuously reflect on the micro-position of the innovation networks and their goals versus macro-level systemic possibilities and constraints. Methods have been designed for this purpose, such as innovation system failure analysis (van Mierlo *et al*., 2010) and participatory impact pathway analysis (Douthwaite *et al*., 2003; Douthwaite *et al*., 2008). These methods help innovation networks to proactively create awareness in regards to their position vis-à-vis their environment.

Box 6. Some examples of interacting with the environment

Devaux *et al.* (2009) report on the Papa Andina project which links smallholder farmers to value chains. They describe how farmers, facilitated by researchers, entered into negotiation with what they previously regarded as 'hostile' organizations in their environment; namely, large food processing companies. By entering into dialogue, partnership with a large potato chip (crisp) producer was forged and the company began producing a potato chip based on an indigenous potato species. http://ideas.repec.org/p/fpr/worpps/68.html

Kristjanson *et al.* (2009) describe several projects in East Africa that endeavoured to link smallholders with people they were previously not connected to, such as policy-makers. They note the very important role of actors who 'span the boundaries' to connect these groups. Furthermore, they emphasize that building connections is important, but that sometimes certain actors in the environment need to be 'bypassed' in order to create a protected space. http://www.cid.harvard.edu/cidwp/pdf/173.pdf

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Chapter 7

Learning to innovate: strengthening capacity for multi-stakeholder processes

Richard Hawkins[1]

Key Message: Innovation often comes from the confrontation of different perspectives from different stakeholders. The challenge is to facilitate this confrontation in a constructive, learning-oriented way. Innovation is essentially a process of stakeholder learning and for that learning to be facilitated and managed, a set of critical capacities are required at both individual and organizational levels.

The Minister has a problem – and he is keen to make it your problem. Parliament is questioning if research and extension are worth the money: "all those guys ever produce is more reports!" International donors also agree that research and advisory services are not having enough impact on rural livelihoods and economic development. They say that unless government organizations adopt an 'innovation systems approach', funding will be cut. The Minister has no idea what they are talking about, so he has created a new 'Unit for Strengthening Agricultural Innovation Systems'. He puts you in charge and wants your ideas in one week. You cannot refuse, so where do you start?

Let's assume that you agree with the approach adopted in this book; that "innovation results from the interaction between stakeholders". That sounds good, but we know that it takes a bit more than just bringing people together. Imagine that you call a meeting of all the individuals and organizations – stakeholders – interested in dairy production in a particular region of the country. Each stakeholder sees a different problem: pasture quality needs to improve, animal health needs to improve, the quality of milk needs to go up, getting produce to the processors, turning milk into products such as yoghurt or cheese that have a higher value, marketing these products in national supermarkets, etc. Farmers want a higher price for the milk that they sell; the processors want to buy at a lower price. The local Member of Parliament wants to make sure that the poorer farmers (his main source of support) don't miss out on this opportunity. The environmental NGO wants to make sure that pasture improvement does not lead to a loss in biodiversity. And so on. All stakeholders agree that increasing dairy production is a good idea, but each one has particular objectives they want to achieve and interests that they want to protect.

If you are not careful, calling a meeting might result in a lot of talk, pocketing of per diems, and nothing more. Worse, the different participants might end up arguing and then going home more determined than ever to avoid such meetings in the future. Recognizing this, you see the problem in a different light. The different actors involved in the 'dairy innovation system' need to understand each other's point of view, agree on common objectives, divide tasks, and learn to trust each other. This may require changing ways of working to accommodate working with the other stakeholders. They may need to examine their own attitudes and beliefs about what is 'good' or 'bad'. They will need energy and motivation to change

1 This chapter is based on the experience of staff and partners from the International Centre for Development Oriented Research in Agriculture (ICRA); comments on an earlier draft by Toon Defoer, Juan Ceballos and Nour Sellamna are gratefully acknowledged.

the things they can, and inventiveness to adapt to the things they cannot. In other words, these stakeholders need to learn how to collaborate and how to adapt. Innovation is all about learning, you now see. But how will you organize, plan and implement such learning? You conclude that this is the focus of your new Unit. You turn to the experience of the International Centre for Development Oriented Research in Agriculture (ICRA) and its partners in Africa and elsewhere for inspiration.

Facilitating learning for innovation

ICRA defines its mandate as stimulating innovation by strengthening the abilities of individuals and organizations in the rural sector to collaborate and learn from each other. To achieve this goal, ICRA focuses their efforts in a limited number of partner countries in Africa and Latin America. There, the national coordination mechanisms necessary to bring key organizations together and encourage rural innovation processes are supported. ICRA also helps form and support core teams of facilitators who can design and implement learning programmes in rural innovation processes. The experience of some of these learning programmes in Kenya, South Africa and Uganda has been described elsewhere (Hawkins *et al*., 2009a).

Recently, in sub-regional needs analysis workshops in three regions (Anglophone and Francophone Africa, and Hispanophone Latin America), these national core teams exchanged experiences, and reviewed the competencies that they themselves need in order to plan, design and implement effective learning programmes in innovation processes. It became clear that an understanding of rural innovation processes by itself is not sufficient to actually promote or implement such approaches. The ability to facilitate the learning of others to achieve these outcomes is essential. Based on the identified competencies, ICRA offered a

three-week refresher course to further improve the skills of national core teams of learning facilitators from partner countries.

From this accumulated experience, analysis of case studies, and review of the growing literature on innovation systems, ICRA:

- improved their understanding of the *competencies and capacities* required for multi-stakeholder innovation processes (Hawkins *et al*., 2009b);
- identified *key features* of a learning programme for promoting interaction and innovation (Hawkins *et al*., 2009a); and
- clarified the main *stages in the process* of designing and managing collaborative learning in rural innovation.

The conclusions from ICRA's experience in these three areas are discussed below.

Capacities and competencies required for innovation. Analysts of capacity development often distinguish different levels at which change occurs (Bolger, 2000; Potter & Brough, 2004), namely: in terms of personal development, organizational development and institutional development. At the individual and organizational level, capacities are needed to promote concerted action by multiple stakeholders in order to support rural innovation. In addition to individual and organizational capacities, an enabling institutional environment is also required for innovation. Institutions are 'the rules of the game'; the structures, policies, funding and accountability mechanisms, etc. that encourage private and public stakeholders to innovate, including coming together in platforms to increase interaction and thus the likelihood for innovation.

Individual capacities include skills in the 'meta-disciplines' that provide a common framework for interaction with others. Such meta-disciplines include systems thinking (e.g. recognizing patterns, making inter-connections), knowledge management, strategic and participatory planning, knowing how to learn, etc. Social skills, including the ability to listen, communicate, work in teams, network and facilitate group interaction are important for interacting with others. Appropriate mind-sets or personal attitudes, including empathy, self-awareness, self-regulation, self-motivation, and social awareness, determine if you are the sort of person that others want to work with.

Organizational capacities are those factors that encourage or discourage interaction between organizations. Most obvious is an operational strategy that dedicates time and resources to joint activities with other stakeholders. Also important is an effective communications strategy which promotes dissemination of information in a format useful to a diverse array of stakeholders, not just peers. Crucial are performance and incentive systems that encourage inter-disciplinary teamwork and partnerships with other stakeholders, going beyond individual effort. Related to this are monitoring and evaluation systems that focus on innovation as a joint outcome, and not just on information products and accountability. Perhaps less easy to define, but also critical, is creating a learning culture within an organization that encourages staff to try out new things, reflect on experience (both positive and negative), document lessons from that experience, and incorporate the lessons into organizational practice.

Key features of an effective learning programme. Change begins with individuals. Nevertheless, achieving changes in capacity at individual and organizational level requires more than just a training programme where outcomes are evaluated in terms of individual knowledge, skills or attitudes. It requires embedding such training in practical learning programmes where organizational practice, stakeholder interaction and the overall performance of the innovation system can also be evaluated. Creating an adequate learning environment and using appropriate methods to achieve these improvements in capacity is critical. ICRA experience confirms that learning about rural innovation processes is best achieved under certain conditions (Hawkins *et al*., 2009).

Perhaps the most important of these conditions is that the learning is embedded in real world development challenges, where results matter, and where stakeholders apply new knowledge and skills to change their ongoing practice (projects and programmes). Without change, there is no learning. Experiential learning is best structured through action-research learning cycles, with successive and iterative stages of planning, doing (experimentation), reflection (formulation of lessons learned) and, re-planning.

A second requirement is the confrontation of different perspectives, resulting from the interaction between people from different disciplines, professions and organizations. This interaction needs to be carefully managed and structured (facilitated), otherwise it may lead to conflict and frustration. Such interaction also best takes place in small teams (i.e. six to eight persons), where individual contributions are visible, and where feedback from other team members is maximized.

Designing and managing learning in innovation systems

You now have an idea of what you want your new 'Unit for Strengthening Agricultural Innovation Systems' to achieve, but how do you go about this? Let's look at ICRA's approach to draw out four main stages: context analysis, design, implementation and follow-up.

Stage 1 – Context analysis

Change in private farms and firms is usually motivated by opportunities for profit – appropriating part of the value added within a particular value chain or specific innovation system. Public organizations, such as research and advisory services (extension) in Africa and elsewhere, often require some sort of crisis, external threat or new policy before the need for a more broadly based organizational change is recognized or accepted. Recently, many such organizations have come to realize that they need to operate more effectively within broader national or sectoral innovation systems.

The dilemma for those trying to build capacity and promote change, in particular organizations involved in rural innovation, is that it cannot be done by focusing on those organizations alone. It has to involve others with whom these organizations interact to promote innovation. A training course for the staff from one organization only will not be sufficient to improve innovation, or even improve performance of that organization within the innovation system. ICRA has found that inter-organizational capacity development is required for sustained change within innovation systems.

The first part of the process for generating change is therefore to identify those key organizations within the national innovation system, and see if their senior managers recognize a need for change. If they do, then your job is to convince them to participate in a learning programme, alongside other organizational representatives. If they do not, or if they do not understand innovation systems concepts, you will need good negotiating skills to get their buy-in. By the end of your negotiation with these managers, you should have agreed on overall objectives for a capacity strengthening programme – and how to fund it.

Then, programmes (projects, value chains or development challenges) where innovation systems approaches are most needed or can be best demonstrated must be identified. These programmes will provide the context in which learning activities can be embedded. To do this, you probably need to form an inter-organizational steering group or task force to choose programmes or projects that are important for all the organizations involved. This steering committee will also help oversee the whole process, make strategic decisions, and smooth the way with mid-level managers and operational staff.

Stage 2 – Design

Once the programmes have been identified, you will then need to negotiate with project managers and key stakeholders at a more local level. What specific innovation system (or systems) do they want to improve, and which can provide the context for learning about rural innovation processes? What are the critical steps leading to innovation? Which actors are involved? How do these actors relate to each other? What are the weak links? What are the main policies, external factors, and 'rules of the game' (institutions) determining stakeholder actions? How can the innovation system(s) be improved?

This analysis with local stakeholders should lead to the development of objectives for the learning programme. In the longer-term, what would a more successful system achieve, and what would it look like? In the medium-term, which key stakeholders need to change their behaviour to achieve this improved innovation system, and how? In the short-term, who are the key managerial and operational staff representing those stakeholders, and what knowledge, skills and attitudes do they require if they are to change their organizations? Potential participants in your programme will have ideas about what they want to learn, but they may not yet realize what they need in order to be effective managers and practitioners of innovation systems. So you will need your negotiating skills again.

Next, you need to figure out what type of activity can best achieve the agreed learning objectives. Innovation systems require coordinated activities by individual stakeholders, although this does not necessarily mean that the activities have to be jointly implemented. But it does mean that planning these activities, and reflecting on the outcomes, is best done together in a workshop setting. Workshops are also useful for introducing new theory to stimulate ideas and activities, as well as practicing teamwork skills in a non-work related setting.

A typical learning cycle will therefore consist of a number of workshops over a period of time. New ideas and plans developed in one workshop, are applied in the succeeding period of ongoing practice by the different stakeholders, and then jointly reviewed in the following

workshop, where (re)planning of the next period of practice also takes place, and so on. Depending on the context and programmes, it might be possible to include several innovation teams in these workshops, each comprising representatives of several stakeholders in that innovation system. Different teams can learn from the experience of each other, but workshops with more than about 25 people (or three to four teams of six to eight people) become difficult to manage.

Stage 3 – Implementation
Having planned the sequence of workshops and perhaps identified a priority theme for each, the next step is detailed planning for each workshop. How can the learning objectives be distributed into discrete learning 'modules'? What combination and sequence of learning activities (presentations, case studies, role plays, group exercises, etc.) will be most effective in achieving the specific learning objectives? How will reflection on experience be encouraged and documented? How will feedback on behaviour/attitudes be encouraged and documented?

To help develop and execute these lesson plans, you will no doubt need the help of some experienced trainers. These trainers will need to be good at facilitating group processes, and not be just lecturers. Their role, as well as yours, needs to be clear with the main actors of the innovation system and workshop participants. You will also need someone to take care of all the administration and logistics: managing the budget, arranging plenary and break-out rooms, accommodation, equipment (projectors, pin boards), reference material, etc.

Stage 4 – Follow-up
After the cycle of workshops is over, your job is not finished. You need to develop a strategy to encourage continued learning by participants and their organizations. This could mean ensuring that stakeholders include in their workplans activities to reflect on their performance as components of an innovation system, and adjust their plans and procedures accordingly. These activities require time and budget. It might mean reviewing progress and constraints with senior managers to have more power to change the organization. You also need to review what went well with your learning programme, and what problems you faced, so that you can improve next time. Documentation of the outcomes of the learning cycle will also help you convince other managers of the benefits of such a learning programme the next time you have to start the process all over again.

Stages 1 and 2 above are all about planning a programme of learning to support innovation systems. The time and effort needed for this should not be underestimated. But usually, it is. The focus is often on the training workshops themselves but, by the time they start, the hard work should have been done.

Summing up

The processes of agricultural innovation and learning are inextricably linked. To facilitate rural innovation, you also need to facilitate learning. Promoting rural innovation demands a good negotiator, a good trainer, a good facilitator of group processes, and a good manager, as well as good knowledge of innovation concepts. Perhaps you do not have all these

competencies, but you should try to ensure that your team does. This process of facilitating multi-actor engagement is further discussed in Part 2.

Without recognition of this central process of learning in rural innovation systems, agricultural support services in Africa and elsewhere are likely to remain disconnected from innovation and development. Reflecting on this conclusion, you now have a clearer idea of the strategy for your new unit. You can face the Minister with confidence.

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Chapter 8

Gender dimensions of agricultural innovation

Rhiannon Pyburn

Key Message: Gender dynamics and inclusion fit snugly within the principles of multi-stakeholder approaches and the concept of complex systems: central tenants to current thinking on agricultural innovation systems. However, working to improve inclusion and support gender equity requires a re-thinking of current practices and reconstructing institutions so that the contributions, concerns and needs of more vulnerable or 'less heard' categories of male and female actors are brought to the surface and valued. Some issues can be dealt with immediately (e.g. ensuring representation in meetings, capacity building, seeking out more vulnerable actors for participation), whilst others are more structural and will take time to bear fruit (e.g. investment in girls' education, changing policy and constrictive legal regulations on land ownership, transforming attitudes towards women doing non-traditional work). Addressing gender equity and inclusion has implications throughout the entire agricultural innovation system but can lead to more resilient and meaningful impact.

We've all been there. Those meetings, workshops or trainings, whether in a village or at a more policy level session in the capital, where agricultural development is discussed amongst 'key actors'– all men, except perhaps a couple of women sitting at the back of the group minding their children or sitting apart from the main table in the room. Under-recognized in production and processing – let alone further up the value chain – women's contributions in agricultural value chains are huge, but far less documented. And their opinions and perspectives are far less sought out than their male counterparts. But gender is back on the development agenda (World Bank, 2012)*! And embracing a gender perspective within the thinking and practice of agricultural innovation systems is long overdue.*

Over the last couple of years, the agricultural innovation systems thinking lens slowly, but steadily, has been bringing gender issues into sharper focus. Unfortunately, there are not yet many successful examples to offer from past practice. This leaves the young professional with an exciting challenge: to do things differently when it comes to gender and the inclusion of vulnerable groups. This chapter begins by arguing for addressing gender equity and inclusion in rural innovation. It looks to recent literature on gender equity and agricultural innovation systems and offers some conceptual common ground to bridge these fields. It then turns to support services (research and extension) and the farmers that use them to identify entry points as to how and where a gender perspective can be integrated into innovation systems discourse, policy and practice. And finally the chapter ends with tips for emerging professionals to help integrate a gender perspective into agricultural innovation initiatives, right from the start.

Agricultural research has lagged far behind health, nutrition and education in terms of acknowledging that explicitly addressing gender is "one of the most effective, efficient and empowering ways to boost development and address poverty" (Meinzen-Dick *et al*., 2011:2). As

the World Bank and IFPRI report on *Gender and Governance in Rural Services* (2010) found, there is a pervasive bias against women in agriculture: the 'women don't farm' perception persists despite women's engagement in many agricultural activities (ibid.:xxxi). We know that women do farm. Recent FAO statistics (2011) estimate that women comprise 43% of the agricultural labour force in developing countries, varying from 20% in Latin America to almost 50% in Africa and southeastern Asia (Meinzen-Dick *et al*., 2011:5). Beyond the farm-level, women also play critical roles in marketing and trading agricultural products (UNCTAD, 2011:1) as well as in food processing (Uhder *et al*., 2013:10).

The World Bank agricultural innovation systems framework argues that: "diversity, inclusion and participatory approaches are critical to building the quality of social capital needed for resilient and sustainable innovation systems" (World Bank *et al*., 2009:258). But, while the framework focuses on equality in access and opportunities for participation, it does not differentiate between farmer types (based on education, asset portfolios, networks, etc.). This means that an agricultural innovation systems framework, like that of the World Bank, may leave disadvantaged farmers (including women, youth and indigenous farmers) behind unless they receive the support – organizational, technological, management and investment capacity – needed to engage (World Bank *et al*., 2009:260)..

That said, international agricultural research and development organizations that embrace agricultural innovation systems thinking in their approach are beginning to recognize that gender and inclusion of marginalized groups have been largely overlooked. For example, a recent paper by Beuchelt and Badshue (2013), based at the International Maize and Wheat Improvement Center (CIMMYT), takes as a starting point that the promising solutions for addressing climate change, food insecurity and natural resource scarcity are heavily technologically -biased, without sufficient attention given to gender and social disparities (Beuchelt & Badshue, 2013:709). So gender is making it onto the radar of some international agricultural development organizations, but a solid conceptual foundation is required to make more significant and comprehensive strides towards more inclusive and gender equitable agricultural innovation systems.

Why bring a gender lens to agricultural innovation systems?

Before coming to the arguments for drawing on a gender perspective in agricultural innovation systems, let's clarify some terms. When we talk about gender, the conversation frequently quickly focuses on, and becomes limited to, a discussion about women. But addressing gender means much more than ensuring that some women are 'targeted' or attending meetings: it means distinguishing different categories of men, women and children and exploring and making transparent the relations between them. It requires looking at power dynamics based on socially constructed gender roles: that is to say the expectations, limitations and possibilities that people place on other people based on their sex. These will vary from one cultural context to another, but gender is a determining factor in "who does what, who has what, who decides and who has power" (UNICEF, 2011). Box 8.1 clarifies key terms.

Box 8.1. Definitions: gender and gender analysis

Gender is a universal social construct defined by the social fabric of the group or population (Meinzen-Dick*et al.*, 2011:12).

Gender analysis looks at the totality of a society to ensure that the interests of all members – regardless of sex or age – are addressed (Meinzen-Dick *et al.*, 2011:12).

With these terms in mind, we turn to the question of why? Why is it valuable to bring the fields of gender and agricultural innovation systems together? Apotheker *et al*. (2012) distinguish three kinds of arguments for addressing gender in value chain development, which also ring true for gender and agricultural innovation systems, namely: social justice, poverty reduction and good business. Meinzen-Dick *et al*. (2011:4) in summing up the rationale for gender equity in agricultural innovation systems, echo these arguments and add improving food and nutrition security. UNCTAD (2011:17) adds a fifth argument: women-led innovations are different to men and tend to be more institutional in nature. These five arguments are summarized below.

1. Social justice – *"it's about rights as well as the 'right thing' to do"*
Human rights are embodied in national legislation and in international treaties such as the Universal Declaration for Human Rights and are the responsibility of governments and organizations/corporations to uphold. They are tools that people can use to leverage improved social justice (Apotheker *et al.*, 2012:15). The 1995 United Nations Development Report recognized that, due to their sex, women face obstacles influencing their human rights. In agricultural innovation systems, one example of this is in relation to access to information. Women farmers have as much right to agricultural information as their male counterparts, however, they do not necessarily get that information (Carter & Wiegel 2011:2). Some argue that once gender equality is acknowledged as a human right then no further justifications for addressing it are required, for example: "gender equality is a critical component of social progress. It is a basic right that does not need economic justification" (Ward *et al*., 2010:vii). That said, poverty alleviation, economic growth, food security, better innovation arguments (see points 2-5 below) are also compelling reasons for addressing gender for some audiences, and are thus important to articulate and bear in mind.

2. Poverty reduction – "it's more efficient and effective for development"
In a recent International Food Policy Research Institute (IFPRI) publication, Meinzen-Dick *et al*. (2011:1) are explicit as to the instrumental, impact-related argument for addressing gender in research, development and extension: "paying attention to gender is not a matter of ideology but rather a matter of development effectiveness*:* incorporating gender issues more widely and systematically in agricultural research, development and extension systems will contribute significantly to meeting the food needs of the future population or ensuring that productivity translates into the improved welfare for the poor". FAO estimates that reducing gender inequalities in access to productive resources and services could increase yields on women's farms by 20-30%, raising agricultural output in developing countries by 2.5-4% (FAO, 2011). Others cite that reducing inequalities between male and female farmers in sub-Saharan Africa could increase agricultural productivity 10-20% (Udry *et al*., 1995, cited in Meinzen-Dick *et al*., 2011:32). For the World Bank *et al.* (2009) summary of the effectiveness argument, see Box 8.2.

Box 8.2. The effectiveness argument

Both women and men manage sectors of complex smallholder production systems.

When gender is ignored, there is a cost to people's well-being and sustainable growth.

Knowledge is not transferred; it is generated and exchanged in a continuous learning process.

Farmers, agricultural educators, researchers, extension workers and traders form parts of multi-actor knowledge and information networks.

Rules and mechanisms governing the way different actors, organizations and enterprises and groups interact to supply and demand knowledge and technology are critical for equitable development.

Source: World Bank et al., 2009. Box 7.1 Gender and Knowledge Systems (my emphasis)

3. Food security – *"women are the guardians of household food security"*[1]

Current approaches for addressing food security tend to be heavily technologically biased without enough attention to gender and social disparity (Beuchelt & Badshue, 2013:709). Yet, when it comes to food crops and food security women are at the frontlines. Typically it is women who have the responsibility of feeding families and growing food crops for home consumption. Their roles in household food security are paramount (Meinzen-Dick *et al*., 2011) as women play key roles in household food production and ensuring essential micronutrient intake, especially for children (Manfre *et al*., 2013). Despite this, women tend to have limited access to resources that could improve the quality and quantity of the food they produce (UNCTAD, 2011:ix). A 2011 publication the Food and Agriculture Organisation of the United Nations stated: "if women in rural areas had the same access to land, technology, financial services, education and markets as men, agricultural production could be increased and the number of hungry people reduced by 100-150 million" (FAO 2011). Overlooking women and other relevant categories of actors is ineffective as it means that the 'right' people are not necessarily being involved in food security efforts.

4. Good business – *"it pays to be inclusive"*

From an agricultural innovation systems perspective, the active engagement of women is not only a right, but an imperative to future farming, processing and marketing to improve both livelihoods and agribusiness development (World Bank *et al*., 2009:260). Women are needed if more intensified, competitive smallholder agriculture is to survive (ibid.:265). We see above that increases in agricultural productivity are possible if inequalities between men and women are addressed. Better services for women would very likely result in better production and better productivity (Carter & Wiegel, 2011:2). But it is not only at the farmer level where inclusion makes good business sense. Gender diversity in management has documented results, including better decision-making in companies and higher profits (Catalyst 2004).

5. New, better innovations – *"more diverse perspectives means different outcomes"*

The idea that better innovation results from having more diverse perspectives on solving a given problem (World Bank *et al*., 2009:262) is at the heart of multi-stakeholder approaches to innovation. Different people shed different light on a problem and generate different kinds of solutions. The result of drawing on a diversity of perspectives leads to more robust and ul-

1 Meinzen-Dick *et al.*, 2011.

timately more sustainable solutions as well as buy-in from the various actors who participate in the process. Thus paying insufficient attention to women's needs, preferences and contributions means missing out on the potential insights and perspectives of significant portions of users of the new technology and community members. The participation of women and marginalised or more vulnerable categories of people in innovation processes can only broaden and enrich the array of potential options explored and render more sustainable the actions undertaken.

A second piece of this argument is embedded in the fact that women's roles as innovators – their capacity to find new ways of doing things or to develop, adapt and put technologies into use - are less recognized than men's. Interestingly, despite this, (or perhaps because of it) a recent UNCTAD report observed that women-led innovations tend to be more institutional in nature (e.g. new way of organizing) (2011:17). This suggests that inclusion of women may support making the leap from purely technological to more institutional innovations (Pyburn, 2014), which is a newer frontier in this field. Likewise, exclusion harms not only women, but also the system as a whole (Pyburn, 2014). Inclusion – first of all of women, but also of youth and other marginalized or vulnerable groups – is imperative for facing the current challenges and complexities of innovation systems thinking.

Bridging the disciplinary gap

So with these justifications for addressing gender equity and inclusion in agricultural innovation systems in mind, we can begin to think about how to bridge the two fields. Gender experts, and those who use the concepts involved in agricultural innovation systems thinking, often speak a different language, which can make it hard for them to understand one another (Kingiri, 2010:33). In addition, entry points often vary considerably. Gender and rights analysis and interventions are often strategic and start with higher level issues related to policies. Likewise analysis of innovation systems is often at the system level, however, the entry points for agricultural innovation initiatives tend to be quite pragmatic, concrete and problem-based (e.g. innovation platforms to improve the functioning of the sesame sector in Burkina Faso). That is to say, an opportunity or constraint is identified within a sector and then actors mobilize around that. While the two fields have their own histories and development, there is, nonetheless, significant conceptual common ground between them. A few key synergies are articulated below to help the new professional bridge the disciplinary gap.

Context matters. In Part Three, we look at context in relation to rural innovation – the enabling (or disabling) environment within which innovation happens. A clear insight is that context matters: the policies and regulations in place, culture, infrastructure and other contextual factors influence and shape potential innovation in a given domain. Context is also key when it comes to gender relations – how men and women relate to one another. Behaviour is highly culture and context specific and opportunities for, and constraints to, change depend largely on the environment in which the person is situated (Meinzen-Dick *et al.*, 2011:2; Meridian Institute, 2013). Whether social, biological, economic or otherwise, what is possible within a given domain and the starting points and process are defined by the context.

Systems thinking. A shortcoming of agricultural research, development and extension has been linear (or 'pipeline') thinking. As we read in Chapter 2, approaches to rural innovation have developed over time from a 'transfer of technology' or technology adoption/dissemination mindset, to a more systemic multi-stakeholder approach. Becoming gender responsive also involves a focus on the system as a whole and ensuring feedback loops are in place (Meinzen-Dick *et al*., 2011:22). This dovetails with current thinking in rural innovation. A gender approach is also about more than empowering individual women, but also the system itself (Jafry & Sulaiman, 2013:435). All actors in the system may become empowered in the process of engaging with gender issues (Pyburn, 2014).

Institutions and institutional change. Innovation systems thinking is focusing more and more on institutions, as defined by Douglas North, and institutional economics – the so-called 'rules of the game' (North, 1990). Institutions can be formal like laws, regulations and policies; or informal – customs, ways of doing things, cultural norms, and so on. This book talks a lot about institutions and institutional change because it is a critical component of innovation, which cannot be limited to technologies alone. A gender perspective is also embedded in institutions and how they are created, reinforced and redefined in and through human interaction. Engendering innovation systems means emphasizing and exploring the institutions and actors that create 'gendered' patterns of interaction (Kingiri, 2010:29): that is to say the socially defined behaviours and norms that allow different categories of men and women to do different tasks within the household, community and the value chain. An emphasis on the human behavioural, social organization and political aspects of change – 'structure' in sociological language (Giddens, 1984) – are common ground between the two fields.

Complexity. Agricultural innovation systems are complex with many actors and interests at stake. Innovation often happens through multi-actor processes, where the many stakeholders involved in an agricultural innovation system are brought together to learn and grapple with the challenges of a sector. Multi-stakeholder processes become more complex as the actors invited to the table become more diverse. A gender lens renders multi-stakeholder processes even more complex as another category of actors and the related standpoints come into play (Kingiri, 2010:34). But recognition and acceptance of this complexity brings resilience (Pyburn & Mur, 2014).

Valuing diversity. As the chapters in this book demonstrate, innovation systems discourse and practice is now very much about involving a diverse set of stakeholders in learning together in what we call a multi-stakeholder process. From a gender perspective, inclusion and the power dynamics between different actors is central, including between male and female actors. Both innovation systems thinking and a gender perspective see the value and importance of engaging a broad range of actors. Gender experts focus on marginalized or more vulnerable actors that may be overlooked if not specifically included. Innovation systems thinking and a gender perspective see the value and importance of engaging a broad range of actors, although gender analysis has a better grasp of power dynamics and that is something that can be learned from the discipline to create better understanding.

Ongoing learning. Learning is built in, and is ongoing within, robust innovation platforms (Pyburn & Mur, 2014). Learning and understanding are key and go beyond just analysis. In recent years, there has been a decisive shift in agricultural innovation systems thinking and practice from analysis towards learning. The limits of analysis have become very apparent in terms of stimulating and creating space for change and innovation. Coming from a gender perspective, Kingiri (2010) brings this same insight to gender analysis. She refers to 'gender learning' and offers an interesting perspective on gender and agricultural innovation systems in her call for a shift from gender analysis to gender learning. Analysis is limited – what to do with the insights gained from analysis? How to put them into practice? Kingiri also underlines how important it is to understand the institutional environment, and links this to strengthening innovation capacity (Kingiri, 2010; Kingiri, 2013). Much of gender and development work is about transformative change. For transformation to happen, the men and women involved must learn together and reflect together on how they relate, engage, etc. Integrating gender analysis into an innovation systems framework means making explicit what is implicit: a transparency that gives space to dialogue and learning (Pyburn 2014).

Gender dimensions of farmer-extension-research relations

Hopefully, by now you are convinced that is both necessary and important to bring a gender lens to agricultural innovation systems thinking, but also that it is conceptually possible. The next question is: where and how to do that, in practice? Gender analysis asks the question: where are the women/men/youth in the value chain from farmer to consumer, and who does what along the chain? This is a first step in understanding the status quo. Where are women in the chain and what allows or constrains them from upgrading in the chain or increasing their say in value chain governance? (Pyburn & Laven, 2012). Looking at structural factors, as well as the agency possessed by the different actors involved, offers insights here (KIT *et al*., 2012) – (see Box 8.3 for definitions of **structure** and **agency**).

Box 8.3. Definitions: structure and agency

Structure refers to the rules, customs, habits and traditions (the institutions) that can either constrain or enable actors in realising their ambitions.

Agency refers to the capacity of an agent (e.g. an individual or an organisation) to act independently and to make their own free choices.

Structure and agency have **'catalytic potential'**: they affect one another and changes in both have a greater impact than changes in one alone (Kabeer, 1999)

For more on structure and agency see Kabeer (1999) and Giddens (1984).

This section of the chapter looks to agricultural support services: the farmers, extension workers and researchers involved in agricultural innovation and some of the gaps that need filling.

Engendering extension and advisory services

Several layers of issues can be teased out in relation to gender equity, inclusion and extension services: *Who needs to receive the message? What message and why? Where is the message given? When is the message given? How is the message communicated? Who is the messenger?* (Carter & Weigel, 2011:1; Meinzen-Dick et al., 2011:62). These questions engender the traditional transfer-of-technology model – with knowledge flowing from researcher to the extension worker

to the farmer. However, they do little to challenge that model, which this book is doing with its focus on complexity and multi-stakeholder processes. That said, it is valuable to look at the traditional trio and work out from there. In this section, we start by looking at the 'client' – ***who is the farmer*** that extension services are provided to? We then turn to the kinds of information that women need from the extension workers – ***what women want to know***. Next, we turn to the extension services themselves – ***who*** is providing the information and ***how*** the message is conveyed – thus ***engendering the approach to extension***. Box 8.4 outlines some key principles for gender equitable extension and advisory services.

Box 8.4. Principles for gender-equitable extension and advisory services

These principles are guidelines for designing demand-driven and gender-equitable extension and advisory services (EAS) services. This list offers potential entry points for collaboration among farmers, service providers, donors, and policy-makers in building a more equitable EAS system. Beyond this, specific actions will need to be designed based on assessment of the local sociocultural context, and in consultation with farmers.

Increase the proportion of women extension officers. No single strategy is likely to produce the desired results; a combination may be needed. The use of information and communication technologies in extension services may offer new opportunities.

Equip all extension officers with the knowledge and skills to address men and women farmers equitably. To reach more women producers and entrepreneurs, male and female extension agents should be equally responsible for and capable of reaching both men and women farmers (although in some places local cultural norms permit only same-sex contacts).

Adapt gender-responsive techniques and methods to the local context. Appropriate methods for reaching men and women farmers equitably will dif fer between and within countries. EAS providers need to be prepared to choose methods based on local gender and social norms that influence women's time, mobility, and education.

Deliver cross-sectoral programming. It is equally important to support collaborative household strategies between men and women. Programmes that link agricultural extension with nutrition and health education or microcredit opportunities, for example, can be very effective.

Collect sex-disaggregated data. The lack of sex-disaggregated data collected by national statistical units, ministries, and donor-funded projects severely limits the ability to assess the effectiveness of EAS programmes.

Evaluate the impact of extension services on reducing gender disparities in agricultural productivity. The shift from top-down and technology-driven approaches to demand- and market-driven approaches is meant to create more responsive service delivery. This should translate into women farmers being able to shape service delivery to meet their needs. Greater investments need to be made to systematically evaluate the results and to identify the strategies that work.

Source: Manfre *et al.*, 2013 (adapted)

Who is the farmer? Let's begin with the bias in common definitions as to who a farmer is and the implications for agricultural extension. Doss (2002) considers three aspects to the definition of a farmer, from the perspective of agricultural service provision: 1) head of household; 2) land owner; and 3) farm income earner. However, Manfre *et al*. (2013) in a recent paper for the US Agency for International Development's (USAID) *Modernizing Extension and Advisory Services* (MEAS) programme, systematically argue why these three definitions are flawed and gender biased. Why does this matter? The assumption that men are the farmers and heads of households making most production-related decisions impedes the progress in taking women farmers into account (World Bank *et al*., 2009:258). Not only do female farmers face the 'women don't farm' bias, but they also face persistent discrimination in terms of access to productive resources and inputs (Ragasa *et al*., 2013:466). Despite being significant players in the agricultural sector, and in food provision, this bias against women in agriculture, coupled with the 'triple challenge' of market, state and community failure (World Bank & IFPRI, 2010:xxv) can make reaching them via service provision, including agricultural extension, quite a challenge. To ad-

dress this, Manfre *et al*. (2013) use an approach that accepts any individual who calls him/herself a 'farmer' to be considered a farmer by extension and advisory service providers; a simple yet compelling change. This requires service providers to meet farmers' needs on the basis of their ever-evolving activities and preferences rather than their gender, ability to own land, ability to earn income, or recognition as the head of a household (Manfre *et al*., 2013:4). The message is clear: women farmers need to be recognized as farmers (Meinzen-Dick *et al*., 2011:11-12).

What women farmers want to know. What extension workers offer to farmer in terms of information and knowledge services does not necessarily fit the needs of rural women and the kinds of information they are after (Jafry & Sulaiman, 2013:434). When the needs and preferences of women are not taken into account then it is unlikely that new technologies being communicated by extension workers will be taken up by women (Meinzen-Dick *et al*., 2011). Women and men often have different roles in agriculture so, unsurprisingly, there are gender dimensions to preferences for different techniques (Carter & Weigel, 2011:4). For example, women may be more interested in new processing techniques that lessen workload if they are responsible for processing activities. Men might be more interested in higher yields for high value crops. Extension services need to be tailored to the needs and preferences of both female and male farmers.

Engendering the approach to extension. First of all, the **'who'** of extension workers: very few are female – less than 15% worldwide, 7% in west Africa (Carter & Weigel 2011:6). Carter and Weigel outline four main reasons for this: *recruitment criteria* based on formal qualifications rather than practical experience; *mobility* – the form of transportation (motorcycle or bicycle) and the need to travel alone and often late at night; *reliability* where women defer to their husband's career path so may not remain long in the position; and, *acceptance* by male farmers (*ibid*). Perception biases against women extension workers are a key challenge (Meinzen-Dick *et al*., *2011:72;* Akerdolou, 2009*).* Efforts to engage more women as extension workers would provide female role models and possibly more accessible support services for women farmers in the field. Whether male or female, extension workers need to be trained to understand gender dynamics and the importance of reaching women as well as men.

And then the '**how'** of extension: how can women farmers be reached in extension efforts? When it comes to technology adoption – putting technologies into use – women are often constrained by limited finances, but also by time, information and/or physical access to agricultural services to learn about new technologies. Women's needs in terms of scheduling meetings (time of day), access to finance, etc., need to be taken into account alongside those of their male counterparts (Meinzen-Dick *et al*., 2011:11-12; Carter & Weigel 2011:6). Concrete ways of ensuring female farmer participation in extension activities include: setting quotas as to the number of women farmers that need to be reached, specific training for female farmers on technical issues as well as on leadership and less conventional approaches to farmer knowledge building, for example, Farmer Field Schools (Meinzen-Dick *et al*., 2011:20; Carter & Weigel 2011:3-4).

Engendering research

Research is another big service area in agricultural innovation systems. In the paragraphs below we look at three entwined levels: women in research, research for women, and gender-aware research.

Women in research. A gender balance in researchers would help maintain gender equity goals in agriculture and spark insights from female farmers. But this requires institutional change to encourage and allow female scientists and farmers to contribute effectively (Meinzen-Dick *et al*., 2011:11-12). UNCTAD (2011:7) cites the proportion of women in agricultural research in West Africa as being 7-10%; 18% in sub-Saharan Africa. This is a real shame as women agricultural researchers bring new ideas to the table as well as providing role models for girls in their formative years (World Bank *et al*., 2009:262). Getting women into science requires addressing structural or contextual impediments that effect 'preconditions to participation' like access to education capital and markets (UNCTAD, 2011:16), as well as supportive policies and an enabling cultural context. Limited agricultural education and training restrict opportunities for women: to gain new technological knowledge; to hold positions as agricultural researchers and extension agents; and, to voice demands for research and training or other support (World Bank *et al*., 2009:262).

Research for women. Little research has been done on gender and innovation (Kingiri, 2010:34). Science for women, or research for women, means facilitating access to technological advances and developing technologies with women's needs in mind (UNCTAD, 2011). For example, the choice of varieties is often gendered: women may choose a variety based on taste and cooking time, whereas men may prefer a variety that can be harvested earlier. Technologies need to be designed for women, with women's priorities, and with the gender division of labour in mind.

Gender-aware research. Each phase in the research and development cycle requires a gender lens (Meinzen-Dick *et al*., 2011:11-12). The international body for agricultural research – CGIAR – is beginning to tackle the gender equity challenge. Box 8.5 outlines the CGIAR's six criteria for gender equity in research design, from priority setting to monitoring and evaluation, to hiring of female researchers and representation.

Box 8.5. CGIAR's six criteria for gender equity in research design

1. Priority setting based on identification of men's and women's needs, priorities and preferences. **Gender balance in the consultation process.**
2. **Representation of women beneficiaries** in proportion to women's roles in production and post-production.
3. **Identification of factors responsible for gender disparities** in adoption or impact of new technologies used in the design of the programme.
4. **Gender-responsive monitoring and evaluation** system in place.
5. **Involvement of men and women in the innovation process** (participation in identification and testing of promising varieties, use of indigenous knowledge, participation in and access to extension systems) through farmer's groups or partner organizations in proportion to men and women share in production and post-production.
6. **Representation of women professionals** at all levels of the programme and research teams.

Source: Meinzen-Dick *et al.*, 2011:13 (*my emphasis*)

That international research bodies, like the CGIAR and its partners, and agricultural development funders, like USAID and the World Bank, have gender equity and inclusion on their radar is encouraging. The challenge is to operationalize existing policies, criteria and principles and to build on those foundations in order to realize transformative change.

Conclusions

Gender is, at last, coming on to the agenda of international agricultural research and development organizations. The challenge is how to engender the agricultural innovation system from the chain actors (farmers, processors, retailers etc.) to the chain supporters (research, extension, as well as financial service providers), and the context to allow supportive policies and conditions that allow more equitable participation and reaping of the benefits. Engendering innovation systems may involve a shift from thinking about agriculture, to thinking more about food (processing, cooking, nutritional value) (Meinzen-Dick *et al*., 2011:32) as women have typically been leaders in these realms. Such a transition is timely as food and nutrition security move higher up the development agenda.

Understanding gender dynamics, and supporting the development of more equitable agricultural innovation systems, will be a task for the emerging professional. To support you in taking up that task, this chapter provided five compelling arguments for addressing gender in agricultural innovation systems, namely:

- social justice;
- poverty reduction;
- food security;
- good business; and
- new and better innovations.

Your task may include convincing others as to why it is important to address gender. Build on the foundations presented here to make your case.

Furthermore, the chapter has taken some initial steps in bridging a gender perspective with an agricultural innovation systems perspective, drawing on several key common or complementary elements, namely:

- context matters;
- systems thinking;
- institutions and institutional change;
- complexity;
- valuing diversity; and
- ongoing learning.

Keep exploring these two fields for synergies, and where ideas come together, or where gaps in one can be filled with the knowledge held in the other.

Finally, this chapter looked at some of the details of what is involved with engendering two important support services – research and extension. It exposed some of the extensive work that needs to be carried out with respect to relations between farmers, researchers and extension workers, and some of the gender challenges within each of these categories. It also presented two frameworks for addressing gender in agricultural innovation systems, drawing on the work of others: one for extension and advisory services, the second for research.

If you have the feeling that there is a lot of work ahead to engender agricultural innovation systems, then you have understood a key message of the chapter. The other key messages are that it is both worthwhile and possible to make that step and that it will take this next generation of agricultural professionals (that's you!) to do it.

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From Principles to Practice, in brief

Innovation requires both scientific knowledge and dynamic learning networks between knowledge users. Coalitions of stakeholders contribute in different ways to making an innovation successful. Tackling problems and responding to new opportunities requires an integration of technical solutions and institutional changes, such as mind-sets, policies and laws, organizational arrangements and flows of information.

Technological innovation must be embedded in human processes: understanding the different people involved in those human processes is key. Innovation is an evolutionary process. For technological innovation to be effective, it must be embedded in a wider process of stakeholder learning that creates an enabling environment of market, service, finance and policy conditions that enable the potential of the technology to be realized. In any innovation process there are a wide range of actors with different roles and interests – this must be understood in order to create an effective innovation process.

An enabling environment is more than just policies, institutional frameworks and research and development programmes – supporting interaction and learning amongst actors is also key. Improving agricultural performance requires an effective national system of agricultural science, technology and innovation, but these alone are not enough. An enabling environment must encourage and support collaboration and learning between all the different public and private sector players that make up the system, facilitating and fostering interactions among the actors. This element is critical for learning and innovation.

Innovation is not just about bright ideas, but getting them into use. Getting new ideas established is the fundamental challenge of an innovation system. A critical dynamic to understand is the relationship between small emerging innovations and larger-scale change in systems (niche-regime relationships). How small niche innovations influence larger-scale change is related to network dynamics. All of this can be creatively facilitated, but not controlled or managed.

Learning is key to innovation processes and conflict can play an important role. Innovation often comes from the confrontation of different perspectives from different stakeholders. The challenge is to facilitate this confrontation in a constructive, learning-oriented way. Innovation is essentially a process of stakeholder learning and for that learning to be facilitated and managed, a set of critical capacities are required at both individual and organizational levels.

The gender gap needs to be addressed in innovation systems thought and practice. It is time for an overhaul to examine and work for change on this front at multiple levels: participation and inclusion of different categories of male and female value chain actors; staffing of more women in research, extension and advisory services, including in management positions; sensitization of research, extension and advisory service professionals as to the importance of seeking out female and male farmer needs, preferences and participation, and so on.

Part Two

Getting the Process Right

Getting the Process Right

Suzanne Nederlof and Herman Brouwer

It is not easy to see how abstract theoretical discussions about innovation relate to the realities of rural dwellers. But innovation happens all the time, and is often championed by ordinary people. Furthermore, innovation is seldom the result of individual efforts – it is usually an outcome of synergy from the interactions between different people and organizations (Schumpeter, 1934; Nooteboom, 2009). As many of today's development challenges cannot be addressed by individuals or organizations, it is evident that innovation is increasingly an issue of collaboration and co-creation. Such collaborative action requires active and careful facilitation, without which the process could take a long time or lead to a dead-end.

This section of the book addresses the questions: 'how' can we accompany and enhance an innovation process; and 'who' plays and pays for this role. Five chapters focus on practical experiences working with multiple stakeholders to support innovation. They more specifically address the following questions: How can we facilitate stakeholder interaction? What role can a facilitator play in this process and who is this facilitator? What capacities are needed to effectively facilitate interaction that leads to innovation and contributes to sustainable development? And – a slightly different take on the topic – what role can monitoring and evaluation play in supporting the facilitation of innovation? This section of the book provides practical illustrations and lessons for getting the process right.

Innovation as a result of interaction

Complex problems require different stakeholders to collaborate within an environment of change and uncertainty. Innovation results from interaction amongst these stakeholders. As discussed in the introductory section, the much-used 'transfer of technology' approach was not successful in 'bringing innovation' to farmers. An alternative emerged in the 1990s (Röling & Wagemakers, 1998) that focuses on facilitation and participation rather than 'delivery'. This approach aims to create opportunities for innovation rather than scientists transferring innovations to passive farmer recipients. This shift entails an engaged and dynamic stakeholder-led approach, and requires a skilled facilitator.

The emphasis in this alternative approach is on managing interaction amongst multiple stakeholders each having their own perspectives. These stakeholders include producers and their organizations, researchers and their institutes, local government, advisory and business service providers, processors, traders and consumers. Stakeholder contributions are shaped through interaction with one another and this interaction is necessary for synergetic outcomes. Chapter 9, written by SadreGhazi, clearly demonstrates the need for interaction amongst stakeholders to actually achieve innovation. A private sector company developed a technology (he calls it an invention) but the interaction amongst stakeholders had to be facilitated in order for the invention to be used.

The process of interacting allows stakeholders to discover or create new value. It is essentially about learning. The major break from the past with this approach is the focus on joint learning rather than on the 'technology'.

Box 7. Single, double and triple loop learning

Argyris & Schön (1978) distinguish different levels of learning, namely they marked the difference between what they refer to as 'single-loop learning' from 'double-loop learning'. Single loop learning is instrumental and focuses on changes to strategies for action or assumptions underlying the strategies, but leaves the values of a theory of action unchanged (Argyris & Schön 1996). Double loop learning results in changes in the values of the theory in use as well as in the strategies and assumptions (ibid.). Making changes to improve immediate outcomes is single loop learning; making changes to the system to prevent the problem, or embed the solution in a changed system (Patton, 2011), involves double-loop learning. Triple-loop learning builds on this by reflecting on how we learn (Bateson, 1972; Argyris & Schön 1978; Senge 1990).

In **single-loop (incremental) learning**, people modify their actions as they evaluate the difference between desired and actual outcomes and make changes that allow them to attain their desired outcomes. In essence, single-loop learning is a problem detection and correction process. It is based on cause and effect relationships. People work with the rules and framework in place to find solutions.

In **double-loop (reframing) learning** those involved go beyond identifying the problem and finding a solution, to addressing the framework in which the problem resides, which can result in changes to a procedure or rule or system. Double-loop learning involves questioning the assumptions, policies, practices, values, and system dynamics that led to the problem in the first place. Actions include intervening in ways that involve modifying underlying system relationships and functioning.

Triple-loop (transformational) learning goes a step further: it is learning about learning. It digs deeper into the beliefs and perceptions held by people and demands reflection as to what we think, believe and the values guiding our actions – how they relate to what we do and how we do it. The result of triple-loop learning within an organization could be changes to the overall strategy.

How can interaction be enhanced?

Röling and Wagemakers (1998) draw lessons from several experiences with alternative approaches to the facilitation of learning. One useful methodology that was developed to facilitate collective learning in complex interwoven actor networks is rapid appraisal of agricultural knowledge systems (RAAKS) (Engel, 1997). RAAKS is a diagnostic framework and participatory methodology for analyzing complex multi-stakeholder situations and for designing effective co-operation and communication strategies. It is a key methodology for facilitating innovation within a development context.

Innovation is often the result of interaction amongst diverse stakeholders: when they meet, share experiences, learn together and contribute to decisions. This can be achieved through multi-stakeholder processes. The Centre for Development Innovation defines multi stakeholder processes[1] as: (1) processes that aim to involve stakeholders in improving situations that affect them; (2) forms of social interaction that enable different individuals and groups, who are effected by an issue, to enter into dialogue, negotiation, learning, decision-making and collective action; and, (3) about getting government staff, policy-makers, community representatives, scientists, business people and NGO representatives to think and work together.

Chapters by SadreGhazi (Chapter 9), Konlambique *et al*. (Chapter 10) and Mayanja *et al*. (Chapter 11), provide practical examples of how interaction amongst stakeholders can be

1 Wageningen UR portal on Multi-Stakeholder Processes: http://portals.wi.wur.nl/msp/index.php?page=1186

facilitated. Two international organizations based in Africa, the International Potato Center (CIP) and the International Center for Soil Fertility and Agricultural Development (IFDC), developed approaches to facilitate interaction amongst stakeholders – the participatory market chain approach (PMCA) and the competitive agricultural systems and enterprises (CASE) approach respectively. These chapters explain the approaches to facilitation and highlight challenges relating to power, trust, leadership and gender, amongst others.

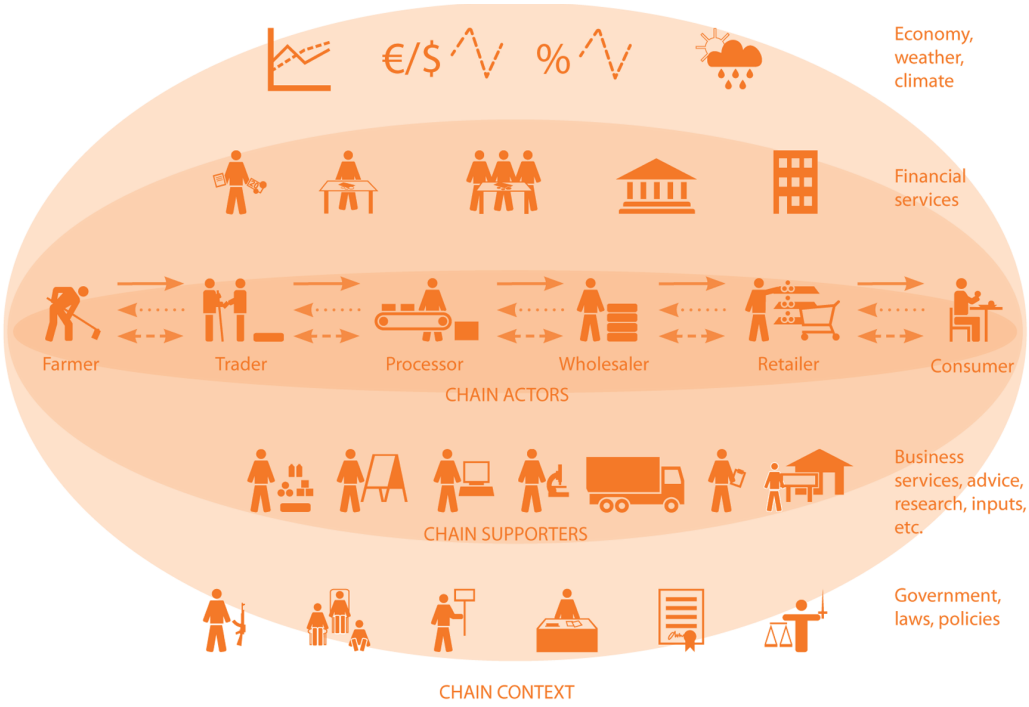
Increasing numbers of actors are involved in innovation processes; this both opens up and demands radically new forms of knowledge creation, innovation and collective decision-making. The power that comes from different stakeholders working together is now well recognized. But, on the other hand, when different stakeholders from across civil society, business and government are in conflict over an issue, it is rare for one group to have the power to push ahead with their own agenda. Without broad-based support the actions of any one actor are likely to be blocked by the others.

Multi-stakeholder processes aim to build trust and understanding, stimulate collective learning, and create the conditions for collective decision-making and action. These processes are not a short cut for resolving complex problems and conflicts. The real challenge is in getting the process right. Very often multi-stakeholder processes do go 'off the rails'. They may become a 'talk-fest', be manipulated by the more powerful groups, lack rigorous use of scientific understanding and analyses or lead to nice ideas that are never implemented. An effective multi-stakeholder process is not just about bringing people together in the same room, as the different chapters demonstrate. It involves much background work, often with individuals or single stakeholder groups to create the conditions for constructive engagement. Designing a good process requires careful attention to the politics and power relations of the situation. In many situations empowerment of the less powerful groups will be necessary before there is the will or capacity for engaging with other groups. Conflict is central to many multi-stakeholder processes; however the learning perspective seeks to open up new ways of tackling conflict.

Value chain thinking

The chapters in Part Two for the most part rely on value chain thinking as a foundation. Both the chapter by SadreGhazi (Chapter 9) and Mayanja *et al*. (Chapter 11) are based on a value chain approach. The value chain (KIT *et al*., 2006) approach looks at linkages between stakeholders – such as producers, processors and traders and their activities – and how value is built and distributed throughout a commodity chain. Value chain analysis allows you to understand the structure and process of a value chain and the position of each actor and its activities while these are linked. It is a demand-driven approach wherein consumers are key actors.

Both chapters by Ujeneza (Chapter 14) and Konlambique *et al*. (Chapter 10) discuss cases in which agri-business clusters are built. In the Konlambique *et al*. chapter, the idea of building clusters is also based on value chain thinking. An example of a cluster approach is the CASE approach, developed at IFDC (ICRA, no date). CASE focuses on agri-business clusters consisting of the producers, entrepreneurs, and technical, financial and business development



Source: adapted from KIT & IIRR, 2010.

Figure 2. An example of a value chain

services that are involved in a particular commodity within a well-defined target region. The CASE approach has been piloted in several West African countries. IFDC scaled out the CASE approach in the From Thousands to Millions' or '1000s+' project which started in 2006. Note, the clusters that IFDC refers to in its approach are different from a widely accepted understanding of agri-business clusters in the academic world (Box 8).

Box 8. Agri-business clusters

A cluster refers to a group of enterprises from the same sector or from the same location that meet. The term originates in the industrial sector. The concept was developed by Porter (1990) and is laid out in detail in his book entitled *The Competitive Advantage of Nations* (1998). The idea behind clustering is that cooperation between enterprises can improve the effectiveness of the sector and the efficiency of the participating enterprise. Clusters and networks then improve access to inputs and services, make negotiation and lobbying more efficient, and share investments in the necessary innovations (de Ruijter de Wildt*et al.*, 2006). IFDC uses this concept in agricultural sectors, hence the term 'agri-business cluster'.

Who can enhance interaction?

Once we recognize the need for, and value of, a well-facilitated multi-stakeholder process, the next question is who can play the role of facilitator. Pyburn *et al*. (Chapter 12), raise the question of who is best placed to take on such a role: a consultant, research organization, government ministry, development organization or private sector organization. Mayanja *et al*. (Chapter 11) look at a research organization that facilitates interaction amongst stakeholders, whereas in SadreGhazi's example (Chapter 9) it is a private sector organization. Konlambique *et al*. (Chapter 10) take the perspective of a development institute.

With the many actors involved it is not always clear who can best play the facilitating role. In some cases, a certain organization or individual start playing this role; this is referred to as a 'boundary spanning actor' and will be further explained by Pyburn *et al* (Chapter 12). In other cases, a person is given or takes the mandate to deliberately act as a facilitator. There are convincing examples of facilitation done by insiders, who represent one of the stakeholders in the innovation platform, as well as by outsiders, who tend to be more neutral professional service providers. The insider category tends to fulfil the coordination role; while outsiders tend to be hired for facilitation. *The Brokering Guidebook* (Tennyson, 2005) is one of many practical books that address the question of how to choose the right type of facilitator.

The legitimacy of facilitators is addressed in the different chapters. Pyburn *et al*. (Chapter 12) highlight the need for such a person and further discusses the position of such a facilitator, whether we refer to them as knowledge brokers, agricultural innovation coaches, or cluster facilitators. They also touch upon the capacities such a facilitator needs and if/how these capacities can be built.

Capacities needed for effective interaction

To be able to usefully engage, stakeholders need to have certain capacities. Usually capacity is conceptualized as a state or a measure of strength, which can be strong (e.g. an organization has capacity because it has many resources and knows how to use them to meet its mission) or weak (e.g. a group of actors is not good at networking). The commonly used Organisation for Economic Co-operation and Development (OECD) definition states that capacity is "the ability of people, organizations and societies as a whole to manage their affairs successfully" (OECD, 2006). Others refer to capacity as a 'potential state of performance' (Horton & Mackay, 2003). Earlier theories on capacity considered it to be something that could be transferred by outsiders, for example, through training. Nowadays much more emphasis is placed on contextual factors within a system which determine whether capacity can emerge, or not. As such, the implication is that if you want to engage in strengthening capacities for actors in an innovation platform, you need a thorough analysis of the context and search for the underlying factors which inhibit capacities to emerge. This is further explored in Part Three.

Box 9. Innovation platforms defined
An innovation platform is a group of stakeholders who are brought together by their interest in shared issues. An innovation platform provides a physical or virtual forum for exploring opportunities to address those common issues, and to investigate and implement joint solutions. Stakeholders have a shared objective in coming together, which needs to be clear to all participants, and translates into a commitment to cooperate. This objective has to be tangible, realistic and achievable (from Nederlof *et al*., 2011; based on Fara, 2007).

Capacity exists at different levels and can take various forms and shapes, as Figure 3 and Table 4 illustrate:

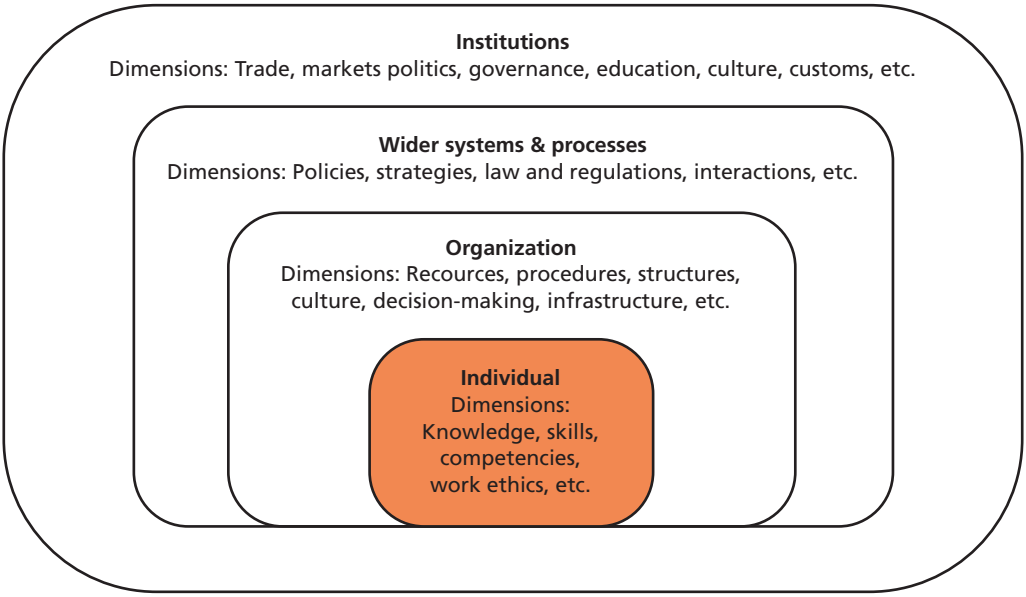


Figure 3: (Adapted from FAO, 2006)

Table 4: Two types of capacity (selected examples from NEPAD, 2009)

More evident capacity elements	Less evident capacity elements
Institutional and structural capacity – including organizational structures	Capacity to learn, focus and strategize
Hierarchies, mandates, procedures, rules and regulations etc.	Capacity to predict, adapt and respond to the volatile and everchanging environment
Financial and material capacity	Capacity to motivate and inspire personnel
Human resources capacity – number of employees and skills levels	Capacity to communicate effectively with internal and external audiences
Capacity to monitor and evaluate output	Capacity to learn and apply lessons learnt to improve performance for effective service delivery

To facilitate innovation processes, it is important to have a clear view of the capacities of each of the actors involved in the innovation process, as well as the joint capacity which emerges when these actors come together and do things. SadreGhazi (Chapter 9) explains how value is created for different stakeholders through interaction with others. Current thinking about good facilitation practice postulates that the facilitation process *itself* can be used to strengthen relevant capacities. Ujeneza *et al*. (Chapter 14) specifically address how the needs for information entrepreneurs can be integrated in a project's monitoring and evaluation system. They refer to this as the creation of competitive intelligence. Pyburn *et al*. (Chapter 12) look at the capacities that individuals need to play in their role as facilitators of innovation processes.

Monitoring and evaluation for innovation

The balances in development cooperation are shifting against predictability and control and towards complexity and uncertainty (ECDPM, 2008). Facing complexity and uncertainty, the need for a dynamic approach to innovation has increased, which has implications for the way monitoring and evaluation (M&E) is carried out. Whilst problems with known solutions (e.g. vaccination to prevent polio) can follow more linear pathways to change, more complex problems require M&E that is flexible and dynamic in nature. In complex environments, such as entrepreneurs working in ever-changing markets, one needs to be able to quickly obtain information (e.g. on market prices) in order to adapt and perform. Without necessary and timely information an entrepreneur may lose their business or opportunities for growth. This is well explained in the chapter on competitive intelligence by Ujeneza *et al*. (Chapter 14), while Mur and Kuster (Chapter 13) look at broader issues in M&E and how it can be used for learning.

Reading this section

Part Two covers three broad topics: (1) **how** to facilitate interaction – with practical examples of facilitating innovation processes in West and East Africa, and in India; (2) **who** facilitates interaction – an overview of experiences with persons in different positions facilitating such processes; and (3) **capacities of the system** – here we explore how learning can become an intrinsic element of an innovation system, largely via a robust and learning-centric approach to **M&E**.

How to facilitate interaction? SadreGhazi (Chapter 9) explains the need for bringing different stakeholders together and facilitating this process of interaction for an invention to turn into an innovation. This is followed by Konlambique *et al*. (Chapter 10), who explain the different issues that arise in facilitating innovation: power, trust, leadership and gender. Mayanja *et al*. (Chapter 11) build on this further, bringing in experiences with PMCA in Uganda.

Who facilitates interaction? Pyburn *et al*. (Chapter 12) explore the position of the facilitator of innovation processes and discuss the implications of specific positioning for different situations. The other chapters provide nice examples where the facilitator is differently positioned: research organization (Mayanja's *et al*., Chapter 11); a private sector organization (SadreGhazi, Chapter 9); and a development institute (Konlambique *et al*., Chapter 10).

Systems level capacities. The chapter by Mur and Kusters (Chapter 13) explains what M&E in the context of facilitation of innovation processes entails. M&E for innovation is learning oriented and needs to be designed as a dynamic and iterative action-reflection process. In the chapter, the authors present an overview of the most important approaches to M&E for innovation. Ujenza *et al*,. (Chapter 14) also take up the subject of M&E, looking at what development projects can do link their M&E systems to the entrepreneur's need for competitive intelligence.

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Chapter 9

Partnership and value creation in a private sector innovation initiative

Shuan SadreGhazi

Key Message: Innovation is often confused with invention. Creating a new scientific discovery or invention is one thing, but having this adapted and used requires interaction between groups with different interests. Innovation can be stimulated by partnerships between community organizations and businesses but, due to different interests, facilitation is often needed in order for dif ferent players to recognize the benefits/value of working together, which are not always apparent. Facilitators can help actors to see the benefits of collaboration.

Despite the number of cows in India, average milk production per animal is very low, mainly due to poor animal health and nutrition. DSM, a Dutch company with expertise in animal nutrition, saw an opportunity to find a solution, but quickly realized that addressing the problem of animal nutrition involves much more than simply introducing a new piece of technology. With the help of farmers, local NGOs and a dairy cooperative, DSM formed a partnership in which value could be created for everyone involved, which transformed what would have been 'technology transfer' into an innovation process.

Livestock farming in rural India

Dairy animals, especially cattle, play an important role in the life of rural Indians. Cattle are believed to bring prosperity to the household and they are a status symbol. Their milk is a source of nutrition and the dung is used as fertilizer or biofuel. If the milk volume is greater than the local consumption, and if the farmer has links to the market, then milk can be an additional source of income. Even very poor households tend to keep at least one or two cows. It is therefore not surprising that India, with more than 70% of its population living in rural areas, has the largest number of dairy animals in the world.

But India's predominantly rural dairy sector is characterized by inefficiency and low milk yields. Poor animal health and nutrition are among the main factors behind this. In addition, due to limited awareness of animal health and farm management, animal productivity and farmer incomes remain very low. Indian farmers currently spend about 60% of their income on animal health, while in Europe only 1% of farmer income is spent this way. Low productivity means that cattle are under-used as a source of income for farmers (Hemme *et al*., 2003). Improving animal nutrition and health has the triple effect of increasing milk yield, enhancing animal fertility and reducing health problems. In the long run, these translate into better and more milk, lower medical costs and higher incomes for farmers.

Private sector 'invention' for nutrition

DSM, a private Dutch multinational company with expertise in animal nutrition, saw an opportunity to apply its expertise and technology in animal nutrition to the problems of dairy farmers in rural India. DSM's research and development team had developed a vitamin-rich food supplement (premix) for use in large commercial livestock farms in India and elsewhere. And the company already had an office in India, where its products were being used by large-scale farmers.

For the first time, DSM decided to venture into a rural innovation project. The research and development team and one manager were located in the Netherlands, and a team was set up in the India office. From the beginning they noticed that it would take much more than a technological invention alone to address the problem of inadequate animal nutrition in rural India. DSM was accustomed to operating in formal markets where it is quite straightforward to set up a supply chain; they were familiar with the process and partnerships needed to introduce a new product. But the company had no experience in introducing a new technology in the context of rural India.

Challenges on the path towards innovation

DSM encountered a number of challenges as they evolved from introducing a new technology to engaging in an innovation process. The company realized that the food premixes they had formulated for commercial livestock farms might not be suited to the cattle in rural areas. Most premixes are developed for large commercial farmers whose milk animals are raised under different conditions. Differences include the type of fodder used, grazing conditions and the soil mineral content. So, DSM set about adapting its premix to suit rural

cattle by first investigating their nutritional deficiencies. This process, which took over two years, included several rounds of interaction with farmers and local veterinarians. With this research as a foundation, pilot projects were then set up in three villages to develop the product further.

A second challenge for a multinational corporation like DSM was access to rural communities. DSM did not know much about rural conditions and how to reach small-scale rural farmers, who are widely dispersed and often far from the areas where formal markets operate. Even if DSM was able to distribute its product in these areas, how could they build trust within the community and convince farmers to try it? In addition, because awareness as to good animal nutrition and its importance was low in most rural communities, farmers were unlikely to use a new product. DSM could see that, although it viewed the new product as a clever invention, it would likely remain unused.

Acquiring missing capabilities through partnership

Even though the nutritional premix was adapted to their needs, its uptake by rural smallholder farmers was far from guaranteed. DSM personnel, while skilled in their own profession, lacked some of the capabilities needed for engaging effectively with farmers, such as local knowledge, market information, distribution channels, and skills in training and awareness-raising about the importance of animal nutrition. To address this gap, the DSM team decided to form a partnership with other actors who had the capabilities that DSM was missing. In addition to DSM and farmer communities, three other key actors were involved in the innovation process: a local NGO, an Indian development research foundation, and a dairy cooperative (see Box 10).

Box 10. Partners involved in the innovation process

Pradan: a rural development NGO that helped with the training programme and access to rural farmers. Pradan had a very good reputation among rural communities for its self-help groups, which were mainly comprised of women.

Baif: a non-profit development research foundation with a long history in rural development. The foundation has expertise in animal husbandry and other animal-health related topics in India; they have many years of experience in working with rural communities in many parts of India.

Amul: a well-established dairy cooperative with a wide network of farmer members. The cooperative helped to access rural farmers and in the distribution of animal premixes. As the oldest and most successful dairy cooperative in India, Amul held valuable knowledge about the dairy market in the country.

DSM contacted local Indian NGOs through ICCO, a Dutch development NGO. The local partners (Pradan, Baif and Amul) had all been working with rural communities for a long time, and had frequent communication with farmers. Pradan had weekly meetings with women's self-help groups and Baif agents used to visit farmers in their region frequently to provide them with extension services. Amul had a wide network of members in villages from whom it collected milk daily; it also provided them with various services. For a company like DSM, who did not have any presence in rural communities, such channels were invaluable.

DSM started its activity with three pilot projects. In consultation with partners, rural farmers in three states were selected. The feedback, observations and knowledge that the farmer

communities shared were very important for improving the innovation process. In order to ensure active interaction with the local communities and NGOs who worked with the community, DSM also hired local veterinarians. These veterinarians offered training and awareness programmes and performed periodic veterinary check-ups, communicating the results both to the farmers and to DSM.

DSM managers also paid short visits to rural sites to communicate with local farmers and partners. Communication through all these channels provided valuable feedback about the project and helped DSM to identify areas needing improvement. Moreover, to enhance communication among local partners and to share knowledge and ideas, DSM organized a number of seminars, inviting its own experts from abroad as well as representatives from the local partner organizations. Communication through these different channels helped to foster trust among partners.

Value creation for the different partners

As shown in Table 5, each partner had certain capabilities that could benefit the innovation process, and each also lacked certain capabilities that it needed. Although the actors in this process each had something to share, they also had different interests. For example, as a private company, DSM had an eye out for long-term profit. To the contrary, the NGOs did not have a profit-seeking interest, but were keen to align the partnership with their rural development goals. And farmers, as the most important partners, wanted to be sure about the benefits that they could glean.

It is important that the intended beneficiaries of a technology perceive that it holds value for them. As such, in this rural innovation process, the main value for the farmer was higher income as a result of better animal health, which would lead to higher milk yields, a reduction in the time between calvings, and reduced medical costs. Given that DSM's products were to be used for this, in the long run DSM stood to benefit.

To increase how farmers valued animal nutrition practices, DSM had to go beyond just selling a product (i.e. a premix to improve animal nutrition) and generate value by offering a broader animal health package. Their main product was therefore combined with a number of other services for farmers, such as experts visiting the animals who were able to undertake medical checks on the cows to track and validate the product's effectiveness.

Because it lacked knowledge about the rural context, DSM relied heavily on the knowledge of local partners and the reputation and trust that they enjoy among the rural farmers, in order to reach those communities. In some cases, local partners helped to distribute the premixes among rural farmers. By engaging in animal health and nutrition schemes, NGOs gained appreciation from both the local community and their donors. They also improved their reputation with the farmers by using DSM's high quality products.

Table 5: Capabilities of each actor and value generated in the partnership

Actor	Capabilities they shared	Value they derived
Private sector	• Technological expertise in animal nutrition and health • Financial resources • Management skills	• Knowledge about rural context • Trust among community • Knowledge about local actors • Raising awareness about animal nutrition
Local NGO	• Knowledge about rural context • Rural development expertise • Close interaction at village level • Community trust • Training skills • Rural distribution channels	• Quality service for their communities • Better access to resources • Enhanced knowledge on nutrition • Offering their community a new quality service
Dairy cooperative	• Market information • Dairy management know-how • Knowledge about linking rural farmers to the dairy market • Rural distribution channels	• Quality nutrition for their cows • Access to scientific expertise in animal nutrition
Farmer community	• Sharing feedback to improve the invention • Indigenous knowledge	• Awareness about proper animal nutrition and health • Access to market • Access to financial resources

Lessons

Invention versus innovation. Adoption and the use of technological inventions cannot be taken for granted: even when technological inventions might have benefits for the intended community, this does not ensure adoption of the technology. That is why the distinction between invention (e.g. a scientific discovery) and innovation (creating and putting combinations of knowledge from different sources to use) is emphasized in the innovation systems approach (Hall, 2003).

Challenges facing the private sector vis-à-vis rural innovation. The private sector has technological know-how, financial resources and management skills that are useful for rural innovation. However, in this case, the private sector faced several obstacles, including a lack of familiarity with the rural context, lack of infrastructure and an absence of trust between them and the intended beneficiaries (farmer-customers). The private sector must overcome these obstacles in order to make technology accessible in an affordable way and to raise awareness about a technology's benefits.

Partnerships and collaboration for innovation. A group of actors needed to work together in order to create an enabling environment in which the invention could thrive, be adopted and used by the intended beneficiaries – the dairy farmers. Capabilities of the various actors were complementary (as seen in Table 5). While DSM provided technological and financial resources, local partners acted as intermediaries to raise awareness and enhance trust between the rural community and the company, as well as linking value chain actors. In other words, partnership and collaboration facilitated the innovation process.

Value creation for partners with different interests. In any partnership, each actor is motivated by different interests. Capabilities might not be shared if an actor does not perceive the value of joining the innovation process. In this case, we saw how each actor found and derived value in the process. What happened can be described as co-creation of value through working together.

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Chapter 10

Facilitating farmer-market linkages through agri-business clusters

Matieyedou Konlambique, Arno. Maatman and Amadou Diallo

Key Message: Historically, innovation has focused on production but it increasingly needs to be seen as something that happens along the whole value chain. Innovation often requires a process of empowerment, trust-building and power re-balancing. Skilled facilitators can play a critical and enabling role.

How and where can I sell the soybeans I grow? Farmers from southern Togo had been asking this question for years. Soybean was initially promoted as an interesting crop because rotating it with maize boosts soybean productivity. But farmers drastically reduced their soybean production between 1998 and 2006 because they had no market for it. A solution to this problem finally arose through innovation at the grassroots level, which was a result of interaction between a diversity of interlinked actors who shared a common interest in soybean business development.

Introduction

Agricultural intensification is widely seen as an essential condition for enhanced food security and as a major driver for economic growth in sub-Saharan Africa. But when it comes to how to achieve this intensification, until recently practitioners resorted to strategies that would increase productivity. They focused especially on strategies to improve farmers' access to modern agricultural inputs, such as mineral fertilizers, improved seed, crop protection products and improved technologies and practices.

In line with this, the International Center for Soil Fertility and Agricultural Development (IFDC) implemented a project between 1998 and 2005 in several countries of West Africa, which focused on the development and dissemination of technologies aimed to maintain and improve soil fertility. During this project, learning plots were designed and implemented jointly – with farmers, national agricultural research and extension services staff, and NGOs – to stimulate farmers to make more efficient use of expensive, external inputs (Gross *et al*., 2005).

Whereas farmers were generally quite enthusiastic about the lessons they had drawn from the learning plots, the emphasis on agricultural productivity alone was clearly insufficient to address the multiple challenges that farmers were facing. Producers' organizations indicated that external outputs were expensive and hard to get, and farmers had difficulties finding markets for their produce. As a result, IFDC's attention shifted from agricultural production and productivity to chain performance, value addition and marketing; and, from technological to organizational and institutional issues. This required new capacities, new ways of thinking and new alliances. In this chapter we discuss how the competitive agricultural systems and enterprises (CASE) approach facilitates innovation from the grassroots level by strengthening the competencies of a diversity of local actors.

BOX 11. The CASE approach and the 1000s+ project

The CASE approach was developed by IFDC and its partners, including producer and trader organizations. It is essentially a grassroots approach to agricultural and agri-business development, based on action-learning and empowerment processes. The approach is based on three pillars:

1 Agri-business cluster formation, aimed at strengthening local capacities by involving a wide a range of actors and stakeholders. A cluster typically includes producers, input suppliers, traders, processors, and business and financial support service agents.
2 Value chain development, which aims to link farmers to consumer segments and emphasizes the integration and empowerment of local actors (i.e. the local cluster).
3 Transactional governance capacity building, which involves both public and private stakeholders, and aims to foster improvements in the institutional environment for agri-business development; especially the reduction of transaction costs for actors in the chain.

This approach is being applied by the 'From Thousands to Millions' (1000s+) project, which aims to improve the livelihoods of 1 million farm households. The project is coordinated by IFDC and executed in seven W est African countries: Benin, Burkina Faso, Ghana, Mali, Niger, Nigeria, and Togo.

Agri-business cluster formation: a way of facilitating innovation

In response to the problems voiced by producers' organizations, the '1000s+ project' uses a grassroots actor-oriented approach to agri-business development called CASE (Box 11). In this approach, agri-business clusters are formed and actors meet regularly, developing mutual trust. At the heart of the project is a competitive grant scheme, complemented by brokering and networking services provided to producers' organizations and other rural entrepreneurs to enable them to conceive and advance a 'business idea'.

In each country, in consultation with the national level steering committee, an effort is made to communicate about the competitive grant mechanism for innovative ideas to as many smallholder farmers and other local entrepreneurs as possible. The requirements are kept as minimal as possible in order to attract many ideas and to keep barriers to entry low – in particular for less well-informed individuals and groups. This is what the project calls the 'mobilization of business ideas'. The cluster advisors of the 1000s+ project make a rapid scan of business ideas, ask for clarification if needed, and consult with the chair of the steering committee on a shortlist of business ideas. The champions of each idea are visited, and a more detailed concept note is made. Then the national steering committee meets to select the ideas based on an agreed set of criteria.

Workshops are then organized by either the 1000s+ project staff or other experienced facilitators who are familiar with CASE; these workshops transform the business idea into an action plan. All actors and stakeholders that need to be involved in the cluster, the value chain, and in any advocacy or lobbying activity, are invited. The final step before implementation of the action plan is sub-contracting. This always involves the champion of the business idea. Business support services may be contracted directly through 1000s+ or indirectly through the local champion. The following section provides an example of how the process works in practice.

The CASE approach in practice: a soybean cluster in Togo

In southern Togo, soybean was initially promoted by the Integrated Soil Fertility Management project as a crop for rotation with maize or cotton, in order to boost the productivity of the latter. Recently, more emphasis is placed on the opportunities offered by soybean products. However, producers perceive the soybean market as risky. In addition, soybean is not often used for home consumption.

When the CASE approach first began, some producers' organizations had a business idea, which focused on organizing collective marketing for soybeans. An agri-business advisor had suggested that rather than producing first and then looking for a market, farmers should instead begin by identifying marketing opportunities before making any decisions about whether or not to continue growing soybean.

Following the selection of the best business idea, a planning workshop was organized for representatives of the producers' organizations and the research and extension services. Very quickly, the need to involve other actors from the value chain became clear. By the end of the workshop, participants had agreed on the main actions needed to address the issue. A market appraisal was carried out by ADA, a local business support service: the outcome was that soybean and oil production were identified as having the highest potential and key actors in the chain were identified.

One of the trading companies – AGRINOVA – was contacted. From discussions, it emerged that farmers were looking for a secure market for their products, and AGRINOVA was looking for a reliable supply of good quality soybean to meet its clients' requirements. The farmers and the trading company had identified an opportunity for collaboration; however, both

actors tended to overestimate their capacity to fulfil their own commitments and lack of mutual trust became a point of contention. Further participatory analyses showed the need to involve a seed supplier and a financial institution.

Finally, AGRINOVA and the producers' organizations agreed to start an experimental phase, during which farmers would have time and support to meet quality requirements, as well as develop a joint loan application, which would guarantee access to seeds for the producers. AGRINOVA would supply the seeds on credit, and producers would deliver the required quality and quantity of soybean. This experimental phase, involving small quantities of products and investments also aimed to improve each actor's understanding of the situation and capacity of the other actors, and to foster transparency in collaborative activity and mutual trust.

Besides AGRINOVA and 17 producers' organizations, the cluster progressively included other actors, including a local NGO to support producers in organizational strengthening and a seed provider. A processing company in Benin, FLUDOR, provided an alternative market outlet. Finally, a consulting company specializing in marketing and management, and a bank (BRS - *Banque Régionale de Solidarité*), joined to support cluster actors. Negotiations with the bank followed, based on a detailed and joint business plan, involving all major chain actors. Thanks to the joint business plan with an output selling contract and input supply contract, the coordination risk[2] among the actors reduced. As a result, the bank was willing to provide a revolving loan to AGRINOVA in order to buy high quality seeds for the farmers and then buy their soybean, paying them in cash. Simultaneously, producers, researchers, extension and AGRINOVA staff established learning plots to experiment with different soil fertility management techniques, and to improve productivity. The producer organizations received training on managing seed distribution to their members and on collecting soybean to ensure – collectively – that the terms of the contract with AGRINOVA were met.

In the first year, the producer organizations did not manage to meet the required volume of oil seeds, and AGRINOVA had to buy additional oil seeds from other producer organizations in Togo. This situation could have led to the collapse of the collaboration. But thanks to monitoring workshops and collective field visits that were included in the facilitation process, AGRINOVA was informed in advance that farmers would be unable to deliver the quantity indicated in the agreement, and understood that this was due to weather conditions rather than human behaviour.

In the second year, things went more smoothly because trust had developed between the partners. On the one hand, AGRINOVA had demonstrated capacity to buy products on time and pay cash; on the other, the producer organization delivered the right quantity of their crop. A quick margin analysis showed that the business venture was attractive for both AGRINOVA and the producers. AGRINOVA was also able to strengthen its relationship with FLUDOR, the processor in Benin. The processor now wants to enter into a multi-year arrangement with some financial facilities, and gradually the agri-business cluster is being formed.

2 Coordination risks refer to those situations where the returns to an investment of actor A is dependent upon complementary action involving other actors, whose behavior is uncertain (Dorward *et al*. 2004).

The soybean cluster facilitation involved planning many activities to strengthen farmer capacities, including: training on cost/margin analysis, negotiation, and understanding the soybean market. These capacities enabled the farmers to participate actively in the process and defend their own interests. At various points, the process was at risk of collapsing. An important challenge was, for instance, to break through the bureaucratic behaviour of the bank's agents in order to speed up the process of loan disbursement.

Emphasis in the action plan is gradually evolving from strengthening the producer organizations to contract negotiation for all chain agents; and from productivity issues to issues that relate to strengthening seed supply chains and overall coordination of cluster and value chain activities. This evolution is possible thanks to a coordination platform that was established, in which all actors, including the bank, are represented. The producer organizations also participate actively. The main role of this platform is to monitor the evolution of the process, to analyze the business environment and to request support if needed. The platform provides an inspiring example, as a means to facilitate coordinated action. It also strengthens the capacities (and information) of the actors involved and helps them to be proactive. On a less positive note, many actors – including the producer organizations – continue to be disappointed by the quality of some business support services.

Facilitating learning

The CASE approach demands a lot from its facilitating agents. CASE facilitators are expected to facilitate action and learning at individual and collective levels in order to trigger innovation and to strengthen competitiveness at the cluster level. The cluster is composed of a very heterogeneous group of actors. Despite efforts, individual interests remain intact and imbalances in terms of differences in knowledge, competencies and networks, continue to play a role. Trust, which never comes easily, is quickly damaged.

CASE facilitators also have to deal with unequal power relationships between actors at different levels. The effectiveness of CASE therefore ultimately depends on the presence of highly skilled, pragmatic and creative facilitators working in the field together with farmers, local entrepreneurs and other stakeholders. Their work involves making informed choices, as the following two examples show.

First, facilitators of change support home-grown initiatives and, ideally, work together with 'product champions' to strengthen innovation processes. However, the situation in which facilitators work is not neutral. As a result, facilitators are obliged to analyze power relationships, and anticipate possible winners and losers. Objectives, such as inclusiveness and empowerment, mean that proactive facilitation that engages more vulnerable groups and problem owners[3] is required. This may be contrary to the idea of ownership, as choices made

3 The notion of 'problem owner' stems from Checkland and Scholes (1999). The concept is useful for development workers and may help them to avoid taking problems over from their owners; this means focusing on the capacities of the problem owner to solve a situation as opposed to solving the problem itself.

by the facilitator (e.g. who to work with, what capacity-building activities to implement) will affect power relationships in agri-business clusters and value chains.

Secondly, a value chain approach demands a focused facilitation strategy. While focusing on just a few well-targeted commodities, a value chain approach also aims to develop local clusters of enterprises and financial institutions that are able to move agri-business ventures forward, developing real – rather than subsidized, artificial and temporary – competitive advantages. This calls for creative ways of carving out an individual or collective specialization within often highly diverse and dynamic farming systems. It calls for opportunities to add value through processing and stronger marketing (including storage) strategies. It also requires dialogue with policy-makers and donors vis-à-vis how competitiveness can be matched efficiently with social and political goals, as well as how risks can be effectively reduced and shared to stimulate specialization and agricultural transformation.

Lessons

Innovation relies neither solely nor predominantly on orchestrated trajectories of research and extension. There is room for more flexible applied research and communication systems, which enable researchers and innovation brokers to work better together with local champions in agri-business on issues that warrant interactive learning. Lessons from the 1000s+ project vis-à-vis the practice of facilitating innovation include:

- Innovative ideas and champions willing to invest in change can be found at the grassroots level, even in challenging regions in sub-Saharan Africa.
- Empowerment in agri-business systems crucially depends on farmers being able to interact with multiple agents, preferably as close to their farms as possible.
- The success of the agri-business cluster formation depends on the capacity of the facilitator to both develop and maintain trust between the actors involved. Trust never comes easily, but can quickly be damaged.
- Facilitators must manage unequal power relationships between different actors at different levels, which requires capacity strengthening, communication and networking, and strong negotiation skills.
- Business challenges and ideas will continuously change; new actions and responses will be needed to appropriately respond to these changes. An innovation platform should offer a framework to build the capacities of local actors to explore and implement new ideas and respond to a changing context.

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Chapter 11

Multi-actor collaboration in value chains: an avenue to innovation?

Sarah Mayanja, Andre Devaux, Berga Lemaga, Damalie Magala, Douglas Horton, Beatrice Akello, Lucy Aliguma, Thomas Bernet, Immaculate Sekitto, Graham Thiele and Claudio Velasco

Key Message: Innovation along the whole chain requires that dif ferent stakeholders (public, private, NGO) come together, take risks and jointly implement new ideas. There is a complex dance to be danced between competition and cooperation. Trust and social networks need to be built up alongside technical knowledge and skills.
The chapter also touches on gender and inclusion, and the challenges that power differentials create in terms of facilitating a multi-stakeholder process for innovation. To ensure that innovations reaches less powerful groups (e.g. women, the poor), innovation processes must be explicitly guided to involve them and to ensure that the less advantaged are not restricted to support roles, but can instead participate in decision-making processes.

Everybody who tasted TomCris's potato crisps loved them: they were fresh, crunchy and great tasting. Thomas and other small-scale processors in Uganda were able to sell their potato crisps in the local market. In the supermarkets, however, it was a different story. Very few people bought local crisps, opting instead for imported brands. Thomas could not figure out why his brand wasn't competitive. That's where the participatory market chain approach (PMCA) came in: an approach created by the International Potato Center (CIP) to develop value chains for the benefit of all actors along the chain. It generates benefits through value addition, improved information flows and collective action.

The potato sector in Uganda

Potatoes are becoming an increasingly important cash and food crop in Uganda and production has grown considerably over the past ten years. The potato is a nutritious food security crop, and is a buffer to increasing food (cereal) prices. The estimated 700,000 t produced in 2007

is sufficient for local consumption and also has the potential to meet export needs. Increased production in recent years has resulted from urbanization, changing eating habits, and increased demand from rapidly expanding fast-food restaurants. In addition, improved political stability, introduction of new varieties and expansion into new areas has also stimulated greater production and market demand. These developments have contributed to poverty reduction and commercialization in many rural communities that, until now, have had few avenues for income generation.

Despite the importance of potato, improved technologies in the production-to-consumption continuum, and governmental efforts to commercialize agriculture, small farmers have yet to see their incomes rise substantially. Additionally, the sector has been poorly organized and characterized by inefficient supply chains, which has greatly hampered the development of high value market chains that are capable of generating significant benefits for actors along the chain. The participatory market chain approach (PMCA) offers an opportunity to develop market chains in ways that mitigate these constraints.

Introducing the participatory market chain approach

The PMCA was developed by the Papa Andina Regional Initiative of the International Potato Center (CIP) to improve the competitiveness of potato market chains and small potato producers in the Andean region of South America. Following its success, Papa Andina partnered with the Regional Potato and Sweet Potato Improvement Network in Eastern and Central Africa, along with several local research organizations, to introduce the approach to Uganda.

PMCA is a novel approach for generating technological, commercial and institutional innovations along market chains by increasing trust, confidence and linkages among market chain actors and improving market access for small-scale farmers (Bernet *et al*., 2006). The approach helps to structure participatory processes that involve different market chain actors. These processes aim to stimulate joint innovations based on shared ideas and trust. The approach has three generic steps, each with defined objectives that culminate in a deeper understanding of the market chain: identifying, analyzing and implementing joint business opportunities.

As illustrated in Figure 4, a research organization initiates the PMCA by selecting the market chains on which to work, identifying potential research partners, and carrying out market research.

Creating functional multi-stakeholder platforms for innovation

Applying the PMCA to the potato sector in Uganda began with a core team of four strong collaborating lead institutes[4]: two NGOs, one private research firm and one research centre. The core team was supported by other partner institutes[5] from both the public and private sector. The key role of the core team was to facilitate the process of improving actor relation-

4 AT Uganda (an NGO), IITA/Foodnet (a CGIAR centre), The Ssemwanga Centre (a private research firm), and Africa 2000 Network-Uganda (an NGO).

5 Partner institutes: the Regional Potato and Sweetpotato Improvement Network in Eastern and Central Africa (PRAPACE), International Potato Centre (CIP), National Agricultural Advisory Services (NAADS) and National Agricultural Research Organization (NARO).

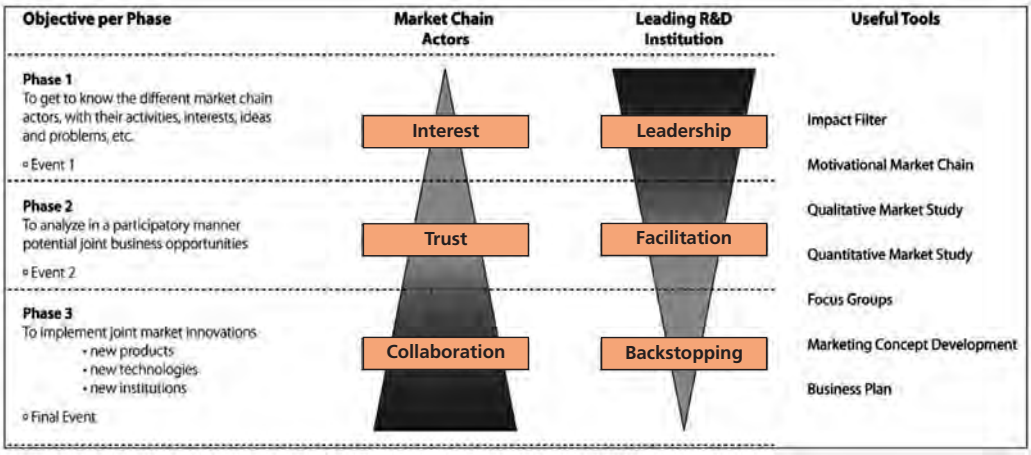


Figure 4: Structure and objectives of the three phases of PMCA (Bernet *et al.*, 2006)

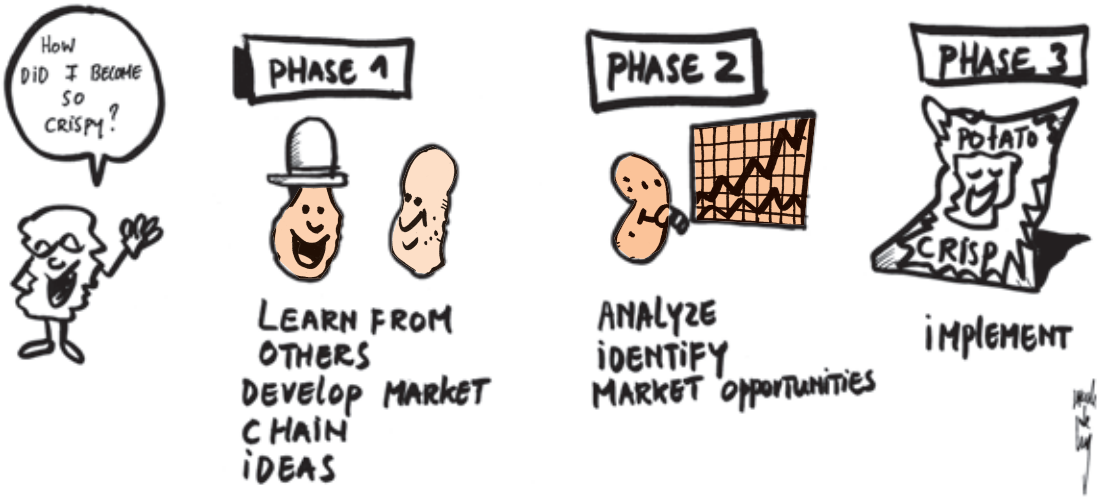
ships in a way that would spur innovations for improved sector performance. Most team members were women, as was the lead facilitator.

During Phase 1, the team carried out a rapid study of the sub-sector to find out how it was organized, which opportunities could be explored, and also to evoke the market chain actors' interest in working together. The actors interviewed included farmers, traders, fast food outlet owners, hoteliers, supermarkets, and researchers, among others. A final event was then held where the market chain actors were invited to learn about the results of the study. They agreed to form a potato group, which was further divided into two thematic groups: 1) table potatoes (referred to as quality ware potatoes); and 2) potato crisps.

In Phase 2, the two thematic groups identified and analyzed potential joint business opportunities, after which the 'best bet' was selected for further action. This was done through ranking and conducting rapid market surveys, as well as focus group research with prospective clients to test the acceptability and rate the proposed innovations. In this phase, a 'poverty filter method' that helps identify the greatest probabilities of pro-poor impact (Bernet *et al.*, 2006), was used to ensure that the opportunities identified would be pro-poor.

The meetings and research activities increased interaction between market chain actors, which allowed trust to be built up between actors who would otherwise compete (Box 12). They gained useful information and knowledge on a range of aspects about Ugandan research and development organizations, the commodities they were working on, production and post-harvest technologies, market concepts and innovation processes.

Box 12. The importance of mutual trust in multi-stakeholder processes
In Phase 2, stakeholders for each theme usually met at hotels, which quickly became monotonous. In a bid to spur variety and hands-on learning, the market chain actors were asked to suggest alternative meeting points, and one suggested the premises of the leading processor, Thomas. Thomas didn't like this idea so he stopped coming to the meetings; instead, he kept sending one of his employees. But since Thomas had been instrumental in guiding the discussions, in his absence the process lost its luster. The facilitators had to lure Thomas back. With the philosophy that 'two heads are better than one', the facilitators wooed him back. Thomas was keen on joint exploration of business ideas, but would not host the meeting on his premises. Perplexed by his reticence to host, the facilitators probed Thomas to explain. It turned out that most of the processors in the group had 'stolen' his former employees or clients!



When business ideas and innovations had taken shape, the market chain actors were supported in developing simple business plans detailing how the innovation would be 'brought to life'. At the end of Phase 2, a final event showcased the proposed business plans and was an opportune moment to integrate new actors into the process to complement the working groups with the necessary knowledge and capabilities.

Due to funding constraints, Phase 3 had a delayed start and a lot of reorganization of the group was required to adapt to changes in the people (both facilitators and market chain actors) engaging: some had left, some new members had joined. The group forged ahead and took the decision to merge the two thematic groups. Steering of the process, which until then had been the role of the core team, was slowly handed over to the market chain actors, and leaders emerged. Working groups were created to undertake core activities (e.g. additional market studies, sourcing for packaging materials, and mechanized sealers) and reported to the entire group on progress achieved. The groups were comprised mainly of women market chain actors who worked with dedication and always prepared brief reports for feedback. Though women were at the centre of the implementation of activities, leadership roles were taken on by men, mainly because of their financial ability, but perhaps also as a result of societal influence.

The entire group always decided jointly on next steps. Other key activities undertaken in this phase included market concept development, shelf life tests and key meetings between producer groups and processors; when needed, required skills were outsourced. For example, a graphic designer designed potato crisp labels, and a researcher provided options as to which potato varieties should be scaled up for crisp production. The process was never linear: a lot of back and forth was needed to come up with a desirable course of action or outcome.

The defining moment in Phase 3 came when the processors needed to invest in commercializing the prototypes for new packaging materials, label designs and sealing techniques. Thomas volunteered and invested his resources to act as a test case, and the group ideas were tried out on his products with reasonable commercial success. After all that hard work, results

were ready for showcasing in a larger, public event. Representatives from research bodies, key ministries, public and private sector companies, the press and donor agencies were invited, and innovations from three different commodity groups (potato, sweet potato and vegetables) were officially launched.

Results of applying PMCA to the potato value chain

By applying the PMCA to the potato chain the packaging, sealing and branding of crisps made by TomCris all improved. This led to improved segmentation of the market and success in the niche market. The processor registered a modest increase in sales. Additionally, there was a noticeable improvement in the organization of the supply of potatoes to crisp manufacturers. Three producer groups now consistently supply good quality potatoes to the crisp producers.

PMCA brought together actors from different backgrounds where there had previously been mistrust. Working together they implemented joint activities that led to the innovations. As a result, valuable capacities for innovation also developed: in terms of knowledge, attitudes, skills, empowerment and social capital. Another positive outcome was that the application and results of the PMCA stimulated considerable interest within Uganda research organizations, donor agencies and policy circles, and among market chain actors who had participated or heard about it.

Of the commercial, technological, and institutional innovations that were at various stages of development when the PMCA exercise formally ended in September 2007, several were successful, complete and ready to be commercialized. But innovation intrinsically has a limited shelf life. In contrast, strengthening the capacity to innovate – through the development of knowledge, attitudes, skills, and social capital – is likely to have greater social and economic impacts in the long run. Capacity building is thus the most important PMCA result given the continuous and dynamic nature of innovation processes.

Challenges and lessons

Features of the PMCA. PMCA is not intrinsically pro-poor; the approach can be used to stimulate and nurture innovation in any market chain and the benefits captured by any group. Therefore, to ensure that PMCA benefits poor farmers, the facilitators need to apply 'poverty filters' or 'lenses' to help researchers identify strategies to give the poor a competitive advantage, such as improving their sale price per unit, increasing sales per season, and gaining access to more outlets.

Another challenge relates to the fact that, although women played a prominent role in facilitating the process, men may benefit more. For example, men generally have more resources to try out a new innovation. In this case study, most potato processors were women, and they worked hard to bring about innovation, but TomCris benefited the most. In future, more attention should be paid to ensuring that women and other disadvantaged groups are more fully engaged in, and benefit from, the results of the PMCA.

As noted from the experience in Uganda, innovation does not end at the final event of Phase 3. PMCA should therefore be viewed as a trigger for innovation processes that need to be nurtured after the initial exercise is complete. Most of the results of the PMCA in Uganda were at a pilot stage at the end of Phase 3. More recently, some innovations have expanded their share in the market and some new 'copy-cat' innovations have emerged. This illustrates that mechanisms for scaling-up are not yet fully understood and implemented.

Implementation. The biggest challenge was funding, which was secured phase-by-phase, leading to substantial delays and uncertainties in the process. Another challenge was that the teams found it difficult to put into practice some of the concepts and methods presented in the PMCA User Guide; they would have benefited from supervision and more extensive and practical training materials. Lastly, for the innovation process to come to fruition, market chain actors had to invest in prototypes – the new, un-tested products. However, many were not prepared to take the risk, perhaps because they could not foresee a commercial benefit. As a result, some innovation processes progressed slowly and participants who might have made significant contributions instead dropped out.

Lessons

1. Successful innovation requires that researchers and development professionals work in new ways with diverse stakeholders, including not only small farmers but also market agents and policy-makers.
2. PMCA requires capacity development to build up trust and social networks in order to change attitudes and develop the much-needed social, as well as technical, knowledge and skills.
3. Follow-up and support to potential innovators is needed after the initial intervention (in this case the PMCA exercise) formally ends until innovations can survive independently.
4. Gender and equity issues merit special attention. Too often, women are seen as the 'doers' and men as the financiers.
5. Transcontinental technology transfer is possible and can help avoid repetition of basic work that has already been done elsewhere, but only when properly adapted to local conditions.

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Chapter 12

Making interaction work: intermediaries as catalysts to innovation

Rhiannon Pyburn, Laurens Klerkx and Peter Gildemacher

Key Message: Interaction is key and we need skilled people to coax, stir and nudge that interaction to support innovation.

Making innovation systems work effectively is like spinning a web: the spider weaves whispery, sticky strands together, criss-crossing the silken fibres to create a strong and effective net for catching flies or other insects. Those flies and insects can be likened to the innovations that emerge from networks of interacting stakeholders. The web represents the links and connections between actors, and the flies are the ideas that are caught in the web and later ingested. Together, the flies, insects, spiders and web itself is what we refer to as an innovation system. But who are the spiders in innovation system 'webs' and how do they weave connections between stakeholders? This chapter looks at the people – the flesh and blood actors – that drive, stimulate or catalyze change by making links between the people, ideas and projects to support ongoing innovation. Who are these intermediaries? And how do they actively and consciously stimulate, support or initiate innovations that positively impact rural development? We look at the role of intermediators in catalyzing innovation and making interaction work.

Shifting focus: it's a matter of scale[6]

Innovation systems theory provides a framework to analyze how different actors and institutions influence innovation within a given context; it helps us understand how innovation works. And it can provide insight into needs, constraints and opportunities for innovation system improvement (a practical case of the potato sector in Ethiopia, Kenya and Uganda is demonstrated by Gildemacher *et al*., 2009). But the identification of constraints and opportunities does not, by default, lead to more or better innovations. The step from identification of a system constraint to collective action for improvement is a big one. We need additional tools to understand this next step.

Innovation systems thinking has also provided insights into the kinds of institutions that stimulate economic development through innovation, but the discussion has largely focused on higher system levels (World Bank, 2007). Much of the body of knowledge and literature on innovation systems refers to the national level. Researchers analyze and compare the actor configurations, policies and institutions at a national level that contribute to, or constrain, innovation, usually after it has happened. So often, this analysis focuses on the support infrastructure for innovation in a country and the 'innovation culture' that is present, which may provide more or less fertile soil for innovation. This focus on higher level actors is also true of the discussion on interaction between actors in these systems: analysis tends to focus on high level actors, for example, firms, government and 'intermediary bodies'. This makes innovation discourse quite abstract and impersonal. Furthermore, a focus on the role of 'institutions' (Edquist & Johnson, 1997), while justified, adds to this abstraction.

To effectively use innovation system theory in development practice, it is helpful to 'scale down' and entrench ourselves with the people actually engaging in local innovation processes: the agricultural researchers, traders, business men and women, public sector, private sector and NGO extension staff, farmers and their direct representatives, retailers, transporters, agro-industry and policy-makers in local and regional government. In addition to concise and accurate diagnoses of innovation system failures, we need effective instruments for shaping collaboration and interaction between these actors, that is, how flexible and adaptive innovation networks can be built. Effective ways to facilitate and stimulate collaborative action at grassroots level can complement the more established innovation system analysis and advocacy for innovation policy change.

Stakeholder interaction to catalyze innovation

Innovation systems thinking underlines the need for connectivity and as such, a lack of connectivity presents a significant challenge. Rajalathi *et al*., (2008) identify the establishment of networks and partnerships as important activities for improving innovation system functioning. Often market incentives are not enough to stimulate the emergence of these networks and partnerships: active partner search, matchmaking and coordination are essential. Innovation occurs as a result of a process of interaction between people (actors) around a problem or those who are working in a common sector (e.g. firms, government, farmers,

6 Innovation refers to change at a range of scales from local to regional, national and international.

NGOs, processors, and so on). Inevitably, communication and interaction between these stakeholders is imperfect, leading to misinterpretations and misunderstandings of behaviour, needs and opportunities. Linkages between actors have often either not been formed or are dysfunctional, meaning that people still do not understand one another and conflicting interests persist.

Network failure[7] refers to these imperfections in the relations between actors. There are lots of examples of 'weak network failure' in which there is limited or no interaction between important actors in agricultural innovation systems in developing countries. Poor interaction between agricultural processors and agricultural producers is a classic example of a network failure that hampers innovation. For example, lack of interaction means that farmers do not understand processors' quality requirements. Likewise, processors fail to understand how they can provide incentives to farmers, which will allow them to achieve the desired quality. On the other hand, the opposite, 'strong network failure', may occur: actors that interact and cooperate may well have established dependencies and interests, so previous choices constrain their 'innovation space'. They may end up with an inward focus (navel-gazing) and be closed for ideas and opportunities which they can obtain by engaging with new actors. Both types of network failure form a serious bottleneck for innovation: a situation requiring facilitation by some kind of an intermediary.

This problem – lack of interaction constraining innovation – is hardly unique to less-industrialized agricultural sub-sectors in sub-Saharan Africa. Klerkx & Leeuwis, (2008b) demonstrated that a lack of coordination was a serious constraint for innovation in the highly commercial farming systems in the Netherlands. The research supported the oft-repeated argument of the *systemic intermediaries* that they were needed in order to facilitate interaction between innovation system actors. Importantly, Klerkx & Leeuwis argue that innovation intermediaries are important for improving the functioning of innovation systems (2008a; 2008b; 2009). Improving an innovation system can be considered an issue of public interest, which would justify public investment in these services. Yet, the same authors also point out that evidence of the impact that these intermediaries have is difficult to make visible and hard to measure, rendering the justification of public spending complicated at best. However, although systemic intermediaries sometimes disappear as a result of this impact attribution problem, the continuing calls for people to play this role, and the appearance of new systemic intermediaries, indicates that the functions they fill are desired and necessary.

If intermediation between actors in the highly organized Dutch agricultural innovation system is identified as a need, it could well be essential to the functioning of agricultural innovation systems of developing countries, where interaction between the private sector (trade, processing and retailing), producers and agricultural research is the exception rather than the rule. Analyzing the success of agricultural sector interventions in developing countries, we see examples of failure due to a lack of intermediation, as well as success where intermediation has played an important role. As such, one could argue that the facilitation of

7 Woolthuis *et al.* (2005) distinguishes four broad categories of failure in innovation systems: infrastructural, institutional, network and capability failure. Here we focus on network failure.

interaction between innovation system actors should be a public good. It addresses the collective concern of system coordination, and thus public support can be justified.

Facilitating stakeholder interaction

But what does facilitating stakeholder interaction mean in practice? Interaction in agricultural knowledge systems has typically been just between two parties; for example, an extension agent relays knowledge from researchers to farmers. But this one-way knowledge channel with researchers being the key knowledge-holders is becoming a thing of the past. The increasingly complex innovation systems we see today, where many parties engage, demand more adaptable and resilient, multi-directional communication channels. We refer to these dynamic communication channels as multi-stakeholder processes. They require a dramatically different set of skills and capacities from the intermediary.

Facilitating interaction between stakeholders, with the specific purpose of catalyzing innovation, can be an important driver of development. Different approaches and methods have been developed and used in different contexts, each with important lessons. However, it could be argued that the facilitation of innovation has not been used systematically as an approach to rural development. Through the facilitation of innovation new marketing opportunities arise, new technology is developed and gets into use, and new arrangements for effective collaboration between stakeholders evolve.

The facilitation role has different manifestations; formal or informal. Kristanjson *et al*., (2009) describe facilitation in its informal state through a series of case studies that capture the stealth nature of what they refer to as boundary spanning actors (Box 13).

Box 13. Boundary spanning actors

Cash *et al.* (2003) state that boundary organizations are "organizations mandated to act as intermediaries between the arenas of science and policy". Boundary spanning actors make connections between actors not well connected or disconnected, and bridge weak ties and structural holes (Klerkx & Leeuwis, 2009).

Informal facilitation is spontaneous – the facilitator does what needs to be done because they happen to be situated in a position that allows them to engage. Their contribution often goes largely unnoticed, despite its importance.

A second manifestation is a more formal or recognized facilitation role: within already existing institutions (e.g. research/extension), in addition to other roles, a person is given the specific mandate to facilitate interaction within the innovation system. For example, the International Potato Center (CIP) Papa Andina project in Uganda and Bolivia/Ecuador/Peru (Bernet *et al*., 2006). Another example of a more formalized facilitation role is that of a specialized organization (intermediary) as we see in Hannington (Chapter 4). These specialized organizations acting as intermediaries are sometimes referred to as innovation brokers or knowledge brokers (Klerkx & Leeuwis 2008a; Klerkx & Leeuwis 2008b; Klerkx & Leeuwis 2009).

Box 14. Innovation intermediaries and innovation brokers

Howells (2006:720) defines an **innovation intermediary** as "an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties". The provision of brokerage and mediation services might or might not be the primary role of an innovation intermediary For example, a research or extension organization might, as a sideline, broker innovation in some of its projects.

Winch and Courtney (2007:751) define an **innovation broker** more narrowly as "an organization acting as a member of a network (…) that is focused neither on the organization nor the implementation of innovations, but on enabling other organizations to innovate".

Klerkx & Leeuwis (2009:851) identify three main functions of an innovation broker:

1) ***Demand articulation***: Articulating innovation needs and visions and the corresponding demands in terms of technology, knowledge, funding and policy.

2) ***Network composition***: Facilitating linkages among relevant actors.

3) ***Innovation process management***: a continuous activity of enhancing alignment in heterogeneous networks of actors with different objectives, institutional norms, values, incentives, and reward systems that involves boundary management, translation, and mediation.

Source: Devaux *et al*., 2010

An important, but unclear question is: who is best placed to play an innovation broker role: a freelance consultant, research organization, government ministry, development organization or private sector organization? In other chapters, we see examples of facilitators of innovation processes who are placed differently: Mayanja *et al*. (Chapter 11) look at a research organization that facilitates interaction amongst stakeholders, whereas in SadreGhazi's (Chapter 9) example it is a private sector organization. Konlambique *et al*. (Chapter 10) take the perspective of a development institute.

Obstacles to intermediation for innovation

There are several important constraints that contribute to the limited use of intermediation as a tool for stimulating agricultural innovation.

Lack of recognition that intermediation contributes to innovation (Klerkx & Leeuwis, 2008a). While this chapter (and book) strongly argues that interaction, and having someone facilitate that interaction, is key to catalyzing agricultural innovation, this is not a universally held position. As we have seen, the role of intermediator/facilitator is often assumed rather than explicitly sought out.

Lack of recognition for intermediation as a profession. The skills and capacities required to effectively intermediate are underestimated. Facilitation and intermediation are not recognized as professions in their own right. However, the recent wave of attention paid to private sector involvement in agricultural innovation in developing countries means that this gap is also coming into the spotlight. This is starting to create a shift in terms of the value placed on the role of intermediates; demand is growing for these 'facilitation' services.

Lack of capacity to effectively play this role. Few organizations in developing countries both recognize intermediation for innovation as a profession and have the organizational capacity to effectively do it. Furthermore, only a limited number of individuals within agricultural service provision organizations actually have experience in this role. Acquiring skills for intermediation in agricultural innovation is a feat in and of itself: no training or capacity development programmes are in place.

Recognizing the potential contribution of intermediation for agricultural innovation, and the above identified constraints, specific action is required to better recognize the role of intermediaries. Further, we need to improve our understanding of how to effectively use intermediation as a deliberate tool and build the human capacity to engage as intermediaries at a significant scale. The next section explores the latter.

Capacity development

To what extent can a facilitator of innovation be trained? What does this imply? In 2009 the Royal Tropical Institute (KIT) brought professionals from Africa together to reflect on this role: an exercise that yielded an impossibly long and broad list of required skills and individual capacities (Gildemacher & Pyburn 2009). The role of intermediary – otherwise referred to as broker – is, strangely enough, an assumed role. This means that people who fall into that role are, for the most part, left without training in the skills required to effectively engage (Tennyson, 2005).

KIT is developing a mentoring programme for facilitators of innovation and is piloting the capacity development trajectory through a number of ongoing projects, including: a Wageningen University joint initiative, the Convergence of Sciences – Synergising Innovation Systems (CoS-SIS) programme, which explores innovation processes in various sectors in Benin, Ghana and Mali, with national universities (Box 15); and Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) (Box 16).

Box 15. CoS-SIS

CoS-SIS was a multi-institute, multi-country university research programme that ran from 2008-2013 in West Africa. The programme aimed to carry out inter-disciplinary policy and institutional experiments to elaborate, apply and assess a development approach to sustainable rural poverty alleviation and food security, based on innovation system thinking. It worked within three domains in each country: Benin – cotton, oil palm production, water management; Ghana – cocoa, food security, oil palm production; Mali - agricultural surface water management, shea butter, integrated livestock and fodder management. Each domain had a research associate and a PhD student assigned to it.

While the universities involved addressed scientific knowledge development, KIT worked with the research associates to support their efforts to put innovation platforms in place and facilitate multi-stakeholder processes within their assigned domains. KIT support to the research associates was provided throughout their work cycle, based on needs arising as they endeavoured to play their roles as innovation brokers or facilitators. Training included: stakeholder analysis, participatory monitoring and evaluation, value chain analysis and facilitation skills. KIT also worked with the programme to make scientific learning available to stakeholder groups beyond the scientists, for example, development professionals.

A strength of the CoS-SIS programme as a whole was that the designers recognized the mammoth task that they were putting on the research associates and that they would be navigating unknown territory with limited pre-programme preparatory training. KIT worked on a 'as-needed' basis to develop a series of support sessions that met the evolving demands of these research associates. For more on CoS-SIS see: www.cos-sis.org.

Box 16. RUFORUM training experience

The Graduate Opportunities for Innovation and Transformation (GO4IT) project aims to equip mid-career professionals in the field of agricultural research and development with the essential competencies, knowledge, attitude and skills to contribute to and facilitate innovation processes for rural development. Participants learn how to establish and facilitate an action research process aimed at rural innovation. With assistance from RUFORUM and KIT, three participating African universities have developed and implemented a part-time mid-career training course on the facilitation of innovation processes. The programme is set up as an action-learning framework: it integrates a training programme with the preparations for action research, and continues with the actual action research. After four blocks of training and consequent on-the-job practical action research assignments of two months each, the programme culminates in a writeshop at the end of the process in which course participants, and the stakeholders involved in the action research, reflect on and analyze the processes and results. For more on RUFORUM see: www.ruforum.org.

An agenda for action set by practitioners

In 2009 at KIT, 14 practitioners from sub-Saharan Africa, with experiences in intermediation in this region, joined forces to develop a capacity building and action research programme for what was coined 'agricultural innovation coaches' (AI-coaches) (Gildemacher & Pyburn 2009). The following principles drive the thinking behind this initiative and sum-up the argument in this chapter:

- Innovation happens through interaction (learning and collaborative action) between stakeholders (at local level).
- It is not possible to completely plan an innovation process; instead it requires adaptive management, which entails responding flexibly and reflexively to changing partner interests, innovation network goals and a changing environment.
- Individual facilitators are essential for catalyzing agricultural innovation through intermediation and fostering adaptive innovation management (Klerkx *et al*., 2010).

Important insights and advice for agricultural innovation from these practitioners with experience in intermediation include:

1. Facilitating innovation is a step-by-step process: 1) context analysis; 2) network establishment; 3) participatory needs and opportunity assessment; 4) action planning; 5) problem solving and conflict resolution; and 6) development of an exit strategy.

2. Context analysis. Map and diagnose the strengths and weaknesses of the innovation system (Gildemacher *et al*., 2009) in order to develop a clear vision as to the issues that need to be tackled, the level of aggregation, and the kind of innovation envisioned. This process should also clarify whether someone is already acting as an innovation broker and the extent to which their actions may complement or overlap with the terms of reference (ToR) of the proposed innovation broker.

3. Existing tools, methods, approaches. While the terms 'AI-Coach', 'boundary spanner' or 'innovation broker' are not widely recognized, the role itself is alive and well in practice. Some resources and bodies of knowledge are already available to support people endeavouring to act in this kind of role, for example: facilitation of multi-stakeholder interaction, value chain development and agricultural innovation system analysis, amongst others.

3. Role of agricultural innovation systems theory. The real proof of a concept is in practice. It is important for practitioners to keep in mind that experience steers the development of theory. Innovation brokers are pioneers and, as such, should make decisions based on their own understanding, experience and judgment, rather than searching for answers in theory.

4. Learning-by-doing. Attention to the role of innovation brokering in agricultural development is a new phenomenon. That said, many practitioners will recognize innovation brokerage as a role that they have played or witnessed. As such, we have elements of what is required for capacity development in terms of theory, resource people, and tools to support practitioners in learning through experience, how to play this role.

5. The ideal innovation broker is just that, an aspirational ideal. When considering the skills and attitudes required of a good innovation broker, a long list emerges (Gildemacher & Pyburn 2009). Such a conglomeration of qualities are impossible, or at least very rare, to find in a single person. So the role of innovation broker will depend on an imperfect/incomplete individual who will need to continually develop their own personal style as a broker in a way that reinforces strengths and compensates for weaknesses.

6. Structured exchange of experiences. As it is a new field, investment of time and effort to exchange experiences between peers, is necessary. Structured peer-to-peer exchange and support will both improve the direct performance of emerging innovation brokers through building capacity and stimulating reflection.

7. Room (and freedom) for manoeuvre. Once established, an innovation broker should be given considerable freedom to explore new options and establish linkages rather than be tied to prescribed input-output schemes and logframe-determined performance indicators. The primary work of innovation brokers is to improve the quality of interactions and processes during innovation trajectories, and it needs to be recognized that this entails many intangible contributions that make interdependent actors and networks collaborate effectively.

8. Direct and indirect results. Results can be both direct and indirect. Direct activities and results are needed to keep the innovation coalition together long enough to build trust and build relationships. Without direct results and activities it is impossible to keep actors motivated to invest in interaction and collaboration. Furthermore, direct innovation results are needed to justify investments in coalition building and brokerage. However, the biggest potential for impact is through better long-term collaboration between actors, which contributes to transforming the innovation system such that it becomes responsive and contributes to a durably competitive agricultural sector.

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Chapter 13

Monitoring and evaluation for rural innovation processes

Remco Mur and Cecile Kusters

Key Message: The success of development initiatives can be enhanced by good monitoring and evaluation (M&E), but rural innovation processes have particular requirements in relation to M&E due to the nature of these processes. They require dynamic and learning oriented M&E as the context, and therefore effects of the innovation processes, rapidly change and the many stakeholders at dif ferent levels need to quickly learn from each other's successes and failures for responsive management.

This chapter describes how (rural) innovation processes are different from processes that are more technical in nature and the implications of these processes for M&E so as to enhance their impact. In order to understand what is needed for M&E, a framework that focuses on innovation processes is provided. In addition a few M&E approaches that are specifically geared to the M&E of innovation processes are described.

The nature of rural innovation processes and implications for M&E

Agricultural development can significantly contribute to the eradication of poverty and enhancing food security. Experience demonstrates that sustainable agricultural development requires simultaneous change at different levels and in different domains (van Mierlo *et al.*, 2010). Innovation in the agricultural sector is essential to maintain growth in productivity, to enhance effectiveness and efficiency of commodity chains and to address issues vis-à-vis sustaining the natural resource base and adapting to change. Development initiatives that are innovative are often characterized by complexity. They unfold in a changing and unpredictable environment (Gamble, 2008).

Innovation processes are uncertain, and involve exploration, experimentation, adaptation, and changing directions based on experiences and newly derived insights. Ritman *et al.*, (2011: 1) define innovation as "the process leading to adoption of new or existing information, technology or practices. It includes factors that affect demand for and use of knowledge in novel ways". The complexity and uncertainty of innovation processes require new ways of management, where strategic thinking, learning and reflexivity, but also stakeholder engagement, are crucial (Hall *et al.*, 2004; van Mierlo *et al.*, 2010). Consequently, there is a need for alternative approaches to M&E. In this chapter we look at how M&E can provide direction to innovation processes and how learning and reflexivity, as well as stakeholder engagement, can enhance these processes. We approach innovation from a systems perspective and as an interactive learning process that involves a variety of interdependent actors.

Monitoring and evaluation for innovation also needs to capture the unexpected, and to understand complex situations that can only be understood in hindsight. M&E needs to be flexibly adapted over time. For the more technical aspects of innovation processes that are simple in nature, or can be understood by experts, it is good enough to work with mainly fixed indicators and M&E that can be more or less routinely carried out, either by programme staff or with the help of experts. But for situations that are more complex in nature, a different approach is needed. Stakeholders need to be in close interaction so as to learn from their experiences, try out new things and keep adapting. Dave Snowden, founder and chief scientific officer of research network Cognitive Edge, developed a useful sense-making model that he calls the Cynefin framework (Cognitive Edge, 2010). In the complex domain cause and effect relationships can only be understood in hindsight, with unpredictable, emergent outcomes.

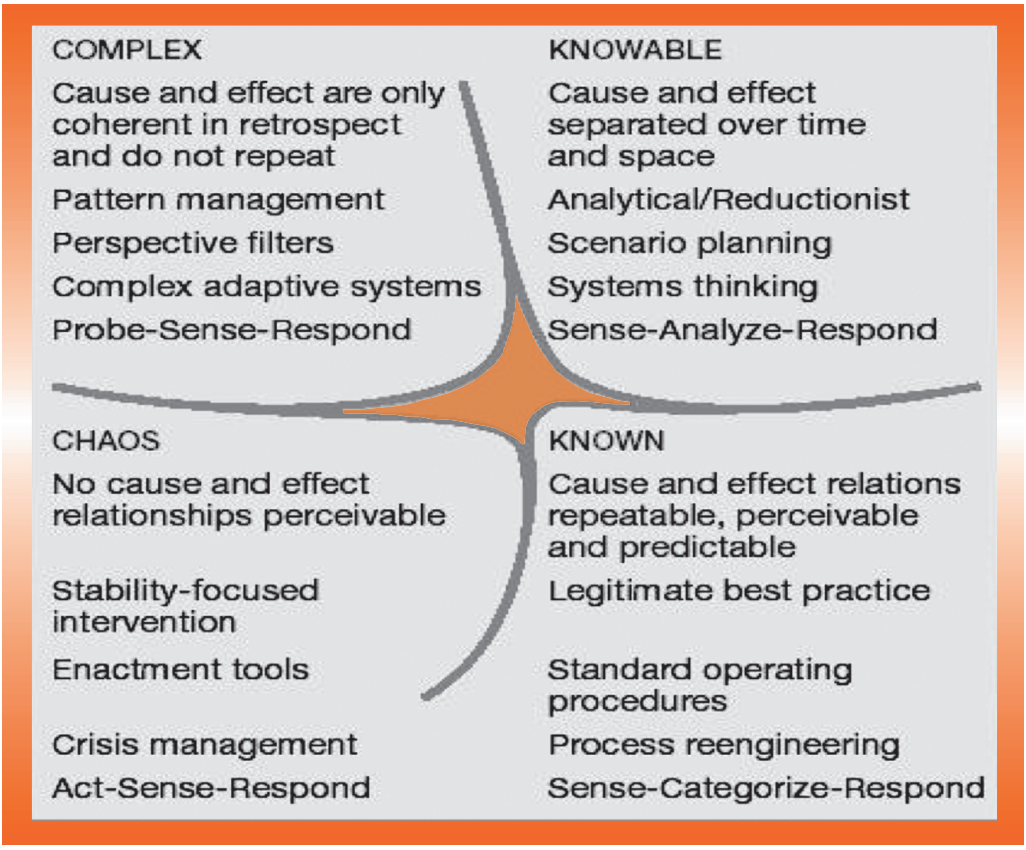

Figure 5: Cynefin framework (Snowden 2010)
http://cognitive-edge.com/uploads/articles/The_Origins_of_Cynefin-Cognitive_Edge.pdf

Innovation emerges from the interaction of multiple stakeholders and is not only about technical change, but also involves institutional innovation. Innovation is the right mix of changes in hardware (technology), software (capacities, knowledge) and orgware (organizations and institutions). Therefore, these elements need to be taken into account when designing and implementing M&E. Keeping an eye on internal and external dynamics is important so as to ensure adaptive management (Table 6).

Table 6: Internal and external dynamics to keep in mind

Internal process dynamics	External environmental dynamics
• Individual capacities: skills, expertise and experience • Institutional capacities: organizational assets, systems and structures • Policies, leadership styles and group dynamics • Values, principles and approaches • Individual styles and preferences • Roles/relationships between key stakeholders	• Global trends and developments: economic, social, political, environmental, etc. • Governance, power and culture • Technological and scientific developments and discoveries • Confzlict, war and other crises • Natural disasters

(Source: Kusters *et al.*, 2011)

Designing an M&E system

When engaging with M&E one needs to have a good understanding of what is required of an M&E system so as to ensure it is systematic and effective. Kusters *et al.*, (2011) propose a framework for the design and implementation of evaluations which can be adapted to M&E system design and implementation. This framework is not a step-by-step sequence of items to deal with, but rather an iterative process (Figure 6).

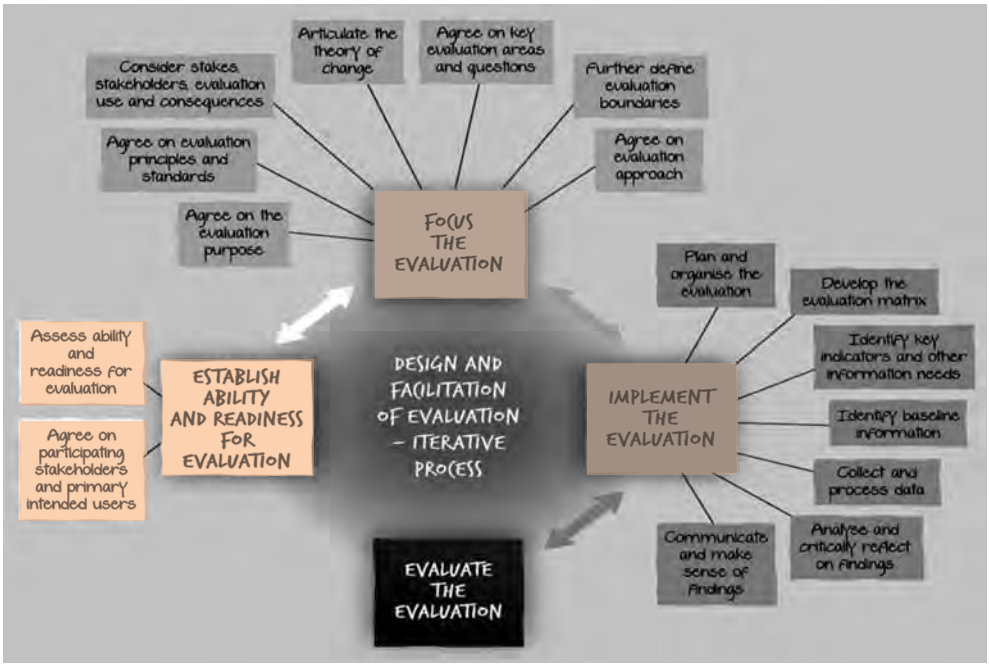

Figure 6: Design and facilitation of evaluation

For the design of the M&E system, it is important to first of all assess readiness and ability of staff and stakeholders to engage in M&E. Then to focus the M&E system:

Agree on the purpose(s): there are many reasons why different stakeholders would require M&E. The most common ones include (upward) accountability and operational management. For accountability the objective is to justify, often in retrospect, the use of resources. The tool of preference for M&E in international development is the logframe (Logical Framework matrix). However, particularly for innovation processes, strategic management and knowledge generation would be important purposes.

Box 17. Purposes of monitoring and evaluation (proposed by Kusters *et al.*, 2011)

- Accountability
- Strategic management
- Operational management
- Policy-making or influencing
- Knowledge development
- Empowerment of stakeholders
- Development of learning organizations
- Creation of forums for democratic deliberation
- Advancement of social justice
- Enhancement of practical wisdom and good practice judgements

Learning from experiences, for the benefit of the innovation process itself, but also for the benefit of future initiatives, is central to M&E in innovation. Box 17 refers to different purposes for M&E. M&E for innovation should support complex processes without predefined outcomes to design, redesign and act upon actions (van Mierlo *et al.*, 2010). Hence, reflexivity and learning become important elements of the management and the major objectives of M&E in innovation processes, which influences the M&E approach. The learning process requires collective action, reflective moments, and an environment of trust between stakeholders (Box 18). In M&E in innovation processes, learning is not considered an end in itself, it is above all about learning to address the challenges that are encountered in innovation processes by developing possible solutions jointly, and allowing for structural

Box 18. Reflexivity

An important objective of an innovation system is learning by doing. This iterative process of acting and learning is referred to as 'reflexivity'. "Reflexivity is considered to occur when the observations or actions of observers in the social system affect the very situations they are observing" (Wikipedia, no date). In the context of agricultural innovation, van Mierlo et al. (2010) refer to reflexivity as "the ability to affect and interact with the environment within which an innovation system operates".

Reflexivity and M&E

Systems innovation initiatives need to be accompanied by a M&E approach that supports and maintains reflexivity. Stakeholders continuously trace obstacles and changes created in the innovation process and developments in the landscape, and then reflect on what these could imply for their basic principles, goals and activities. This reflexive process continues throughout the process, from the planning stage until after it is completed, and involves assessing the experiment in its environment. This analysis might cause the stakeholders to revise their points of departure and/or activities or consider new plans for the future. "System innovation projects benefit from a type of monitoring that encourages the 'reflexivity' of the stakeholder and their ability to affect and interact with the environment within which they operate. To realize the ambitions of system innovation, then reflection and learning must be tightly interwoven within the process" (van Mierlo *et al.*, 2010).

changes that are needed for sustainable development (van Mierlo *et al.*, 2010). Hence, M&E is embedded in the innovation process. Evaluation is no longer an external observation of the intervention strategies but rather becomes part of innovation strategies (Patton, 2011).

- *Agree on principles and standards:* there are existing evaluation standards that have been developed to enhance the quality of evaluations. Next to or in line with these, principles that should underpin the M&E processes should also be considered (American Evaluation Association, no date). Kusters *et al.*, (2011) propose principles around utilization and

consequence-awareness, stakeholder engagement and learning, situational responsiveness and multiple M&E roles. M&E geared towards learning is characterized by active engagement of stakeholders in the process. Participatory approaches have been widely accepted in the planning and implementation of development programmes. With the need to improve downward accountability, the need for participatory monitoring and evaluation (PME) arose. In innovation processes, M&E and learning by stakeholders are intricately linked.

- *M&E for innovation is utilization-focused*: it applies methods to serve intended development practitioners who need specific information and use evaluation findings in their activities and decision-making. Utilization-focused evaluation is done for and with specific primary intended users and for specific intended uses. To make M&E matter, it should be developed for utility and actual use. This refers to the ways people use and apply the evaluation monitoring and findings and how they experience the M&E process (Patton, 2011). In M&E for innovation, the intended use is innovation. The primary intended users are stakeholders (e.g. farmers, process facilitators) of the innovation process as well as others working to bring about innovation, such as policymakers and service providers.
- *Consider the stakes, the stakeholders, evaluation use and consequences*: when engaging in M&E think through who needs (and wants) to be engaged in the process and how they intend to use the M&E findings. Also think through the consequences of any decisions made during the design and implementation process. For example, not engaging a particular stakeholder may affect the use of findings by this stakeholder.
- *Articulate the theory of change (Box 19)*: different people have different theories about how change happens. In innovation processes, result chains are often complex and dynamic: they evolve during the process and cannot be predicted in advance. Care is required when making judgements about cause-effect relationships of result chains. Nevertheless, people involved in innovation processes do have ideas on, and make assumptions about, how change will happen. These ideas and assumptions are reflected in the theory of change. M&E for innovation plays an important role in making explicit and adjusting stakeholders' theories of change and in identifying communalities and fundamental disagreements, not only at the beginning, but more importantly as the process evolves. Only in retrospect can we know the way that innovation occurred, the relationship between the effectiveness of the design and execution of the intervention, and the observed impact.

Box 19. Theory of change

A theory of change is the envisaged pathway of change for a development intervention or innovation process. Different people have different views on how change comes about. It is important to make explicit these implicit theories of change, including the views on roles and relationships, as well as on the underlying processes and assumptions for change to happen (Kusters *et al.*, 2011). Typical steps in articulating a theory of change include:

1. Identification of a long-term goal.
2. "Backwards mapping" to identify the preconditions necessary to achieve that goal.
3. Identification of the interventions that your initiative will perform to create these preconditions.
4. Development of indicators for each precondition that will be used to assess the performance of the interventions.
5. Writing of a narrative that can be used to summarize the various moving parts in your theory.

This process provides an opportunity for stakeholders to assess what they can **influence**, what **impact** they can have, and whether it is **realistic** to expect to reach their goal with the time and resources they have available. Accordingly, the theory of change can be used to:

- check progress;
- keep track of emerging issues that influence the innovation process;
- keep track of critical assumptions and other (unexpected) changes in the context
- document lessons about what really happens;
- keep the implementation and evaluation process transparent;
- help prepare reports of findings, policy, etc.

(See: www.theoryofchange.org)

- *Agree on key evaluation areas and questions*: these are questions that help you to focus your information gathering on what will truly advance understanding and improve performance of the rural innovation process. Often these questions are developed around the common evaluation areas based on the OECD's Development Assistance Committee (DAC) criteria: relevance, effectiveness, efficiency, impact and sustainability (OECD, no date).
- *Further define evaluation boundaries*: other factors also influence the extent and approach of the M&E system, such as level of stakeholder engagement, level of detail and funding.
- *Agree on evaluation approach*: once the above mentioned boundaries have been further clarified, think about the general approach for M&E. Below you can find a few examples.

Approaches to M&E for innovation

In summary, M&E for innovation needs to be designed as a continuous, dynamic, iterative action-reflection-action process. Reflection spaces, where stakeholders reflect on experiences, analyze and draw lessons, are imperative. The approach employed will need to include qualitative methods to make sense of what is happening and what effects are emerging. There is no step-by-step methodology for M&E in rural innovation. The right method is determined by need and context. Approaches may be drawn from organizational development, traditional evaluation, or community development. Often combinations of methodologies are required, including both quantitative and qualitative methods. M&E tools are currently being developed to more specifically reinforce the process of learning and documenting lessons.

The choice for a particular approach depends on the purposes, the level of complexity of the innovation process, the level of stakeholder engagement in the process, and on the focus of the M&E system as defined above, amongst other factors. Below you will find a few examples of M&E approaches that seem to be more appropriate for the M&E of rural innovation processes.

Table 7. Principles of systems thinking and their implications for innovation processes

	Traditional programme evaluation tendencies	Complexity-sensitive developmental evaluation
Evaluation purposes	Formative-summative distinction dominant: formative improves, summative tests, proves, and validates programme models; accountability.	Support development of innovations and adaptation of interventions in dynamic environments.
Situation where it is appropriate	Manageable and stable situations: root cause of the problem being addressed is known and distinct; intervention reasonably well conceptualized; goals known; the key variables expected to affect outcomes are controllable, measurable and predictable.	Complex, dynamic environment; no known solution to priority problems; no certain way forward and multiple pathways possible; need for innovation, exploration, and experimentation.
Dominant niche and mind-set	Finding out if a programme model works: focus on effectiveness, efficiency, impact, and scalability.	Exploring possibilities; generating ideas and trying them out; pre-formal model, so pre-formative; non-summative in that ongoing innovation and development is expected, never arriving at a fixed intervention.

Developmental evaluation

Developmental evaluation supports development of innovations and guides adaptation to emergent and dynamic realities in complex environments. Table 7 provides an overview of the contrasts between traditional approaches to evaluation and complexity-sensitive developmental evaluation. Patton (2011: 59) refers to developmental evaluation as a suitable way to evaluate complex situations: it "tracks and attempts to make sense of complexity, documenting and interpreting the dynamics, interactions, and interdependencies that occur as innovation unfold". Its focus is on systems change and the provision of feedback, generating learning and supporting action in the innovation process. Developmental evaluation is based on systems thinking and aims to capture and map complex system dynamics and interdependencies, and to track emergent dynamics (Patton, 2011; Kusters *et al.*, 2011).

Developmental evaluation applies to an ongoing process of innovation in which both the path and the destination are evolving. Given its orientation towards innovation and complexity, developmental evaluation is best suited for situations in which innovation is key with a high degree of uncertainty about the path forward. There is no step-by-step methodology for developmental evaluation. The right method is determined by need and context. Approaches may be drawn from organizational development, traditional evaluation, or community development. Tools include outcome mapping, systems analysis framework, system mapping, system modelling, and strategy development, testing, and refinement. During the entire process, it is important to keep an eye on group dynamics, key developmental moments and actions (small or not). In the end, sense has to be made of the data. This requires both analysis and synthesis. This is when the emerging insights are identified, assessed, and developed (Patton, 2011).

Systems concepts in action

In *Systems Concepts in Action*, Williams and Hummelbrunner (2011) provide a number of useful and practical approaches and methods for system analysis that are very suitable for M&E for innovation. The methods help us to understand, analyze, manage, learn, change and evaluate complex and complicated situations. The approaches and methods help to describe situations systematically and analyze the various boundaries, perspectives, and interrelationships that are observed. There is a strong focus on applying the insights these methods generate aiming at changing and managing situations and at learning about the situations through sense-making. It includes concepts and tools for:

a. ***Describing and analyzing situations.*** Causal loop diagrams; system dynamics; social network analysis; outcome mapping; process monitoring of impacts; strategic assumptions surfacing and testing;

b. ***Changing and managing situations.*** Strategic area assessment; the container, differences, exchanges (CDE) model; assumption-based planning; Cynefin model; viable system model;

c. ***Learning about situations.*** Cultural historical activity theory; soft systems methodology; dialectical methods of inquiry; scenario questioning; circular dialogues; critical systems heuristics.

Reflexive monitoring in action: monitoring innovation projects

Reflexive monitoring in action (RMA) is a monitoring approach that has been developed by researchers from Wageningen University and the VU University Amsterdam for supporting and facilitating innovation projects in general, and complex system innovation projects in the agricultural sector in the Netherlands in particular. Such projects are carried out by stakeholder networks, e.g. networks to develop CO_2-neutral cultivation or networks to create ultra-short food chains. These are learning and reflection networks in the sense that the new knowledge can only emerge as a result of one or several social learning events. The facilitator or 'monitor' will take action if there is insufficient trust within the network or if participants are becoming so entangled in details that they are getting distracted from the long-term ambitions. To do so, the monitor can make use of seven tools, some of which were specifically developed for RMA: (1) system analysis; (2) actor analysis plus causal analysis; (3) dynamic learning agenda; (4) indicator sets; (5) reflexive process description; (6) audio-visual learning history; and (7) timeline and eye-opener workshop. Guidelines for the application of RMA are provided by van Mierlo *et al*. (2010).

Outcome mapping: evaluating behavioural change

The key difference between outcome mapping and most other project evaluation systems is its approach to the problem: the idea that a project's direct influence over a community only lasts for as long as the project is running, and that development agencies have difficulty in attributing resultant change in those communities directly to the actions of the project itself. The outcome mapping approach is to focus less on the direct deliverables of the project and to focus more on the behavioural changes in peripheral parties affected by the project team. It focuses on behavioural change exhibited by secondary beneficiaries. The outcome mapping process consists of a lengthy design phase followed by a cyclic record-keeping phase. Outcome mapping is intended primarily for development projects in the South. In soft systems methodology terminology, outcome mapping is more concerned with effectiveness than with efficacy or efficiency.

There are three stages and 12 steps to outcome mapping. They take the programme from reaching consensus about the macro-level changes it would like to support, to developing a monitoring framework and an evaluation plan. During the design, project leaders identify metrics in terms of which records will be kept. In outcome mapping, three types of records may be kept, and it is largely up to the project leaders or donor organization to decide which of the three (or all three) types of records should be reported back on. The records are: (1) *a performance journal*, which is essentially a collection of minutes of progress meetings; (2) *a strategy journal*, which records strategic actions and their results; and (3) *an outcome journal*, which is an anecdotal record of any events that relate directly or indirectly to the progress markers (the expect-to-see, like-to-see and love-to-see items). The outcome journal is most useful towards the end of the project in providing the donor with visible impact stemming from the expenditure of funds, but may also be submitted to the donor at intervals.

Rapid appraisal of agricultural knowledge systems (RAAKS)

RAAKS builds on a model of learning and inquiry that is specifically aimed at problems in agricultural knowledge and information systems (AKIS) (Engel, 1997). RAAKS is special in the sense that it is theoretically founded in the soft systems methodology and practically validated in four continents, including Africa and Latin America (Engel, 1997; Engel & Salomon, 1997). RAAKS is a methodology for facilitating agricultural innovation and rural development.

RAAKS has been widely used for innovative capacity development[8] and social learning processes at the community level among rural organizations and institutions and, more recently, in agricultural market chains. The RAAKS methodology is described in *Facilitating Innovation for Development: A RAAKS Resource Box* (Engel & Salomon 1997). A RAAKS action-research study is carried out in three phases: (a) problem definition; (b) analysis of constraints and opportunities; and, (c) strategy development and action planning. In each phase, different perspectives or 'windows' are used to explore the situation. Each window provides one or more tools. The tools outline practical means for gathering and organizing the relevant information.

Realist evaluation: what brings about change?

The distinctive focus of realist evaluation is on how interventions bring about change. It not only asks what works, or if something works but goes further, delving into what works for whom, in what contexts, in what respects and how (Westhorp *et al.*, 2011). Realist evaluation assumes that a development programme is testing a theory about how change occurs and about what is causing change. Programmes are viewed as 'theories'. Often, the theory is not made explicit and different stakeholders have different assumptions and different hypotheses as to how change comes about. The task of a realist evaluation is to make these theories, hypotheses and assumptions explicit. In this way, it contributes to developing clear understanding about how, and for whom, programmes might work and under what circumstances. The implementation of the programme and its evaluation test these theories and hypotheses and contribute to their refinement (Pawson *et al.*, 2004; Westhorp *et al.*, 2011).

Hence, the collection of data in realist evaluation is not just about programme impacts or implementation, but also about the specific aspects of programme context that might impact on outcomes, and about the specific mechanisms that contribute to change. A realist approach compares mechanisms and outcome patterns within programmes. It may ask whether a programme works differently in different localities and contexts and if so, how and why. It may also ask whether a programme works differently for different segments of a population (men vs. women, differing socio-economic status, caste, ethnicity etc). Different stakeholders have different information and understandings about how programmes are supposed to work. Data collection processes (interviews, focus groups, questionnaires, etc) should be designed to collect the particular information held by those stakeholders in order to

8 The capacity for innovativeness is embedded in the social relations and interactions of a large number of semi-autonomous actors – individuals, groups, organizations and institutions.

understand and refine theories about how and for whom a programme 'works' and under what conditions (Community Matters, no date; Pawson *et al.*, 2004).

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Chapter 14

Monitoring and evaluation for competitive intelligence

Noël Ujeneza, Ted Schrader and Arno Maatman

Key message: For stakeholders to innovate and learn together they need good information. This requires 'entrepreneurial monitoring and evaluation' that supports innovation.

Managing a farm in northern Rwanda

Kalisa, his wife Mukesha and their five children live on a farm in a mountainous part of northern Rwanda; they mainly produce maize and potatoes. They are eager to improve their living standards and dream of sending their eldest son to Kabuga high school and of buying a dairy cow.

Kalisa and Mukesha have started to intensify their farming methods. What is the smartest strategy to improve productivity? Kalisa's neighbours got subsidized hybrid maize from the local authorities. It looks nice in their fields and gives a better harvest. But the growing season is longer, which means foregoing a second potato crop. Would selling fresh maize be an option? Last year the price of a cob of fresh corn was 80 francs. This compares to the five cobs needed for every kilo of dried maize, which was then sold at 250 francs. Selling fresh corn would be new for Kalisa and might be profitable. But how and where would he sell it? The major market is in the capital city, Kigali. Which traders and middlemen can be trusted? Will they pay, when so many promises never materialize?

In trying to find answers to these questions and preparing to sell 1,000 ears of maize, Kalisa discovered that the local authorities discouraged the sale of fresh maize in order to increase the availability of maize flour. The 80,000 francs needed for school fees were suddenly out of reach. If they had been informed earlier, Kalisa and Mukesha would have sought alternative sources of income. Mukesha could have increased her plots of climbing beans, which mature rapidly, and good seeds are reportedly available at the nearby research centre. Now, they have to borrow money from the bank. But banks require collateral and they do not yet have a cow. Would it be an idea to join the saving and credit group on the nearby hill?

Maize inputs are subsidized by the government through the Crop Intensification Programme. Chances of getting such a subsidy are improved when farmers consolidate their land. Should Kalisa and his fellow farmers join their land and volunteer for land consolidation? The local government may tell them to do so in any case. But if they decide to convert all their land to maize production, the farmers need to be sure of a good price.

Kalisa has heard that the Amizero cooperative negotiates interesting contracts with the Mukamira maize mill, but that the contract negotiations generally take a long time. What are the advantages and disadvantages of becoming a member of the cooperative and engaging in contract farming? Might it be more profitable to sell individually to traders, especially in the rainy season when imports from southern Uganda and northern Kivu in DRC are less important and prices are highest? Whatever their strategy, Kalisa and Mukesha definitely need money to repay the bank loan.

Management: an agri-business versus a development project

People like Kalisa and Mukesha are farmers – but they are also rural entrepreneurs trying to increase the productivity and efficiency of their agri-business (the farm) and earn better incomes. Just as they are working to improve their position through economic activities, many development projects aim to support rural farmers to earn better livelihoods and climb out of poverty.

Although the aims are the same, the process of managing an agri-business is quite different from managing a development project. Local entrepreneurs have different information needs, for example, than project managers. And the monitoring and evaluation (M&E) of development projects (project M&E) fundamentally differs from M&E of agri-business ventures (entrepreneurial M&E). This paper explores whether it is possible to connect agri-business and development projects, and, if so, how. In other words: what can agricultural development projects do to strengthen the competitiveness of local entrepreneurs?

Project M&E versus entrepreneurial M&E

How do development projects operate? Normally, a project document is the starting point. It indicates the goals and desired results and the activities that should lead to them. The budget enumerates planned expenditures. Project managers, who are responsible for implementation develop operational plans, define implementation modalities and recruit project staff. Donors expect that by the end of the project the budget is spent and goals attained. During the implementation process, project management has the obligation to regularly report to the donor. Project teams therefore develop project monitoring and evaluation systems, and collect information on the indicators set out in the project document. M&E costs are part of the project budget.

Managing an agri-business is a different story. Entrepreneurs start off with business ideas and initiatives. They mobilize their own funds or take bank loans to achieve economic objectives. Over time, turnover and profits are expected to grow. The information needs of agri-business

enterprises are multiple and evolve as the business unfolds. M&E is an expenditure that needs to be earned back. This does not mean that entrepreneurs (both large and small) do not invest in M&E – they do, although sometimes with very limited means. Through 'light', flexible and generally informal M&E systems, they keep track of activities, earnings and expenditures, and identify opportunities and risks. Table 8 summarizes the major differences between project and entrepreneurial M&E.

Table 8: Major differences between project and entrepreneurial M&E

Parameters	Project M&E (navigating a development project)	Entrepreneurial M&E (navigating business)
Sources of funding	- External funds ('cold money')	- Own funds and/or bank loans ('hot money')
Goals	- Public good, typically poverty reduction	- Benefits for enterprise: profit, competitiveness
Indicators	- M&E indicators in project document (log-frame)	- M&E mostly informal (small entrepreneurs) - M&E indicators in business plans, to convince banks and inform business partners
Planning	- Annual activity plans based on project document, quite rigid - Time-consuming planning process, extensively reported	- Incremental investment and adaptive decision-making, reacting on operational performance, constraints and opportunities - Generally 'light' planning documents (if any)
Motivation for M&E and learning	- Upward accountability to funding agency - Learning focused on project staff and project implementation	- Accountability to management, shareholders and business partners (including banks) - Learning focused on strengthening performance and competitive position
Monitoring costs	- Part of project budget be earned back	- Part of operational costs of enterprise, have to
Reporting	- M&E reports (surveys, data analysis, evaluations) - Extensive progress reports	- Regular face-to-face exchange within enterprise and with business partners - Written reports focus on operational and financial performance

Information needs of local entrepreneurs

Farmers, and rural agro-enterprises in general, need to constantly gather information to innovate, remain competitive and sustain profits. They need to proactively navigate their business. 'Navigating business' refers to steering an enterprise in dynamic environments. An entrepreneur needs 'competitive intelligence', i.e. the ability and capacity to monitor business processes and performance, relate to other stakeholders and read the business environment. Entrepreneurs engage in operational, tactical and strategic M&E activities to substantiate decisions for strengthening their competitive edge.

Business processes and performance. Entrepreneurs need up-to-date information on the functioning and performance of their businesses. Are operations efficient? Can costs be reduced? Are there alternatives to be tested? How is the company performing compared to

similar and often competing companies (benchmarking)? This information supports day-to-day management, short-term planning and decision-making. It contributes to what is called 'operational intelligence'.

Relations with other stakeholders. Local entrepreneurs operate in dynamic market systems, especially in the agricultural sector. They have many relations with other stakeholders: relations along the value chain (supplier-buyer relations), relations with chain supporters (business-to-business relations with banks, transporters and others) and relations with public sector organizations. In this realm as well, entrepreneurs need to innovate and be proactive. What are potential partners and options for collaboration? How can relations among producers, traders, processors and transporters be established and innovated? Can banks develop more appropriate financial products? How can a business or a development project work together with local authorities? What can development projects offer? Tactical intelligence relates to positioning the enterprise in a multi-stakeholder context. It is especially important for maintaining and forming useful alliances and for developing competitive value chains and agri-business clusters.

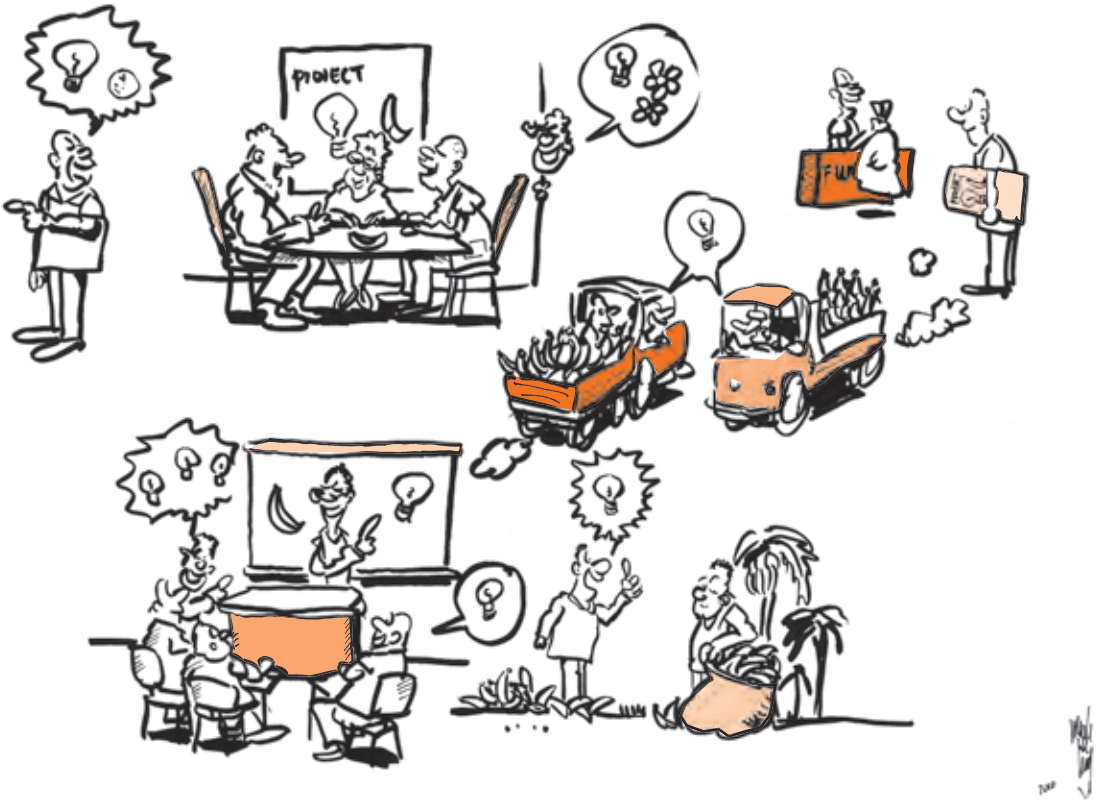
Business environment. Entrepreneurs need to be constantly aware of what is happening in the external environment. What are the market opportunities and risks? What are market channel options? What are the relevant laws, regulations, policies, taxes and industry standards and how are these evolving? Are there possibilities for harnessing external support? Answers to these kinds of questions nurture strategic intelligence, which allows enterprises to jump on opportunities and protect their business ventures from threats. Strategic M&E generally takes a medium to long-term perspective.

Kalisa and Mukesha's story suggests that rural entrepreneurs constantly face different, and often unexpected, problems. It shows that navigating business is highly context-specific and that operational, tactical and strategic questions are closely related when making agri-business management decisions.

Agri-development projects supporting entrepreneurs?

Project managers operate in 'donor markets'. Agri-business managers operate in real markets for agricultural products and services. Is it possible to engage in both of these very different worlds? Experiences with bottom-up agri-business development and promotion of rural entrepreneurship suggest five principles that make it possible to take entrepreneurial activity into consideration when running a project, meeting the information needs of local entrepreneurs and consolidating project and entrepreneurial M&E[9]. Through the five principles below, we articulate project/entrepreneurial M&E and developing competitive intelligence.

9 Experiences of 1000+ project in West-Africa (IFDC), catalyst project in Great Lakes region (IFDC) and promotion of rural entrepreneurship programme in several African countries (Agri-ProFocus)



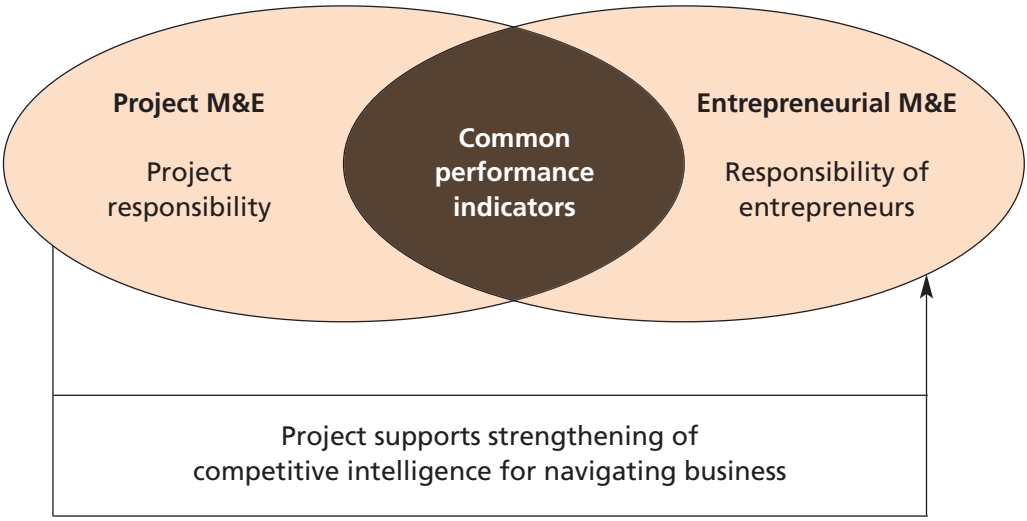
Five principles for developing competitive intelligence

1. Treat private actors in the agricultural sector as entrepreneurs. That's what they are. Projects should not treat entrepreneurs as 'target groups' or 'beneficiaries'. That kind of language keeps farmers and other local entrepreneurs in a passive role.
2. Take local entrepreneurial initiatives as a starting point. This makes it possible for both local entrepreneurs and development projects to orient their efforts towards clear economic objectives. Cooperation requires a convergence of objectives. These objectives can be stated in terms of higher production, improved productivity, better quality, good agricultural practices, more processing activities, product and market development, turnover and benefits. Both the agri-business and the project partners that support them navigate on these economic impact indicators.
3. Recognize that projects have to be accountable to the fund provider. They have the responsibility to monitor project activities, budget use, capacity strengthening activities, etc. This is the project's responsibility.
4. Recognize that entrepreneurs need to navigate their own business. Gathering the information they need is their responsibility.
5. Support the development of 'competitive intelligence' of local entrepreneurs. This requires tool development and harnessing the services of local capacity builders.

These principles have important consequences for donors, project design and implementation modalities. Agricultural development projects need to be flexible and have a limited number

of economic impact indicators. This requires a change of attitude among donor organizations. The projects in Africa from which these principles were derived benefited from a flexible and innovative donor that accepted a process-oriented approach. Schematically, these principles can be visualized, as seen in Figure 7.

Figure 7: Principles relating information needs of development projects and entrepreneurs



Conclusions: project design to support rural entrepreneurship

There are fundamental differences between project M&E and entrepreneurial M&E. Acknowledging these differences can contribute to innovation in agricultural development cooperation. The agricultural sector is largely made up of entrepreneurs, both large and small: producers, input dealers, seed multipliers, traders, processors, transporters, banks, business development services, etc. To manage a business in dynamic environments (navigating business), these entrepreneurs need the ability and capacity to monitor enterprise processes and performance, relate to other stakeholders and read the business environment (competitive intelligence).

The five basic principles outlined in this chapter make it possible to better relate the information needs of development projects to those of local entrepreneurs who are involved in agri-business ventures. Another consequence for project design is to anticipate the significant human and financial resources needed to develop the competitive intelligence of local entrepreneurs. Good business navigation skills and competitive intelligence of local entrepreneurs will contribute to achieving the common economic objectives of the project and the agri-business.

Getting the Process Right, at a glance

Innovation demands stakeholder interaction, which often requires skilled facilitation. Innovation is often confused with invention. Creating a new scientific discovery or invention is one thing, but having this adapted and used requires interaction between groups with different interests. Innovation can be stimulated by partnerships between community organizations and businesses but due to different interests, facilitation is often needed in order for different players to recognize the benefits/value of working together, which are not always apparent. Facilitators can help actors to see the benefits of collaboration.

Innovation is needed not only at production level, but throughout the whole value chain. Historically innovation has focused on production, but increasingly needs to be seen as something that happens along the whole value chain. Innovation often requires a process of empowerment, trust-building and power re-balancing, in which skilled facilitators can play a critical and enabling role.

Innovation is a multi-stakeholder process which needs to balance competitive and collaborative impulses. Innovation along the whole chain requires that different stakeholders (public, private, NGO) come together, take risks and jointly implement new ideas. There is a complex dance to be danced between competition and cooperation. Trust and social networks need to be built up alongside technical knowledge and skills.

Inclusion must be consciously sought and managed – whether women or vulnerable groups are those at risk of being excluded. To ensure that innovations reaches less powerful groups (e.g. women, the 'poor') innovation processes must be explicitly guided to involve them and to ensure that the less advantaged are not restricted to support roles, but can instead participate in decision-making processes.

Interaction is key and we need skilled people to coax, stir and nudge that interaction to support innovation. Skilled facilitation is critical for managing multi-stakeholder processes. Facilitation is required to help stakeholders see the benefits of collaboration and to manage power differentials and the many, sometimes conflicting, interests within a stakeholder group, as well as for building trust, and stimulating/guiding learning.

Rural innovation processes require dynamic and learning-oriented monitoring and evaluation (M&E) to respond to a rapidly changing context. The success of development initiatives can be enhanced by good M&E, but rural innovation processes have particular requirements in relation to M&E due to the nature of these processes. They require dynamic and learning oriented M&E, as the context and therefore effects of the innovation processes rapidly change, and the often many stakeholders at different levels need to quickly learn from each other's successes and failures for responsive management.

For stakeholders to innovate and learn together they need good information. This requires 'entrepreneurial monitoring and evaluation' that supports innovation.

Part Three
Dealing with the Context

Dealing with the Context

Willem Heemskerk, Marianne van Dorp, Peter Gildemacher and Mariana Wongtchowski

> *"Ideas are the raw material of progress. Everything first takes shape in the form of an idea. But an idea by itself is worth nothing. An idea, like a machine, must have power applied to it before it can accomplish anything." Bertie Charles Forbes*

In the previous sections of the book, we discovered that innovations are most likely to emerge and develop in environments where lots of stakeholders and sectors interact and collaborate. As in natural systems, diversity is richest at the intersection points or 'edges' where two or more distinct entities meet. In nature, an example is the meeting point between a grassland ecosystem and a forest; in innovation, it is the interaction between different stakeholders, for example, researchers, farmers and private sector companies. We see from Part Two that, in order to actively promote innovation, it is possible to deliberately initiate and facilitate a multi-stakeholder process aimed at innovation. Nooteboom *et al*. (2007) note that a diverse group of stakeholders are needed for innovation, but that this diversity also means that interactions may be more contentious (WRR, 2008).

People are motivated to take part in multi-stakeholder innovation processes when they see potential benefits from participation. But the road to participation is full of obstacles. Policies can block innovation processes, lack of financial resources for the different stakeholders at the right time can be a constraint, and human resource capacity may not be dynamic enough to spark innovation. Furthermore, collaboration between the public and the private sector is often difficult due to cultural or legislative 'rules of the game' – institutions – that limit opportunities. Power relations and hierarchies (part of the same institutions) can also interfere with otherwise smooth and open collaboration. All of these are examples of elements in the 'enabling' or 'constraining' environment in which an innovation process takes place.

Improving the opportunities for innovation leads to potentially beneficial societal/sectoral change. For this reason, it is important to understand the enabling or constraining environment in which innovation processes unfold. As the quote above states, ideas (or innovations) are just ideas until power is applied; then they can become vehicles for change. Such an understanding will allow stakeholders to redesign these contextual conditions together to support innovation.

In Part Three, we consider what constitutes an enabling environment for effective innovation processes. First, we identify favourable conditions. We then take a next step and discuss actions that can be undertaken to specifically create these favourable conditions. This chapter concludes with a roadmap for reading the remaining chapters that comprise Part Three.

Favourable conditions for innovation

An 'enabling environment for innovation' can be understood as conditions favourable for innovation processes to be initiated, sustained and effective. An innovation process takes time and needs a space in which to unfold: this happens within a context or environment. An innovation system can, in line with this, be pictured as a wider environment in which innovation processes take place (Figure 8). The innovation system is a combination of the innovation process and the environment in which this process takes place.

Innovation system

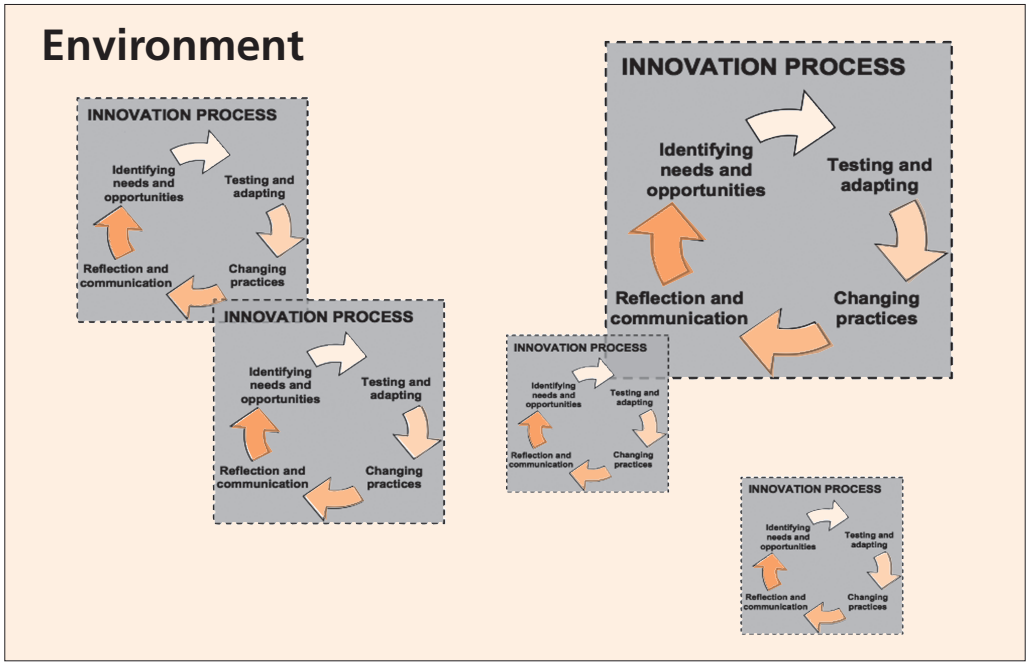


Figure 8: An innovation system – innovation processes occurring within a wider environment.

The innovation process has several components: identifying, testing, adapting, and adopting practices and approaches; and, reflection and communication of lessons learned. These components of the process do not necessarily take place in chronological order, but may also occur simultaneously. Nooteboom *et al*. (2007) argue that four elements are important in the public context for innovation: (i) being open to new partnerships (which requires brokering); (ii) being ready for the 'unexpected' throughout the process (the surprise); (iii) being open to new ideas from a diverse array of new actors; and (iv) being open to moving beyond a disciplinary focus (interdisciplinary) (WRR, 2008). The innovation process and how it can be facilitated has been discussed in earlier sections of this book. These processes are not isolated events, but occur within, and in interaction with, a wider environment. Together, we can consider this the innovation system. Of course, Figure 8 is an oversimplification of reality: it is, in fact, very difficult to separate the innovation process from the context in which it occurs. Nevertheless, we find it a helpful distinction for the sake of discussing the enabling environment.

Woolthuis *et al*. (2005) identified different types of 'system failure' hampering innovation. Rather than discussing failure though, we opt to discuss favourable conditions for innovation. This implies specifically that, without these favourable conditions, innovation is less likely to occur, but not impossible. Based on the work of Woolthuis *et al*. (2005) we re-conceptualize their system failures as favourable conditions for innovation, as follows:

1. Support infrastructure
2. Supportive hard institutions
3. Supportive soft institutions
4. Interaction networks
5. Capable individuals
6. Competent organizations

We begin by adding flesh to the bones of each of the elements mentioned above, illustrating them with practical cases from the field.

Support infrastructure

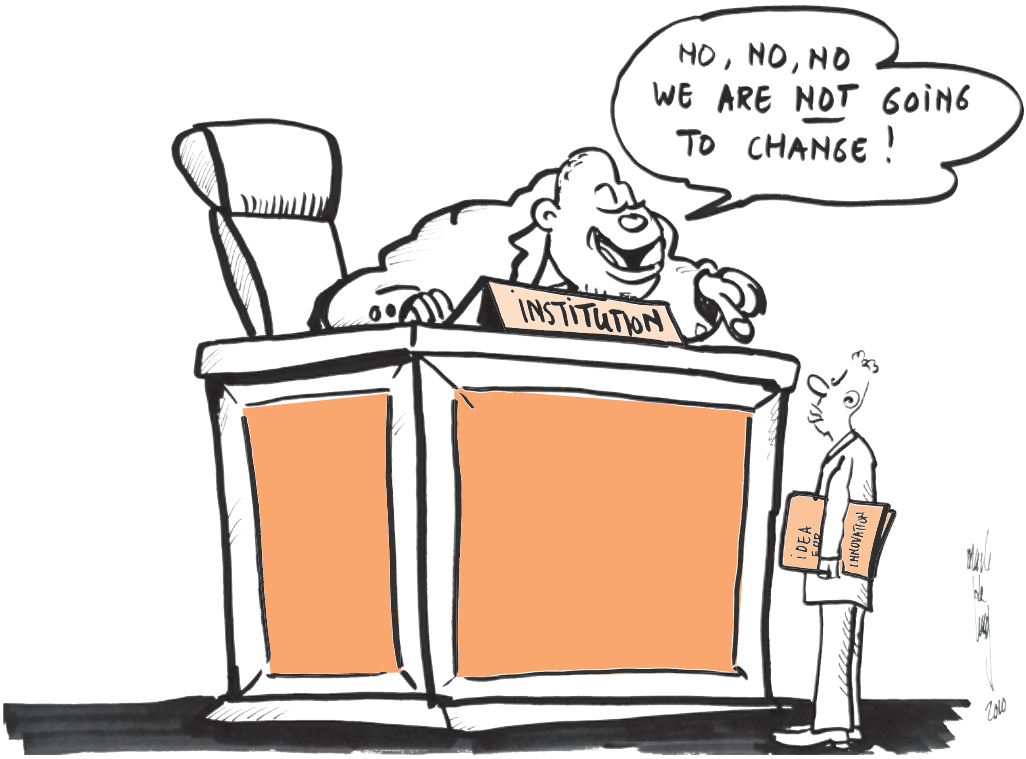
Support infrastructure refers to the basic services considered essential in order for a society to function. To create favourable conditions for agricultural innovation, a number of basic services are important to bear in mind: these can be clustered together under the banner of 'support infrastructure'. In the first place, basic physical infrastructure, such as roads, electricity and communication systems, contribute to creating favourable conditions. But also services like a functioning educational system, functioning financial and commodity markets, and an effective research infrastructure are all part of the support infrastructure. Support infrastructure is not improved specifically to make the conditions for innovation better, but nonetheless, innovation processes may lead to better infrastructure. Wanda (Chapter 17) suggests this when mentioning that linkages between local farmers and local authorities led to road works.

Supportive hard institutions

Institutions are agreements and commitments as to societal 'rules of the game' (North, 1990). These are both formal and informal, and determine how people engage with one another. Institutions can be associated with the interaction between the state, the business and civil society sectors, or with society at large. Public policy may fail to meet its objectives if the overall institutional context is not taken into account (Vermeulen *et al*., 2008).

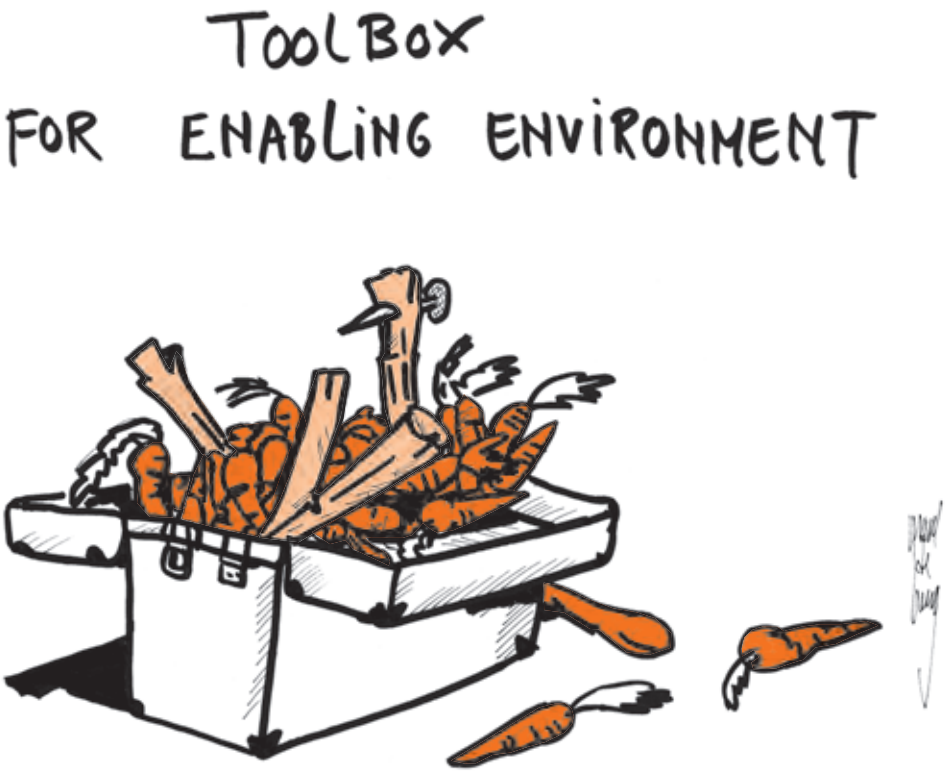
'Hard' institutions refer to formal written laws, policies and regulations. It is not the actual texts that are important, but how they work out in practice. Tax laws, pricing policies, subsidy laws, policies to promote (or not) public-private collaboration, may all drive agricultural innovation. Ideally, the development and implementation of laws, policies and regulations involves high levels of accountability, transparency, representation, participation and partnership, with attention to (downward) accountability, local ownership and empowerment.

Governments at local and national level, as well as international governing bodies, are the major decision-makers and implementers of laws, policies and regulations. However, there are exceptions of regulations made by, and enforced through, market partners. Increasingly, we see that in supporting and enabling innovation, creating conditions at local levels is most important, followed by creating conditions at the national or even international level (WRR, 2008; World Bank, 2007). However, we need to be conscious that policy changes in the global environment – e.g. newly negotiated World Trade Organization rules or, for example, international decisions on food standards – will reshape the conditions for choices about learning, networking and innovation processes at the local level (World Bank, 2006).



Governments, national or local, make strategies and policies to give direction to innovation. In agriculture, this is done mostly by identifying priority sectors and approaches, which narrows the focus and channels resources from different sources (government, donor community, private sector) into a direction considered likely to contribute to development. Although this sounds logical and important, we have to remember that strategies and policies guide interventions in a certain direction, but not necessarily into a direction considered 'right' for all segments of society. Young (2008) recognizes that policy-making is 'fantastically complicated' and hardly ever logical or linear. Supporting decision-making on priority areas for intervention is thus of great importance to ensure that the general focus of efforts is on entry points with true development potential.

In Part Three, Dormon and Gildemacher (Chapter 19) and Mtisi *et al*. (Chapter 15) argue that identifying and tackling needs for policy change, through generation and analysis of evidence, is an important function of the innovation process. Mtisi *et al*., go further to suggest that innovation processes can start by drawing on existing favorable policies, as a milestone towards changing others of a less favourable character. Doorneweert and Spoor (Chapter 16) illustrate this in using the example of securing funding for an Indian company, Zameen Organic, that trades and processes cotton lint. Barred by strict Indian regulations from approaching Indian banks, the entrepreneurs setting up Zameen Organic looked for 'greener pastures' abroad and were better received by a Dutch bank.



In addition, specific government regulations may provide incentives or disincentives ('carrots' or 'sticks') for organizations and companies to invest in innovation. Dormon and Gildemacher (Chapter 19) describe how Ghana's agricultural policy allowed the International Fund for Agricultural Development (IFAD) and the United States Agency for International Development (USAID) to provide support to value chain improvement in the country, though it also mentions that capacity to implement such policies is often lacking (see point on capacity below). Protection of intellectual property rights is also important for innovation. For example, effective protection of breeders' rights on improved crop varieties provides an incentive for commercial breeding.

Governments can decide to subsidize innovation processes by matching resources provided by different partners in the innovation process (Rajalahti, 2009). Wanda (Chapter 17) makes

reference to a number of occasions where this does – or does not – take place, discussing the importance of channelling funds for agricultural research and development through adequate channels.

Other options for providing incentives for innovation are through market formation. Governments can influence national markets in a range of ways, including through import levies, its role as a substantial client for a certain innovative product, or through legislation banning, and otherwise disadvantaging, an older and competing product.

Supportive soft institutions

In addition to the effect of laws and regulations, 'soft institutions' also influence the conditions for innovation. The concept of soft institutions is harder to grasp than hard institutions. Soft institutions have to do with the values and unwritten rules of societies with regard to human behaviour and interaction. Of importance for agricultural innovation is, for example, a spirit of collaboration for the common interest. At the same time, a sense of entrepreneurship in a society is an important driver for innovation. Transparency and honesty in business dealings are not necessarily based on laws and regulations, but on the wider values of society, and are important for successful innovation. In this section, Wanda (Chapter 17) and Dormon and Gildemacher (Chapter 19) provide examples of the important role open communication and transparent decision-making has to play in innovation systems.

Other soft institutions relate to the inclusion (or exclusion) of different parts of society in agricultural development processes. In many places, farmers are considered by other actors to be less capable of coming up with, adapting or dealing with, innovations of any sort. Breaking this barrier is essential for triggering innovation that is well-adapted to a certain geographic and cultural reality, as argued by Wanda (Chapter 17). Wanda emphasizes the need to build trust between parties in an innovation process, involving farmers and others at different steps in the process.

Farmers are not the only ones whose ideas are often overlooked. Mtisi *et al*. (Chapter 15) argue that the participation of government officials in a research programme – who are often reticent to accept research results – provided the basis for trust and confidence in the research findings, and therefore on the work done by the other partners. Likewise, Doorneweert and Spoor (Chapter 16), found more understanding from their donors as to their problem in dealing with very different donor requirements after they brought the different donors together and jointly discussed the problem. Dialogue, as illustrated by many of the cases in this book, is key to behavioural change, forging trust and enhancing commitment.

In places where women are not able to participate fully and equally in the process of exploration of new practices and approaches, a large part of the human potential of a society remains untapped, and this creates less favourable conditions for innovation. This is illustrated by the case of one of the project sites described by Wanda (Chapter 17) and also highlighted by Mayanja *et al*. (Chapter 11). Similarly, barriers for the active involvement of youth may constrain innovation, as would barriers for engaging in core economic and social processes

based on race or social status. Non-inclusive practices are widespread. An example is the general inclination of agricultural service providers to work with more successful and affluent and usually male farmers. This category of farmer tends to have better opportunities for technology adoption, as well as more time. Further, they are often easier to interact with as they are better educated and equipped to adopt and adapt innovations. The problem is that agricultural service providers then implicitly consider these (more affluent, successful, male) producers as a fair cross section of their target population (Leeuwis & van den Ban, 2004). Clearly they are not.

Interaction networks

Interaction between different types of actors creates the space for cross-fertilization between different experiences and world views. We have seen that such mixing of stakeholders with different ideas and opinions provides fertile ground for innovation processes. The actual interaction between stakeholders is considered part of the innovation process. It is, however, the enabling environment that makes it possible and stimulates the interaction (WRR, 2008).

Networks that provide the interface for ideas and opinions to meet contribute to a favourable condition for innovation. Such networks may be virtual, physical and have different scales and formalities. Conferences, in which scientists and practitioners from different countries meet, are a form of *ad-hoc*, fairly formal network. At the same time, rural markets where producers and traders meet and interact can also be considered a type of network, providing a platform for interactive action planning.

Stakeholder interaction is important for innovation, so deliberate actions that support quality interaction between stakeholders can directly improve the environment for innovation. This is a kind of network formation that may take place at different scales; from international to national to local. Such interaction at meso level, above local, but below national, can be effective[1]. Meso-level networks are 'well-placed' to look beyond the immediate interests of individuals, and attract stakeholders from research, agricultural extension, producer organizations, as well as (local) government decision-makers. Investing resources in the formation and maintenance of interaction networks, in its different possible forms, is a way to stimulate the emergence of innovation processes.

Nevertheless, the actual partnership or networks, which directly link partners in innovation, are part of the process of innovation and not of its enabling environment. In other words: the fact that an NGO coordinator and the Ministry of Agriculture meet as part of the festivities for alumnis of a university is part of the enabling environment – they are part of the same informal alumni network. But once these two individuals start collaborating, formally or informally, on the identification and exploration of opportunities for change, this is part of the process of innovation itself, and has been dealt with elsewhere in the book (Gildemacher & Wongchowski, Chapter 20).

1 See Mtisi *et al.* (Chapter 15) on the work of the 'Learning and Practice Alliance'.

Capable individuals

Possibly the single most important element of the enabling environment are 'capable individuals'. Human beings with the capacity to effectively engage in innovation processes are an essential prerequisite for innovation processes to occur and be effective.

People require different skills and capacities depending on the role they play in the innovation process. The skills required by facilitators of innovation processes have been discussed in the previous section (Part Two) and are once more brought up by a number of chapters in this section (Mtisi *et al*., and Dormon and Gildemacher). However, other actors (not just facilitators) also require skills for effective participation. The most important capacity required is an explorative and open mindset. A mindset that searches for advances in the practices and approaches he or she applies in agriculture. A producer, for example, should be searching to understand the problem they face, and looking for opportunities for improvement, be it by experimenting with new ways of doing things or by consulting others that may help them in doing so.

Individuals should be open to learning from their own experiences and from others, which demands appreciation and understanding of the roles that others play in agriculture and, in particular, in agricultural innovation. Researchers, as well as producers themselves, need to value producer knowledge, opinions and practice-based perspectives. At the same time, a producer should understand and value the knowledge of a researcher in the field who is skilled at structuring and systematizing experimentation with new practices and approaches and making links to concepts that allow individual experiences to be generalized

Building the required capacity of individuals – whether policy-makers, researchers, entrepreneurs or farmers – to effectively contribute to innovation processes requires a combination of efforts. Attention for development of the soft-skills of professionals to effectively perform in multi-stakeholder environments is an underdeveloped component of professional and higher education. To address this, reform of agricultural education systems is required, especially in Africa (International Bank of Reconstruction and Development, 2007).

In addition, improving the capacity to effectively participate in agricultural innovation is also an integral part of the innovation process itself and is a core component of facilitating innovation processes. This has been discussed in Part Two.

Competent organizations

The potential of individuals to engage effectively in innovation processes depends largely on the supportive environment provided by the organizations they work in (Potter & Brough, 2004). A fundamental part of organizational capacity to innovate is the ability of an organization to make it possible for staff or members to participate fully and in a rewarding way to innovation processes underway. Producer cooperatives need to assist their representatives with travel costs to enable them to participate in innovation processes. Researcher participation in multi-stakeholder initiatives needs to be appreciated, incentivized and made possible by research institutes and the scientific community. Private companies need to appreciate, in a similar fashion, the time investment for their staff to engage in multi-stakeholder interaction.

In addition, organizations need to provide an environment in which their staff and members are allowed, and possibly even be actively stimulated, to explore and try new things out. This requires providing staff or members with autonomy in decision-making and the trust that the outcome will be benefit the organization. Organizations should provide an opportunity for new ideas to be pursued and allowed to develop. Accepting and allowing failure, as part of the process of exploration of new ideas, is an essential characteristic of an organization providing opportunity for innovation.

Agricultural research organizations deserve a specific mention as they provide an essential service to the innovation process. Most resources for agricultural research are made available through governments, large enterprises and international donors. A non-flexible manner of research funding may hinder the innovation process (Kampen, Chapter 18). More fundamental agricultural research services require long-term funding, whereas applied agricultural research for development for small-scale producers may be funded through demand-driven, competitive grant schemes.

Financial resources for innovation activities

Innovation processes are only able to take place if sufficient and timely resources are made available, particularly for the required research, advisory and facilitation services. Availability of financial resources is not one of the six favourable conditions to innovate mentioned above. Rather, it is a product of the interaction between several of these conditions: it depends on policies, willingness to cooperate, (informal and formal) networking, and capacity (to write proposals, to manage them, to mobilize donors). Because funding is critical to the implementation of any innovation process, we discuss it here in more detail – and have two chapters that focus on the issue (Doorneweert & Spoor, Chapter 16; Wanda, Chapter 17).

In the South, innovation in agriculture often combines the objective of innovation with an objective of poverty alleviation. Resource poor producers are therefore important actors in the innovation process although they generally have little financial resources to contribute.

Private companies in agri-business may have more opportunities to contribute to the costs of innovation activities. At the same time, however, the unpredictable direction and outcomes of innovation processes also make it difficult for smaller private enterprises to invest substantial financial resources, other than the resources required for their own participation.

Although the results of innovation processes are unpredictable, the intended impact goes beyond the direct benefits of the participants in the process alone. The investment of public funds in the process is therefore justified, provided that the innovation process aims at the development of new practices and approaches that are of wider, more generic value, than to those directly involved alone.

In general, co-financing and joint resource allocation by the different stakeholders is a good principle to assure ownership of the process, and allows close scrutiny by the stakeholders of the direction the process takes. However, it remains a challenge to leverage these resources,

as direct benefits cannot be guaranteed. For innovation of value chains involving smallholder farmers, in particular, it is difficult to attract the required resources from the chain actors themselves (Rajalahti, 2009). In established value chains, innovation processes, focusing on the immediate functioning of market (such as quality improvement and processing agricultural produce, value addition and marketing arrangements) generally attract direct research investment by the private sector more easily, particularly in terms of matching funds and co-financing with the public sector (World Bank, 2008). Though we learn, from Doorneweert and Spoor (Chapter 16), that this is not always the case.

Interaction between the innovation process and the environment

Although we make a distinction in this book between the process of innovation and the facilitation of this process, and the environment in which this process takes place, the reality is slightly more complicated. A clear-cut distinction cannot be made to decide where the enabling environment stops and the innovation begins.

Is informal interaction between an agricultural researcher and a producer part of the process of innovation? Or is it part of the networking that is a function of the enabling environment? And what if an agri-business entrepreneur, who has been exploring new processing opportunities, shares his experiences with another entrepreneur in an entirely different sector?

The conditions for innovation discussed above should not be interpreted as 'hard' requirements, without which innovation will not happen. In reality, systemic barriers to innovation are an issue that needs to be dealt with by agricultural development interventions; it is important to identify these barriers and attempt to address them. At the same time, however, even with these barriers and with an environment that could be considered sub-optimal, innovation processes may be initiated, supported and be successful. The existence of these barriers frequently sparks innovation, stimulating people to think of new or other ways to circumvent the barrier, or remove it entirely. But even in such cases, when a difficult system component provokes innovation, other enabling conditions must be in place to allow these 'new ways' to flourish.

Examples of innovation despite sub-optimal conditions could include a drought that triggers farmers to come up with new agronomic techniques, or political repression that may push students to come up with new ways of communicating without fear of being tracked, etc. In these cases, whereas one or more conditions were not favourable for innovations, others were (the knowledge of the farmer, the availability of internet connection for the students).

More confusing still is the fact that the enabling environment itself may get changed as a result of an innovation process. The experiences from exploration of new practices and approaches often results in new insights which may influence policies, institutions, organizations and individuals. As such, a sub-optimal environment may trigger innovation, creating new ways to deal with it.

Changing the conditions for innovation to occur is a process of innovation in its own right. It is a process in which different actors collaborate to realize positive change in the infra-

structure, institutions, networks, organizations and individuals, as illustrated by the chapters in this section. The objective of change is to create a system that provides favourable conditions for future innovation processes to emerge, be sustained and be effective. Many of the chapters in this section build on the assumption that joint action between stakeholders is essential in making this happen. As Dormon and Gildemacher (Chapter 19) illustrate, joint action brings constraints out into the open, showing what has to be improved and how actors can make the needed improvements.

Reading Part Three

The chapters that are part of this section further illustrate the six proposed categories of favourable conditions that contribute to innovation processes emerging and being effective. In addition, the chapters offer examples of how the use of resources may promote innovation processes to emerge. The interaction between innovation process and environment becomes evident through the chapters in Part 3.

The paper by Mtisi *et al*. (Chapter 15) provides insight into specific action that can be undertaken to improve the enabling environment for innovation. The chapter focuses, in the first place, on improving interaction networks with the objective of better information and knowledge exchange on water and sanitation in Ethiopia. Secondly, the intervention intervened through improving the competencies of intermediary organizations to engage in innovation processes. Finally, hard and soft institutions were influenced actively through the intervention, changing both the policies and regulations, as well as mindsets of users, intermediaries, policymakers, decision-makers, and researchers. The distinction between the innovation process and improving the enabling environment is opaque. Whether a multi-stakeholder process was at the local level or at national level, the conditions for innovation were addressed at the same time as the technical and organizational issue.

Doorneweert and Spoor (Chapter 16) highlight network failure between different sources of financial capital providers (public investment, bank credit and venture capital), which hampers innovation in the field of social and environmental sustainable agricultural business development. As a solution, they propose closer collaboration between the different funding sources to improve the enabling environment for agricultural business innovation.

Wanda (Chapter 17) also focuses on funding within a cassava project but more in terms of addressing payment at farmer level. The project put in place an institutional innovation – the agreement to pay farmers at source – to alleviate a major constraint faced by farmers, namely lack of credit. This chapter compares and draws lessons from cassava processing plants set up in two regions of Uganda – Bukedea and Masindi. Wanda reflects on why one site performed well while the other floundered, which mainly related to institutional issues including infrastructure, new ways of payment, bold project policies and governance, and changing cultural mind-sets.

Chapter 18 by Kampen makes a case for the use of smart funding mechanisms to improve the environment for innovation in sub-Saharan Africa. In the first place, better research priority

setting is advocated through multi-stakeholder identification of promising entry points. This is an example of the need to improve institutions, both hard and soft, through a multi-stakeholder process. Furthermore, the need for closer networking is advocated with the objective of improving research coordination between sub-Saharan African countries. Finally, Kampen advocates for improving hard institutions related to intellectual property and breeders' rights to create favourable conditions for private sector investments in agricultural innovation.

Dormon and Gildemacher (Chapter 19) use the specific case of maize value chain development in Ghana to investigate which conditions have been favourable or constraining to chain innovation. It provides an example of imperfect financial services infrastructure, which hampered maize chain development. Furthermore, this case demonstrates how the regulations (hard institutions) of the donor community also created unnecessary barriers to innovation. The soft institution of quick profit-seeking over longer-term business relationship building is another factor that had its bearing on the success of the maize chain innovation. In addition, the limited capacity of public research and extension organizations to effectively participate in, and contribute to, value chain development processes was apparent in the intervention. At the same time, private companies were also lacking the capacity to participate effectively as they had difficulties in adhering to procedures set by donors.

To close the section, Gildemacher and Wongtchowski (Chapter 20) return to the framework explained in this introductory chapter. Using two examples – potato seed selection in Kenya and institutional innovation through a national level platform in Cambodia – they illustrate the six types of favourable conditions for innovation.

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Chapter 15

Promoting research-informed policy and practice: lessons from Ethiopia's water and sanitation sector

Sobona Mtisi, Nicola Jones and Harry Jones

Key Message: Improving the enabling environment for innovation requires a diversity of action, which may include: improving interaction networks for better information and knowledge exchange; building organizational capacities to engage in innovation processes; and, influencing both regulations and policies alongside the mindsets of the people involved. Technical and organizational change therefore go hand-in-hand.

One of the critical weaknesses of the water and sanitation policy in Ethiopia has been the limited use of research in the generation of knowledge necessary for influencing sector policy and practice that responds to the needs of poor people. To address this gap, the Research-inspired Policy and Practice Learning in Ethiopia (RiPPLE) programme developed innovative ways of conducting research, knowledge production and knowledge translation to influence policy and practice in water supply and sanitation in three regions of Ethiopia as well as at the national level. This chapter argues that when using the innovation systems approach, there is a need to better understand the dynamics embedded within supply-demand relations, the importance of facilitation and mediation roles by networks and intermediaries in promoting learning and knowledge exchange, and the relative influence of the political institutional context on actor behaviour.

Box 20. Key acronyms used throughout the chapter

BoFED: Bureau of Finance and Economic Development
FLoWS: Forum for Learning on Water and Sanitation Services
LPAs: Learning and practice alliances
RiPPLE: Research-inspired Policy and Practice Learning in Ethiopia
SNNPR: Southern Nations and Nationalities People's Region
UAP: Universal Access Plan
Woredas: Third-level administrative divisions in Ethiopia
WSS: Water supply and sanitation

Water supply and sanitation in Ethiopia

Water supply and sanitation (WSS) coverage in Ethiopia ranks among the lowest in the world. In 2000, 86% of the rural population (43 million people), and 27% of the urban population (3 million) had no access to safe drinking water (World Bank *et al*., 2009). It is within this context that the government embarked on a reform process to improve WSS coverage and services. The key strategic programme for WSS is the Universal Access Plan (UAP), drawn up by the Ministry of Water Resources, which aims to provide an implementation framework for programmes that seek to contribute to improved provision of WSS services. The UAP target is to halve the proportion of people without sustainable access to safe drinking water and improved sanitation by 2015.

In view of this, RiPPLE seeks to contribute to evidence-based policy on water supply and sanitation in Ethiopia and the implementation of better programmes within the sector, in order to provide measurable improvements for the poor. Specifically, RiPPLE focuses on issues of planning, financing, delivery and sustainability, and the links between sector improvements and pro-poor economic growth (RiPPLE, no date). With regards to planning, RiPPLE aims, through action research, to identify the key challenges and opportunities for effective management and decision-making processes in the WSS sector, from the local (i.e., *kebele*) to federal government level.

Given the multiple sources of financing in the WSS sector, RiPPLE aims to gain increased understanding of different funding streams, and to provide a basis for efficient and effective use of available funds to ensure better provision of WSS services for the poor. RiPPLE's third focus is based on the premise that improved access to WSS has positive impacts on poverty reduction and pro-poor growth. As such, RiPPLE aims to support the development of interventions that result in improved access to WSS by the poor, which contributes to poverty reduction and pro-poor growth.

To achieve its objectives, RiPPLE developed research-based information and knowledge systems with policy-makers and WSS programme implementers, which inform them of the diverse challenges that exist within the sector, and the ways in which WSS services can be effectively delivered to meet UAP objectives. To this end, RiPPLE contributes to the development of not only an effective institutional framework for management and delivery of WSS services, but also of an efficient mechanism for financing WSS programmes.

Key features of RiPPLE

Importance of both supply push and demand pull factors. Although there is increased attention paid to WSS issues in Ethiopia, it is widely recognized that a paucity of information and knowledge on the sector exists. RiPPLE aim to meet this demand for research-based information and knowledge on various aspects of WSS.

At national and regional level, the demand for information was premised on the fact that available data on WSS was unreliable. Yet, accurate information is crucial for policy planning, sector financing, and monitoring progress towards UAP goals. For instance, WSS coverage data provide a basis for budget allocation at regional and *woreda* levels. In the absence of accurate information, WSS coverage data was manipulated for budgetary purposes. In the Southern Nations and Nationalities People's Region (SNNPR), it was reported that some *woredas* tended to under-report their WSS coverage levels with a view to obtain a larger budget allocation. Rather than relying on WSS coverage data, the Bureau of Finance and Economic Development (BoFED) and the Bureau of Water held a meeting every year to discuss the coverage data and then allocate funds on the basis of the discussion, therefore the budget allocation for WSS programmes in SNNPR was a matter of negotiation rather than accurate WSS coverage data. As a consequence, there was demand by policy-makers, particularly BoFED officials, for accurate and research-based information on WSS coverage in the region. RiPPLE was thus viewed as responding to this demand by providing accurate information on WSS coverage.

Further, the demand for the RiPPLE research programme was partly predicated on the need by national universities (e.g., Addis Ababa, Awassa, Arba Minch, and Haramaya), federal government and the three regional governments to contribute to the development of research capacity among local researchers and policy-makers. To this end, RiPPLE research is viewed as meeting this demand by contributing to the building of research capacity in the WSS sector, and providing a forum for researchers, policy-makers and practitioners to contribute to the development and use of research information in planning and implementation of programmes.

The limited use of research findings in policy and implementation processes, and the inadequate research capacity among policy-makers, university students and staff, constitute the two key supply push factors. RiPPLE sought to fill these gaps by promoting evidence-based planning and programming within the WSS sector, and actively involving local policy-makers, students, and academics in policy-related research.

The importance of intermediary organizations. Intermediary organizations[2] are central to RiPPLE's research programme on WSS, and these include government departments, donors, NGOs, community-based organizations and research organizations. Such organizations are actively engaged by RiPPLE at different levels of research, policy development and implementation processes related to WSS. Given the broad conceptualization of intermediary organizations, Table 9 outlines some of the key organizations and the different areas of WSS that they focus on, within the overall framework of the RiPPLE research programme.

2 Intermediary organizations' (both formal and informal) contribute jointly and individually not only to research, but also to the interface, dissemination and exchange of research findings in policy-making processes and practice.

Table 9: Intermediary organizations in WSS sector under RiPPLE

Area of focus	Intermediary organizations	Role in linking research, policy and practice in WSS
Research	These include the Research and Development Department, the Ministry of Water and Energy (MoWR), Bureau of Water, Bureau of Health, and the Bureau of Finance and Economic Development (BoFED), Addis Ababa University, Arba Minch University, Hawassa University, and Haramaya University.	Intermediary organizations involved in generating evidence-based information and knowledge in the sector, as well as in communication and dissemination activities.
Policy	For example, MoWR, Bureau of Water, Bureau of Health, and BoFED in SNNPR, Oromiya and Benishangul-Gumuz.	Organizations that use RiPPLE research findings to influence WSS policy and programmes.
Implementation	For instance, MoWR, regional government and cabinet, Bureau of Water, Bureau of Health, and BoFED, WaterAid, International Rescue Committee (IRC) Ethiopia, and Hararghe Catholic Secretariat (HCS) – Ethiopia.	Organizations involved in the implementation of WSS programmes and projects.

It is evident from Table 9 that intermediary organizations involved with RiPPLE are organizations that are already responsible for research, policy-making and implementation of WSS programmes. Intermediary organizations play various but intricately related roles which ensure, through their participation in RiPPLE's research programme, broad-based joint ownership of the research process and the resulting information and knowledge. The involvement of various intermediary organizations provided a basis of local ownership and conferred legitimacy to both the research process and suggested options for better policy and practice in the WSS sector. Additionally, policy options and new approaches for improved implementation of financing and planning to the WSS sector were based on already existing stocks of options and knowledge, which were being supported by research findings. In combination, these factors enhanced the uptake of research findings into policy development and implementation processes.

The framework conditions and basic infrastructure are crucial. Ethiopia has witnessed a plethora of research on WSS that has contributed little to policy and practice. The basic fault of conventional research was that it employed a top-down approach, with researchers and consultants viewed as 'experts', while key policy actors and the intended beneficiaries were largely excluded. The exclusion of key policy actors such as government officials who are responsible for policy implementation undermined the use of research findings in informing policy and practice.

RiPPLE's use of action research approach sought to democratize research and actively involve policy-makers, implementers and citizens in the research process, and in finding solutions to

the problems that were encountered in the WSS sector. The active involvement of key actors ensured that research findings and suggested policy solutions were likely to inform policy decisions on WSS.

The action research approach employed by RiPPLE, and the participatory aspects that it engendered, was in sync with government policy on decentralized and integrated management of WSS. This policy sought to foster collaboration and coordination of programmes among relevant government departments at national, regional and *woreda* levels. RiPPLE's cross-sectoral engagement in exploring the challenges and solutions in WSS provision was viewed as facilitating and strengthening government policy on integrated planning within the sector.

In combination, the aforementioned factors contributed to the legitimacy and acceptability of the research process and its findings by policy-makers, which, in turn, contributed to the increased use of research findings in the implementation of WSS programmes.

Innovation networks. RiPPLE's contribution to the uptake of research findings in WSS programmes partly rested on the ability to build effective partnerships and networks in the implementation of the research and in the dissemination of research findings. RiPPLE built a network of cooperation between research organizations, NGOs, and government agencies with a view to promote interaction, information exchange and collaboration. With reference to research, the RiPPLE programme has a consortium of four research partners and 14 network partners, who contribute to various aspects of the research in the three case study regions. Network partners also act as key nodal points for communication and dissemination of research findings.

The concept of a Learning and Practice Alliance (LPA) lies at the core of RiPPLE's collaborative networks, and is aimed at providing effective communication channels between the various organizations and individuals that are involved in the research programme. An LPA is a group of stakeholders from various organizations working in the WSS sector, who meet regularly to share experiences on issues of joint interest and develop ways of working together. LPAs provide platforms for the uptake of research findings into policy and implementation processes.

LPAs are organized at different levels, from *woreda* to national level, and focus on issues that are particular to each level. At the national level, there is the Forum for Learning on Water and Sanitation Services (FLoWS), which aims to enhance and support existing networks and research on WSS by providing an overarching forum by which learning across networks can effectively occur. Consequently, FLoWS contributes to the overall understanding of the challenges, opportunities and options that researchers, donors, policy-makers and implementers encounter in the WSS sector. FLoWS also provides a platform for commitments by different agencies to the WSS sector to be commonly agreed and evaluated.

LPAs act as networks for learning and action for improved delivery of WSS services. As a network, regional and *woreda* level LPAs are well-placed to act as the principal interface between national-level policy-making, financial flows and implementation of WSS pro-

grammes. Therefore, regional level LPAs provide a significant opportunity for influencing the implementation of local level WSS programmes. *Woreda* level LPAs play a critical role in influencing the actual implementation of WSS programmes and services. This is because most LPA members at the *woreda* level are, in practice, the officials responsible for allocating funds to, and implementing and maintaining, WSS services. In short, LPAs were of critical importance in the dissemination, uptake and use of research findings and recommendations in policy development processes governing WSS.

Key interventions of RiPPLE

In this section we look at how key features of the innovation systems approach were embedded in RiPPLE's research programme and account for its significant contribution to the use of research in informing WSS policy and practice.

Undertake a holistic diagnosis (or analysis) of the system. A starting point for RiPPLE was the critical analysis of the WSS sector, aimed at identifying the key challenges in financing, governance and planning processes. This preliminary analysis was conducted in the case study regions, involving a series of consultations with relevant stakeholders, as well as a literature review. For example, initial case study analysis for Mirab Abaya and Alaba, both in SNNPR, explored the socio-economic, institutional, and technological factors that affect WSS (Deneke & Abebe, 2008). Broadly, case study research provided a detailed overview of the WSS policy in Ethiopia, and the challenges that undermined effective delivery of, and access to, WSS services for the poor. Key stakeholders, mainly federal and regional government, donors and NGOs supported these initial studies, though it was recognized that there is a need for a long-term action research programme.

Facilitate interaction. The interaction of diverse actors, supported by RiPPLE through LPAs, aimed to contribute to information sharing and exchange, and cross-sector cooperation. This, in turn, contributed to an increase in the use of research findings in providing WSS services at the local level. Through LPAs, the interaction between researchers, policy-makers, implementers and donors was facilitated. For instance, policy-makers at regional and *woreda* level credit LPAs for fostering trust and cooperation. Significantly, it should be noted that government officials from the Bureau of Water, Bureau of Health and BoFED were involved in the research. Their inclusion subsequently provided the basis for trust and confidence in research findings, and the subsequent use of the research findings in WSS planning and programming activities. For example, the BoFED in SNNPR was relying on RiPPLE's WSS coverage data for budget allocation in Alaba and Mirab Abaya (Terefe & Welle, 2008).

Strengthen the demand side – empowerment. Strengthening the demand side of the innovation system was centred not only on providing policy-makers and implementers with research findings relevant to their needs, but also empowered them to demand policy relevant research. RiPPLE, in turn, responded by 'supplying' policy relevant research outputs including toolkits, policy briefs and info-sheets. Strong communication and dissemination activities also enhanced demand for RiPPLE's research findings by policy-makers. Central to the communication and policy engagement strategy was the targeting of policy-makers,

donors, and implementers with various research outputs which improved the research-policy linkage, which also led to the demand for more evidence-based knowledge in development policy and practice. Although policy-makers were empowered through the research process, a key limitation of RiPPLE was that there was little dissemination of research findings and other relevant information to ordinary citizens which could serve to amplify their voice in WSS. Disseminating information to ordinary citizens could contribute to the ability of citizens to hold key actors accountable to their commitments to the sector, and also empower them to participate in local level decision-making processes on WSS.

Intermediary functions. The main intermediary organizations are outlined in Table 9. By involving intermediary organizations' staff in the research, RiPPLE strengthened their capacity to conduct research, as well as their understanding of evidence-based planning and programming in the sector. RiPPLE supports the education and training of officials from the Bureau of Water, Bureau of Health and BoFED across the three regions to undertake post-graduate studies on courses relevant to the WSS sector. Such training strengthens the ability of officials to perform their policy development and implementation functions and to appreciate the role of research evidence in WSS sector planning and programming.

Through LPAs, RiPPLE provided the vital link between policy-makers and researchers, and thus enabled policy-makers to access research-based knowledge on the WSS sector. One aspect of LPAs is that they empower policy-makers and implementers to demand research that would enable them to pursue informed policy decisions. For instance, at an LPA meeting in SNNPR, bureau officials argued that the National Water Supply, Sanitation and Hygiene (WASH) inventory study should pay particular attention to addressing the needs of policy-makers and implementers. It can thus be argued that LPAs provided a platform by which policy-makers are able to interact with researchers, and are then empowered to demand new knowledge that enables them to better implement WSS programmes.

Incentives and disincentives. RiPPLE recognized the importance of providing incentives to policy-makers and implementers as a way of motivating them to participate in the research as well as in the uptake and use of research findings in implementing WSS programmes. RiPPLE motivated them in two main ways. First, RiPPLE actively cultivated a collaborative relationship with federal government, through the Ministry of Water Resources, and relevant bureaus at regional and *woreda* levels, which motivated policy-makers and implementers at all levels of government to participate in the research programme and to use the findings in their programming activities. Second, RiPPLE supported its partners from federal and regional government to attend international and national conferences relevant to WSS. Lessons and experiences gained at conferences motivated partners in up-taking and using research findings in policy development and implementation processes.

Conclusion

The RiPPLE programme contributed to the use of research findings in improving policy on financing and the development of more effective systems of governance and planning in the WSS sector. For instance, in SNNPR, the BoFED relied on data from RiPPLE on WSS coverage

in its budget allocation for different *woredas*. Similarly, the lack of reliable information affected the planning and implementation of WSS projects by donors and NGOs. In this context, RiPPLE was viewed as providing accurate information that informed donor and NGO planning and projects in SNNPR. The increased use of research findings in policy development and programme implementation implicitly followed the key features and interventions associated with the innovations systems approach.

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Chapter 16

Funding social-environmental business start-ups: bank, NGO and government financing bricolage

Bart Doorneweert and Gijs Spoor

Key Message: Private sector innovation through socially and environmentally progressive businesses face a major constraint due to a disconnect between NGO, private and public funding avenues. The institutional setting (enabling environment) for innovation can be changed through dialogue amongst funding actors with diverse objectives with triple bottom line entrepreneurs. Integrating and distinguishing funding flows can lead to better synergies but linking public and NGO funding for business development requires coordination.

Zameen Organic

Zameen Organic: the facts

- Started 2006 with 200 farmers in cooperation with the NGO AOFG India, funded by a Dutch Foundation, SHGW; 0% farmer equity
- By 2009, 4,000 farmers; 50% farmer equity
- Turnover in 2009: € 1.5 million
- Works with a network of sales representatives in six countries
- Received commercial equity investment from Aavishkaar and working capital via Rabobank Agri Guarantee Fund

Zameen Organic is an Indian company that trades and processes organic cotton lint produced by small farmers. While the company is commercially profitable, it also contributes to farmers' livelihoods by trading at fair prices and giving farmers the opportunity to invest in the company. In addition, as the cotton is produced organically, the company contributes positively to the environment. Zameen Organic thus operates according to a new business model which looks not just at the economic value a company creates (*Profit*), but also at its value to society (*People*) and to the environment (*Planet*); this is often referred to as the 'Triple-P' value or the 'triple bottom line' (TBL). In contrast, conventional business models focus only on profit, neglecting the adverse impact they may have on ecosystems and society. In India's mainstream cotton industry, for example, these adverse effects include pesticide poisoning, widespread use of child labour and large-scale farmer suicides brought on by extreme debt (Ahmed, 2006).

Three sources of capital are available for funding businesses like Zameen that aim to be TBL companies. These sources of capital are: commercial funds such as banks; civil society funds from NGOs; and public funds from governments. Commercial funds are primarily interested in financial returns, whereas civil society and public funds are interested in creating environmental and social value (public goods). They all have an interest in funding TBL ventures but they prioritize differently the value created. As a result, TBL entrepreneurs face the puzzle of uniting three sources of funding with different motives or interests in order to obtain the capital they need.

This chapter describes Zameen Organic's experience of securing funding from all three types of funders and the difficulties facing entrepreneurs in dealing with these parallel funding systems. Based on Zameen's experience, this chapter provides general suggestions as to how entrepreneurs and funders can better work together to facilitate financing of TBL ventures in the future.

Three types of funders: three different business plans

Zameen Organic makes use of funding from both commercial and non-profit sources. Although essential to financing the business, working with three different funders (commercial, civil society and public funds) was a complicated process. Because each funder has its own interests, three different modes of communication were needed in order to satisfy each funder's priorities. As a result, three different business plans were drawn up to explain how Zameen Organic would generate value for each type of funder it contacted. Each is described below.

Donors. Zameen's civil society partners, a Dutch Foundation (Stichting Het Groene Woudt – SHGW) and Cordaid, were willing to support market-based interventions that would speed up and prolong Zameen's development impact on rural communities. However, civil society operates with strictly-defined indicators (often referred to as metrics) and reporting systems to make sure that their funds are used to achieve development impact. As a result, the number of activities that Zameen's donors were able to fund to develop commercial activities was limited; their focus was rural development.

Commercial funders. Because donors were not able to provide all of the required funding, the company sought out additional support from other funds for the development of its commercial activities. Zameen needed two types of commercial funding: firstly, funds for operational expenses, like wages for personnel, travel, and phone costs; and, secondly, for investment in the company's assets.

Zameen Organic failed to secure funding support for operational expenses when it approached commercial banks in India. This was due to India's strict regulations regarding the provision of funds to Indian businesses. However, Zameen did secure support from the Dutch Rabobank Agri-Guarantee fund, which has a special foundation that reviewed the TBL venture funding proposals. Rabobank provided a guarantee fund that boosted Zameen's credit-worthiness, which in the end generated trust among Zameen's Indian bank, the Yes Bank, who later provided debt finance. An important challenge was that because the requirements of Yes Bank did not pertain to social and ecological impact, which was central to Zameen Organic's business model, backing by Rabobank was needed in order to tap into Yes Bank's sources of funds.

For investment funding, Zameen needed to connect with commercial equity funds. In general, these funds do not specifically cater to TBL ventures. However, Zameen needed an equity fund that took an interest in projects with a social and environmental component. It found a partner in Aavishkaar, a fund that more closely identified with Zameen's TBL objectives and company values. However, Aavishkaar's approach and process for accounting, as well as for evaluating a business plan vis-à-vis social impact, differed from that of the donors. In addition, the evaluation criteria of this social equity fund and the donors were not well-aligned. More interaction between the social investors and development donors would have reduced the time spent explaining Zameen's social impact to each party. But, despite Zameen's attempts to bring the two parties together, securing funding from each party remained an entirely separate process.

Government funding. Lastly, Zameen Organic approached the Government of India for support. The Indian government is starting to realize the potential contribution of TBL enterprises to poverty reduction, especially in rural areas. However, most of the existing subsidy schemes for TBL ventures in India are rigid and tied to a limited number of policy priorities; for instance, supporting only tribal farmers instead of mixed groups which include non-tribal people. Zameen's core business did not match most of these schemes' requirements.

Despite the complexity involved in obtaining funds for a TBL business, as the Zameen case shows, the process is manageable as long as the entrepreneur is able to facilitate and create linkages between the otherwise isolated interests of different funders. But, there is no blueprint to be drawn based on the Zameen case; each funding puzzle is unique.

From isolation to synergy between funders

As we can see from Zameen, commercial, civil society, and public funds each have a different focus and approach. This poses a huge risk to the development of TBL ventures where there is misalignment between the funding sources from the point of view of the company.

Ventures may never obtain the funds needed in order to get started. Likewise, they may be unable to combine funding from multiple sources, and as such, TBL entrepreneurs may end up using the first-best capital source to fund everything, and later find themselves in a difficult position having used commercial capital for non-profit value creation, or vice versa. Misalignment can even occur within one of the potential sources. This is why the Schwab Foundation (2011) has recently released a publication on the social investment landscape, highlighting different types of investment capital and guiding the TBL entrepreneur in making matching decisions.

The importance of venture capital in providing opportunities for innovation is well-recognized (Kortum & Lerner, 2000) but securing that capital is a difficult process, especially for TBL ventures. In the current situation, the success of funding a TBL venture depends very much, if not too much, on the ability of the entrepreneur to create linkages between the isolated interests of the three funders. This implies that many relevant TBL business ideas are lost in their development, because not all entrepreneurs with potentially good ideas are expert fund managers.

To improve this situation, funders for TBL ventures need to engage in dialogue with entrepreneurs to initiate a process of learning and exchange of experiences. The aim is to stimulate the development of a new institutional setting, where the focus and approaches of the multiple funding sources align. Such an institutional setting would be a breeding ground for TBL venture capital innovation, increasing the number of start-ups and improving their success rates.

Figure 9 below depicts this change. Each of the three funding sources is represented by a coloured circle: commercial (market – 'M'), civil society ('CS') and public funds (government – 'G'). Each segment illustrates a scenario of interaction between funding actors. The first shows them as totally separate, so-called 'silo thinking', where each is inaccessible to the other. The second segment shows the current status wherein the funding source borders touch, and there are some bridges between them. The third segment illustrates a future scenario: a blending of the three.

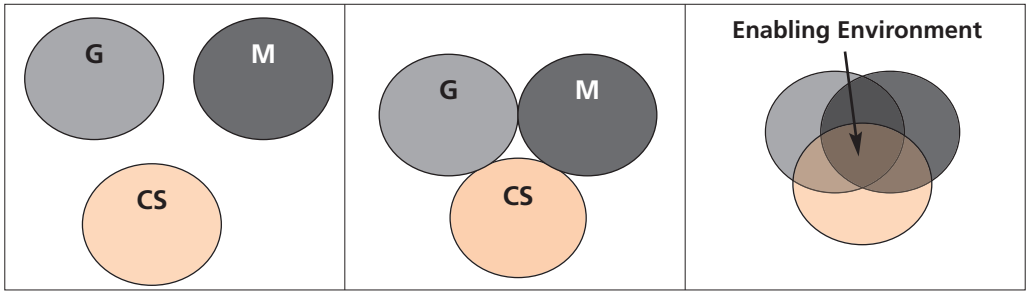

Figure 9: Changes in interaction between funding sources of TBL venture start-ups

This final process of integration demands a change in how these funding sources function. Table 10 captures how the roles of different funders have adapted so far and indicates changes needed to reach the desired scenario.

Table 10: Overview of commercial, civil society and public funding roles vis-à-vis TBL entrepreneurs

	Previous	Current	Desired scenario
Public	Centralized decision-making and control over key parts of the economy concerning public welfare	Public-private partnerships; trade policy including development goals	Support TBL entrepreneurs in a systematic and transparent way to maximize social and ecological returns by creating a level playing field and by reducing the risk of investment in TBL ventures
Commercial	Capital allocation mechanism that selects ventures which can most efficiently and profitably employ capital resources	Corporate Social Responsibility (CSR) initiatives, impact investment funds, social enterprise	Merging competition on metrics for social and ecological returns with metrics on financial returns
Civil society	Covering gaps left open due to either government or market failure	Social enterprise, business development services, market access, making markets work for the poor	Support TBL entrepreneurs through public advocacy and further development of business conduct, which can tackle new (emergent) issues.

In the past, funding sources had mutually exclusive roles: co-financing was not possible. These days, however, funding sources are prepared to contribute to funding for TBL ventures. But lack of coordination and collaboration between funders has resulted in market-led and civil society funders trying to do, or take over, what the other specializes in. At the same time, governments tend to restrict activities to the macro level. The role of each Zameen Organic funder has evolved in a positive direction, but compatibility and synergy between these roles needs further improvement.

Ideally, the funders would take up mutually-supportive but discreet roles: these are presented in the 'desired scenario' column of Table 10. The role of the state is to establish a level playing field where TBL entrepreneurs are rewarded for creating public goods or protected against competitive disadvantages (i.e. having to compete against companies only seeking to maximize profits). The market's role is to develop and institutionalize social and environmental performance indicators (metrics), merging them with financial performance metrics. This allows the TBL entrepreneur to have a basis for reporting and discussing the performance of the venture and the value it creates. The role of civil society is to aid entrepreneurs in developing new social forms of business organization and finding ways of incorporating ecological sustainability issues into business. By working together in this manner, funders are able to enhance opportunities for TBL ventures and make room for entrepreneurs to focus on what they do best: running their business.

Managing multiple funding sources

If funders were each to fulfil ideal roles, how then could TBL entrepreneurs best make use of the various resources available? To answer this, let's look at the typical phases of a business cycle, depicted in Figure 10.

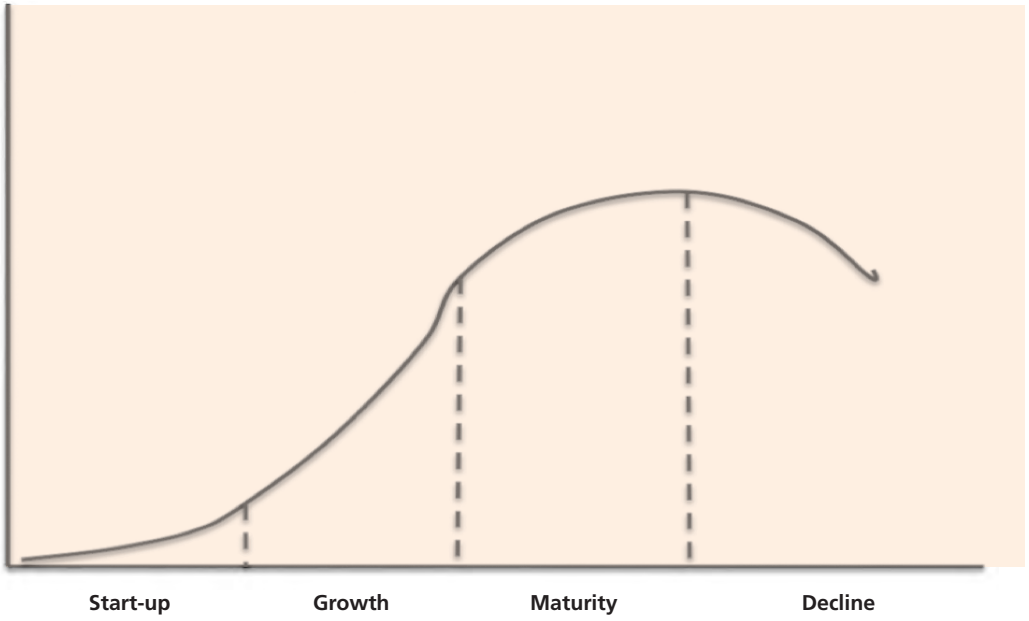

Figure 10. The typical business life cycle

Each business life cycle consists of four stages: start-up, growth, maturity and decline. Now, by looking at each life cycle stage we can reflect on the type of support which each funding source could play, based on the 'desired scenario' roles defined in Table 10.:

1. ***Start-up***: grants from civil society support feasibility studies and pilots; provide seed money to start up the company; or experiment with a business concept that aims at generating social and environmental value.

2. ***Growth***: commercial investment, particularly in the form of risk-bearing capital, supports the establishment and expansion of a commercially-viable business that aims to achieve both monetary and social/environmental impact. Commercial investment is essential because the main priority at this stage is to expand the business in line with commercial priorities.

3. ***Maturity***: government guarantees, largely in the form of funds to finance operational aspects of the business. In this phase, the business is commercially sustainable and has established a stable and dependable track record. The social and environmental impact generated is equally dependable, predictable, and transparent (also in terms of metrics). Based on this, the government can provide a fitting remuneration for the public services provided.

4. ***Decline***: support at the decline stage depends very much on the entrepreneur's future planning. It could be to sell the business, to go public, or to close down altogether. From the perspective of capital provision, TBL ventures are no different from other ventures.

Required changes in the funding environment

So far, we have addressed what compatibility between the roles played by different funding sources for TBL ventures would look like (Table 10). But there are still some key obstacles which need to be addressed; most importantly, the lack of metrics, the absence of business models and insufficient institutional support.

Lack of metrics. Both investors and investees depend on indicator metrics to manage their activities. 'If it can't be measured, it can't be managed.' But attempts to quantify social returns on investment and environmental impact are still in their infancy: a common language to express non-financial impact does not yet exist (Emerson, 2003). As a result, social and ecological benefits are not included in business accounting. TBL entrepreneurs need to be clear about the kind of value their business can create in order to make accurate business performance projections. As long as social and ecological benefits are not directly included in the business planning process, building the case for social and ecological value creation will always remain an unnecessary hardship for each TBL entrepreneur.

Lack of (knowledge on) feasible business models for TBL ventures. Upon starting a TBL venture, the entrepreneur will need to find a convincing business model that shows how the business will generate the intended values. This requires that business models of comparable ventures, which do not address the TBL, must be redrawn. Redrawing TBL business models entails linking a firm's revenue creation to creation of social and ecological returns. The new business model should demonstrate that social and ecological impact will increase with company revenue. A handy tool to achieve this is the 'business model canvas', developed by Osterwalder & Pigneur (2010). The tool can be used to produce a basic business model design, which can then provide the basis for further working out important issues in business planning. Business schools are likely candidates for documenting the cases of this kind of business model innovation, but tend to lag behind industry in this regard.

Lack of institutional support. Entrepreneurs are currently creating institutions to bring the three funding streams together. Every successful TBL entrepreneur basically creates a private institutional solution to tie funders to their venture. However, entrepreneurs lacking experience with institution building are either excluded from the market or their TBL potential is not reached, despite potentially very interesting and viable business ideas. In order to mainstream TBL business development and bring it to maturity, the playing field for accessing funds needs to be opened up and made more accessible. Privately-developed institutions therefore need to be documented and brought into the public eye so other entrepreneurs can learn from and replicate successful constructions.

Recommendations to funders

The three funding sources distinguished in this paper, alongside TBL entrepreneurs, need to work together to better define their respective roles. A TBL finance alliance could support emerging TBL entrepreneurs in approaching each funding source and provide information as to good/best practices on several issues, including:

- TBL monitoring and reporting through jointly agreed reporting indicators and/or those designed by other initiatives;
- business models that link business revenue to social and environmental impact;
- basic conditions for access to support programmes, subsidies, guarantee programmes, venture capital, debt finance, production licenses etc., taking into account the stage in the business development cycle of the TBL venture applicant;
- best practices for educating a new generation of business administration and business managers and leaders;

Such a TBL alliance could help in creating the right institutional environment, in which different sources of funding and entrepreneurs cooperate, and will enable entrepreneurs to better compete for funding to establish and grow their TBL ventures.

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Chapter 17

Ups and downs of cassava processing development in Uganda

Kelly Wanda

Key Message: Open, transparent and democratic governance is key to innovation. This refers both to the dynamics in specific projects, as described in this chapter , and in the wider policy environment.

Despite productivity enhancing technologies developed through research and numerous projects implemented to introduce them to small-scale farmers, adoption and adaptation remains low. This Ugandan case study describes how processing high quality cassava chips for the animal feed sector was promoted through setting up pilot agri-businesses for cassava processing on or near farms, and under the management of poor farmers. But this process was not easy and, indeed, struggled to overcome many failures. This case highlights the importance of creating an enabling environment in order to achieve sustainable innovation and presents critical issues that had to be overcome in order to drive the innovation process. It underscores critical conditions regarding governance, institutions, attitudes and values and draws important lessons as to how to support innovation processes.

Background

Cassava is an important crop in many sub-Saharan African countries because it is drought-resistant and survives in marginal conditions with few inputs (Scott *et al.*, 2000; Westby, 2008). It is therefore grown mainly for food security, although its role as an income-generating crop is gradually increasing (FAO, 2008). In Uganda, approximately 74% of farm households grow cassava. Although the number of hectares of cassava under cultivation (1.07 million) is lower than that of maize (1.54 million) and bananas (1.12 million), surveys indicate that nearly every household of five to six people in Uganda grows it (UBOS, 2007).

But human consumption is not the only use for cassava (Tewe, 2006). Agricultural research for development (AR4D) experiments with cassava in many industries as a cheaper alternative raw material. As a result, demand for cassava has increased alongside economic growth in sub-Saharan Africa (Abass, 2008). Graffam *et al.* (2000) found that cassava chips had the potential to partially replace (10%) maize/maize bran in animal feed rations and that the animal feed sector had the greatest potential for successful growth in the five years ahead. This was mainly attributed to the relatively large market and simple technologies well-suited to rural areas (Graffam *et al.*, 2000). However, its market potential as an industrial crop has not been realized. The number and quality of processed products from cassava is still low due to poor technologies, low awareness on alternative uses for cassava, little technical know-how and the lack of supportive policies for selling cassava. In addition, the marketing chain is long and inefficient and farmers and local processors lack entrepreneurial skills.

A key problem is the gap between the quality expectations of industry and what is available from small-scale growers. Furthermore, small-scale growers cannot always meet the timelines expected from industry. This is due to many factors, including lack of understanding of the quality requirements, poorly organized and inefficient production techniques, insufficient use of improved technology and heavy reliance on traditional practices. The scale of production for smallholders is low; they mainly rely on traditional technologies with low outputs. These technologies also tend to produce poor quality agricultural products. Smallholder production is simply not well-planned to meet market demands. Consequently, smallholders are trapped in a vicious cycle of poverty with low incomes, low savings, low investments and hence low and poor quality outputs.

In response to the growing demand for cassava as an industrial crop, and in an effort to fight poverty and food insecurity, research has successfully generated productivity enhancement technologies, such as high-yielding and disease-resistant varieties and better processing equipment, which can support commercial quantities; these technologies are motorized and have large outputs. In addition, AR4D innovations have included the development of rural agro-enterprises as a way of accessing higher volumes and more stable markets for cassava. Such agro-enterprises were piloted so that lessons for up-scaling could be drawn.

Setting up cassava processing plants in two regions

In 2005, a consortium of organizations set up two cassava processing plants in rural Uganda to supply high quality cassava chips to the country's biggest animal feed manufacturer, Ugachick. The organizations involved were NARO (National Agricultural Research Organization, Uganda), IITA (International Institute for Tropical Agriculture) and ASARECA's (Association for Strengthening Agricultural Research in Eastern and Central Africa) East African Root Crop Research Network (EARRNET) which provided technical backstopping. The buyer, Ugachick, was also part of the project implementation team.

The processing plants were to be owned by the farmers who would run them as a business. In locating the sites for the plants, the consortium looked for the existence of some kind of organized group, a storage facility, large areas of unutilized land and possibilities for co-investment. The aims were to:

- promote motorized chippers and improved dryers for processing high quality chips for the feed industry;
- impart entrepreneurship skills to producers and processors;
- create marketing chain linkages between farmers, processors and feed millers;
- generate a supportive policy environment through developing quality specifications for cassava and cassava-based products at national/ regional levels.

The expected project outputs were:

- increased awareness on the benefits of cassava chips in the animal feed industry;
- increased use of improved technologies for processing high quality cassava chips in the region;
- better marketing strategies for cassava chips developed and piloted at regional level;
- quality standards for cassava products.

The sites selected were Bukedea in the east and Masindi in the mid-west regions of Uganda. In a participatory selection exercise involving farmers, the project was explained. Lively focus group discussions were held and the way forward agreed upon, and roles were clearly shared and identified. Farmers demanded to know the extent to which the project would invest in the processing facility. Documentary evidence was provided showing how much would be invested in the facility. Farmers were expected to co-invest and manage the plants in order to ensure sustainability.

A meeting between the buyer and the farmers in each of the selected sites took place. At each of these two sites, participants openly discussed not only market requirements but also the fears of the sellers and together a way forward was agreed. Farmers would receive payment immediately when they delivered chips to the local store rather than wait until the entire quantity was delivered to the market in Kampala (about 200 km away). This agreement to pay farmers at source was an institution put in place to facilitate trade.

The project delivered processing equipment, a drying sheet capable of drying about one tonne of dried cassava, and provided training in processing high quality cassava chips to each of the sites to enhance the competitiveness of the producers/processors. The existing storage facility was rehabilitated.

As a result of the project, farmers gained awareness as to the requirements of the animal feed market in terms of quality and volume. There was increased investment in producing cassava at both sites. Farmers/processors also gained knowledge about processing high quality cassava chips. Quality standards to be used for cassava products were agreed on based on use of improved technologies that the project aimed to promote. The Bukedea site became famous for producing high quality chips, attracting many new buyers. This is a nice example of the value of co-learning in a multi-stakeholder process: farmers and processors learned from one another and, as a result, the quality of cassava improved and buyers were motivated to buy the product. Based on the improved quality, new standards were developed.

Linkages with the local authority were formed in one of the sites (Bukedea). The project benefits were explained to the local authority and were found to be in line with their programmes. These linkages with the local authority resulted in improvements to the road to the processing site, enhancing marketing competitiveness.

Overcoming the challenges

Convincing farmers to participate in the project was the first challenge. Farmers demanded commitment and assurance that a market existed; they demanded to see the buyer and discuss the price and, if possible, to sign contracts. However, it turned out that no contract was signed. This was after the realization by farmers that it was not easy for them to meet the market requirements. The buying price of 250 Uganda shillings per kg was a disincentive because it was lower than the local price of 300 shillings per kg. But, farmers were sensitized that volume was more important than price. Also, discussions between research, farmers and traders helped to build trust and improve information and knowledge of all parties about each other. Farmers also saw an opportunity to consider markets beyond just the feed market.

In response, the buyer, farmers and researchers met and an open dialogue took place. The researchers made a sincere attempt to share project information in terms of planned activities and costs and they asked for advice from the farmers as to how to best carry out this investment to their (the farmers') benefit. This encouraged the farmers and convinced them to become involved in the project. Researchers acknowledged their lack of local knowledge and showed willingness to learn from the farmers, as well as incorporate other markets as per the farmers' request. Farmers also acknowledged their lack of knowledge about end markets.

Open sharing of project information (e.g. planned activities and their corresponding costs) with the intended beneficiaries (farmers) was a way of allowing the farmers to contribute to decision-making. But it also raised concern on the part of some of the researchers who felt that farmers need not know the budgets allocated for investment in technologies; they found it unnecessary to communicate to farmers the amounts put aside to offer them technologies with the reasoning that these sums might change over the project cycle. Sharing cost information with farmers was intended to enable them to participate in prioritizing scarce resources.

Different interpretations of project activities arose between farmers and researchers. Farmers had agreed to co-invest in some action research activities, which would explore issues of profitability. However, while farmers met their obligations, researchers were unavailable, which led famers to lose morale and decreased their participation. This was in Bukedea where a plan to co-invest in research was made. The reason researchers did not invest in it was due to lack of funds to carry out this activity. This innovation was only in Bukedea where researchers found a walking tractor whose engine was not working. The walking tractor belonged to one of the group members.

Lessons – why Bukedea worked and Masindi did not

The major differences in performance between these two processing sites can be explained by several critical factors, including: supportive infrastructure; institutional development; new and bold project policies; project governance; and cultural mind-sets.

Infrastructure support. Innovation can be propelled by the level and scope of involvement, commitment and partnership of local authorities. For example, the involvement of local authorities led to the upgrading of the road leading to one of the processing sites. This greatly facilitated the transport of cassava. Most farmers in Bukedea had attained higher levels of formal schooling compared with Masindi farmers.

Institutional development. From the two cases we can draw out examples of institutions which supported/constrained innovation. The first addresses the limited access to credit as a constraint to innovation. While the demand for investment was high, farmers had limited resources and were unable to access quick or better credit facilities. Lack of credit meant that individual farmers needed to be paid immediately for their deliveries rather than wait for group delivery and payment from the buyer, which was paid by cheque. The project put in place an institution – an agreement to pay farmers at source – which facilitated trade.

A second example of institutional development was an aim of the project, namely the development of quality standards for cassava. The project aimed to support the production of a high quality product – cassava – through the use of an improved technology and both sides agreed to trade in the high quality product. Initially it aimed to use standards as a way to increase the utilization of cassava. While the development of cassava standards was, in fact, not realized by the project, a parallel effort was underway based on the improved technology related to this cassava project. Eventually, cassava standards were formulated by the separate project. Standards are a good example of an institutional development that can support innovation.

Bold, new project policies. Flexibility in the use of project funds enabled new and bold approaches to be undertaken to address the credit problem in the previous point. Although not specifically mentioned in the project document, project funds were used, for example, to pay upfront for the cassava chips so that farmers did not have to wait for payment. This solution was agreed during an open meeting, which led to funds being committed for the purchase of individual farmers' outputs. Although this solution held promise and encouraged the farmers, it was later abandoned. Nonetheless, we see in this example both a constraint in the environment for innovation (e.g. lack of credit for farmers) and a potentially enabling solution (agreement to pre-pay farmers for their cassava).

Project governance. Open, transparent and democratic project governance was important in making information available and finding solutions to perceived problems. Where there was limited flow of information, the group failed (Masindi). Open dialogue and increased information-sharing enhanced accountability and performance. Trust was built through the buyer's act of sharing the project document and discussing its aims and objectives, and consciously showing the farmers the willingness to learn from them was a major driving force. Improving project governance by soliciting more equal participation amongst stakeholders (including farmers) creates a more conducive environment for innovation.

Cultural mind-sets partially explain the difference in performance between the two project sites. For example, disagreement over the role of women as managers arose in the Masindi group, which led to its break-up. As a result, all of the cassava going to market came from the Malera Farmers group in Bukedea district. Ironically, this group was led by a woman. The community in Bukedea accepted women as leaders based on their performance. The community also had higher literacy levels. This situation is partly rooted in the educational system. Bukedea belongs to Teso region where primary level education is more widespread than in Masindi.

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Chapter 18

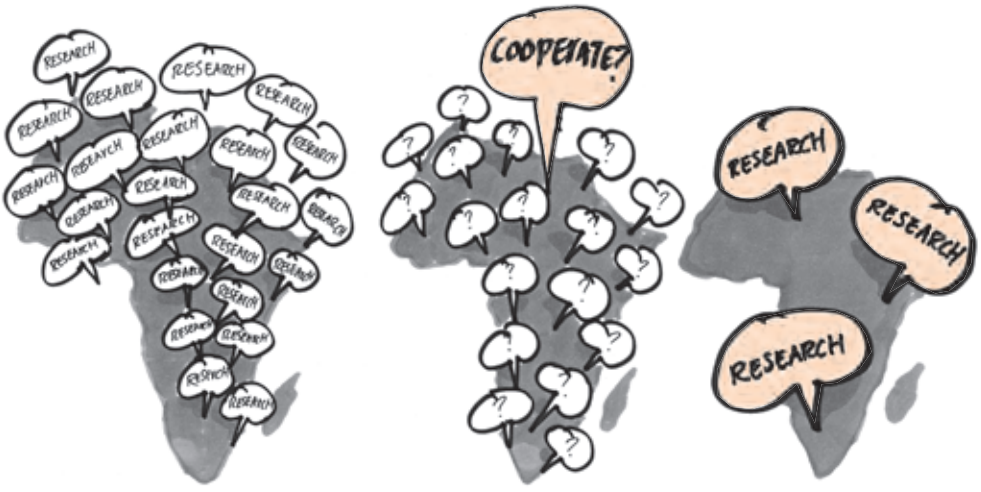
Financing for sustained innovation in sub-Saharan African agriculture

Jacob Kampen

Key Message: Linking public and private investment in research must be done strategically and in a coordinated manner. Separating research funding from research implementation ensures higher levels of accountability.

Innovation requires significant research capacity, but in sub-Saharan Africa (SSA) that capacity has been seriously under-invested in, regardless of evidence that this will lead to economic growth. Despite decades of effort and large investments to increase agricultural production and to defeat hunger, more than 200 million people in SSA, of which at least 30 million are children, still do not have enough to eat. Enhancing food security, increasing incomes and lessening poverty depends – in part – on greater agricultural productivity. Achieving this requires improved agricultural technologies through more effective agricultural research for development (AR4D)[3] *and the dissemination and adoption of these technologies.*

Agricultural research has been hampered, however, by a lack of adequate, timely and sustained financing. To add salt to the wound, the limited funding that is available is often not used effectively. Recent experience in using more effective, creative and sustainable avenues for financing research has not necessarily lead to change 'on the ground'. This is despite SSA governments, donors, sub-regional and international organizations all agreeing to address the issue. This chapter summarizes the state of SSA agricultural research financing, looks at better ways to organize and use it, and suggests concrete and urgent actions. The chapter takes up financing for agricultural research – one important part of an agricultural innovation system, and more specifically, finance for technological innovations.



3 AR4D involves: joint theme identification, interactive learning, multi-dimensional analysis and joint uptake strategies (Hawkins et al., 2010).

Box 21. Key acronyms for reading this chapter

AR4D: Agricultural research for development
ASARECA: Association for Strengthening Agricultural Research in Central and Eastern Africa
CARDESA: Centre for Agricultural Research and Development in Southern Africa
FARA: Forum for Agricultural Research in Africa
NARS: National agricultural research systems
WECARD: West and Central African Council for Agricultural Research and Development

Investing in agricultural research pays off for development

Africa has benefited less from the fruit of agricultural innovation than any other continent. Since 1990, food availability per person increased by 30% in Asia and by 20% in Latin America but decreased by 3% in SSA (IAC, 2004). Due to a lack of sustained support to AR4D, farmers in SSA have seen many exciting concepts of technology development and innovation come and go, never delivering on their promises of increasing their incomes and enhancing livelihoods.

According to the World Bank, there is solid evidence worldwide of high economic rates of return from investments in agricultural research, which illustrates that this is an effective way for governments to achieve accelerated growth (World Bank, 2008). In SSA, collaborative research between the CGIAR – a global partnership that unites organizations engaged in agricultural research – and the national agricultural research systems (NARSs), which is relatively well-funded, reports economic rates of return ranging between 12% and 64% (Maredia & Raitzer, 2006). Doubling research investments in SSA and making them more effective would increase agricultural production and likely help reduce poverty by 9% annually.

However, despite this evidence, growth in AR4D investments in SSA has stagnated and NARSs in the region have failed to implement financial budgeting and management systems that maximize returns from funds allocated to agricultural innovation and optimize output and impact.

Trends in financing

Global patterns of investment in agricultural research are changing rapidly. Especially during the 1990s, expenditures on AR4D grew rapidly in the Asia-Pacific region. By contrast, in SSA, public spending on AR4D stagnated at the early 1980s levels, even as agricultural research staff numbers continued to rise rapidly. This caused a decline in spending per scientist by about 50% from 1971 to 2000, putting downward pressure on salaries, operating resources and morale, and in turn resulting in reduced AR4D output and impact (Beintema & Stads, 2004; Beintema & Stads, 2006).

In some developed countries, the private sector finances over 50% of AR4D (Echeverria & Beintema, 2009) but, in SSA, it remains stuck at a few percent. In the Asia-Pacific region, public investments in agricultural research totalled US$ 4.8 billion in 2000, while in Latin America about US$ 2.7 billion was spent; SSA trailed at around US$ 1.2 billion. Research intensity, which is defined as a country's expenditure on agricultural research as a proportion of national agricultural gross domestic product, on average was about 2.35 in developed countries in 2000; for developing countries it was 0.55; and many SSA countries had even lower ratios.

SSA governments still provide by far the largest proportion of agricultural research funding. In 2000-2001, the shares funded by governments, various donors, and internally-generated revenue[4] amounted to about 56%, 35% and 7%, respectively. As mentioned above, in SSA, producer organizations and the private sector contribute only marginally.

Better organization of A4RD

Three important phases of reform have taken place in SSA agricultural research systems in recent decades: (i) building the capacity of the NARSs and making them more effective; (ii) redefining governments' roles in research; and, (iii) more recently, creating sub-regional research organizations.

Capacity building of NARSs began in the 1980s with substantial investments in infrastructure and human resource development. This was followed by efforts to improve NARS effectiveness, which often involved establishing single national institutes, developing and coordinating national and agro-ecological zonal plans, strengthening partnerships with stakeholders, and improving management practices, especially monitoring and evaluation.

4 Many research centres generate income from activities such as 'research on contract' with the private sector, payments for 'intellectual property rights' e.g. on hybrid seeds, the sale of produce from centre lands (seeds and breeds), rental of laboratory services, provision of advisory services and consultancies, etc.

Redefining governments' roles in agricultural research involved separating the research funders (mainly governments and donors) from the implementers (research centres and scientists); decentralizing decision-making processes downwards to ago-ecological zones; increasing stakeholder participation and influence over priority setting and resource allocation; identifying new funding sources and mechanisms; and strengthening system linkages (Chema *et al*., 2003). Several countries also explored the possibility of setting up agricultural research 'trust funds' to enhance research funding sustainability and efficiency[5].

More recently, an important development has been the creation of sub-regional organizations in SSA. This is important because many countries in the region, and their NARSs, are far too small to resolve national priority research and development issues alone. For many NARSs operating independently, human resource capacity and the levels and effectiveness of financial support are too low to achieve real results. For example, the Association for Strengthening Agricultural Research in Central and Eastern Africa (ASARECA), established in 1992, now plays an important cross-country coordinating role, runs a number of CGIAR research networks and finances and oversees four sub-regional Centres of Excellence, where NARSs closely collaborate on AR4D concerning key priority commodities (cassava, rice, wheat and dairy). Similar organizations have been established in two other sub-regions: in West and Central Africa, the West and Central African Council for Agricultural Research and Development (WECARD) and, in Southern Africa, the Centre for Agricultural Research and Development in Southern Africa (CARDESA) co-ordinate agricultural research and development in their region of responsibility. At continental level, the Forum for Agricultural Research in Africa (FARA) also plays a supporting and coordinating role. These new institutions are expected to greatly enhance research efficiency of the national agricultural research systems in sub-Saharan Africa.

Financing challenges and new approaches

Unreliable financing. In addition to simply a lack of funds, discrepancies between official budget allocations and actual fund disbursements have also negatively affected research in many SSA countries. Often, disbursements are not only less than the official budgets and/or seriously delayed, they also fail to come at the right time because agricultural research has to be timed with the rhythm of the growing season. In many cases, research activities have had to be abandoned leading to funds being wasted and disappointed potential end users. One exception is collaborative research between the research centres of the CGIAR and NARS: this financing has been generally more reliable, which has allowed research objectives to be reached and the desired impact on production and farm incomes to be achieved.

Effects of donor support variability. From the early 1980s to the mid-1990s, donor support became increasingly important in financing agricultural research in SSA. However, since about 1996, donor contributions have precipitously declined (Pardey *et al*., 1997). In part, to counteract this shortfall, research institutes in some countries, especially those with export crops, generated substantial funds through other means such as internally generated revenue.

5 Such trust funds invite government, donors and foundations to deposit (large) amounts of money into a 'basket' or 'fund'; theinterest derived from such deposits is then used to finance agricultural research.

Historically, in some countries in SSA, research on export crops (such as coffee, tea, cotton) has been financed through commodity levies. A challenge is that many 'research products' – better soil management practices, for example – are not private goods that can easily be sold in export markets. The question is: who will pay for these research products? Because the market size is often small, and due to the general business climate, private sector financing in SSA agricultural research is generally less than 2%. Recently, however, much attention has been given to supporting the development of value chains where both farmers and the private sector are jointly contributing to investment in research services and to public-private partnerships for agricultural innovation.

Joint ventures. Joint ventures between public and private institutions that share the costs and benefits of research are currently being developed in many countries, including in SSA. There has also been emphasis on matching funds, i.e. funds that are only accessible on condition that the private sector provides co-financing.

Competitive grant schemes. To give stakeholders a stronger say on research programmes and to enhance transparency and quality, the share of research financing through competitive grant systems has been rapidly increasing. Competitive grant schemes aim to enhance the performance of agricultural research and development by encouraging the most competent national (sub-regional and/or international) agencies to collaborate in addressing an identified priority issue by putting 'the client in the driver's seat': the client here being the farmer or end user. Research proposals are evaluated competitively, technically vetted and grants are allocated by a committee comprising stakeholders and clients of the research system.

Governments do not yet finance a significant share of the cost of competitive grant schemes causing large and unpredictable fluctuations in terms of availability. This is because these grants mainly depend on donor funding, which can be intermittent, causing failure to deliver on the promise of sustained, dependable funding. In addition, competitive grant schemes are normally used to finance specific, relatively short-term research projects and therefore should be seen only as a complement to regular annual government budgets for strategic priority programmes, research infrastructure and human resource strengthening.

New commitments. Recently, several organizations e.g. the New Partnership for Africa's Development (NEPAD), the Comprehensive Africa Agricultural Development Programme (CAADP), the Dar es Salaam Heads of State declaration, and the Framework for African Agricultural Productivity have emphasized the critical role of agricultural research and development in SSA and the need for better funding (World Bank, 2008). All recommend at least a doubling of SSA public agricultural research funding and a strengthening of each country's research intensity. They also recommend the concurrent implementation of more effective and efficient financing systems that encourage enhanced performance, among others, through better monitoring and evaluation. Closer sub-regional and SSA-wide cooperation in agricultural research is also advocated. However, far too little has actually changed and increased and more effective agricultural research investments remain crucially important in SSA.

Recommendations

Setting priorities. First, there will be a need to better focus research priorities to achieve more effective and efficient investments; this will require multi-stakeholder involvement and analysis.

Increased and more reliable government financing. Government financing of agricultural research will remain the most important funding source in SSA for a long time to come; it needs to be doubled in order to increase researcher salaries and operational budgets. It is also important that government funds match the approved budgets on which ongoing field programmes are based and that they are released in time with the growing seasons.

Support to competitive grant schemes. Competitive grant schemes (CGS) with strong client involvement in deciding on priorities, grant allocation and project evaluation have shown considerable promise and need to be greatly strengthened and expanded. Government budgets need to finance a gradually increasing share of CGS programmes to make these sustainable and independent from often unreliable donor financing. During the transition (while incremental government funds are mobilized), donors and other AR4D finance providers, however, also need to considerably increase their support.

Strengthened collaboration. In part, due to their small size and agro-ecological complexity, few SSA countries can realistically hope to address their priority agricultural research issues independently. Greatly strengthened sub-regional and international collaboration is therefore essential, backed up by sustained competitive grant scheme support. CGIAR programmes at SSA continental and sub-regional level have provided a conducive framework for agricultural research on global issues and should continue to play an important role.

Alternative sources of funding through private sector involvement. In several SSA countries where cash and export crops are important, taxes and/or levies should be used to generate additional financing while simultaneously involving producers more substantially in resource allocation and oversight. Public-private-partnerships through collaborative ventures or contractual arrangements also have significant potential to generate incremental financial support. This will require greater market and value chain orientation.

Particularly for commodities which are produced using hybrid seeds, including animal breeding stock, opportunities for greater private sector involvement in technology generation and dissemination need to be explored, which will free up public sector resources for other priority areas. However, this will also involve addressing intellectual property rights issues and updating of Seeds Acts.

There is also substantial opportunity to expand self-financing of research institutes through internally generated revenue. It is, however, important to independently evaluate the economics and investment requirements, and to safeguard the core agricultural research mandate.

Trust funds. Although trust funds for AR4D have, until now, not been very successful, partly for accountability reasons, their potential role needs to be further explored.

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Chapter 19

Developing a maize value chain in Ghana: how institutional innovation creates a more conducive context

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Key message: Innovation is increasingly focused on value chain development; that is to say, on engaging with and changing the enabling environment itself. Value chain innovation underscores the importance of both formal and informal institutional factors when it comes to creating new structures within the context in which innovation takes place and the conditions under which facilitation processes can be effective.

Efforts to facilitate innovation in the agricultural sector can only be successful if, like seeds, they fall on 'fertile ground'; in other words, an environment that is conducive to the emergence and sustainability of innovation. This chapter assesses the characteristics of an enabling environment based on an experience with facilitation of innovation in the maize value chain in Ghana.

Introduction

In recent agricultural development practice in Africa, value chain thinking has become a major paradigm. It marks a significant shift from the traditional approach to research and extension that emphasized increased agricultural production through technological innovation, with little attention to markets and market innovation. Provided value chain development initiatives pay due attention to innovation, both within the farming system and in the related knowledge and innovation system, a value chain approach is a practical example of how innovation system thinking can be applied to agricultural development practice. Value chain development makes a deliberate effort to link actors, services and processes that take a product from production through a chain of actions to final consumption (Figure 11). In this chapter, we use the case of maize value chain development in Ghana to examine how the environment in which a chain exists, contributes or hampers the process of innovation.

Developing a maize value chain: a case study

The world food crisis of 2008 led to high food prices and underscored the urgent need to focus on the local production of staple foods in Ghana as a substitute for costly imports. One such staple crop was maize. A sub-sector analysis of the maize value chain[6] showed some weak links between the relevant actors. Priority constraints were clustered around four general issues: (i) low yields associated with poor quality inputs and inadequate adoption of good

6 Value chains encompass the full range of activities and services required to bring a product or service from its conception to sale in its final markets.

agricultural practices; (ii) inadequate post-harvest practices resulting in high post-harvest losses in terms of quantity and quality, and subsequent failure to meet market requirements; (iii) high unit cost of production due to a lack of economies of scale for input purchase and marketing; and (iv) in most cases the absence of formal contracts between buyers and producers and, where the contracts exist, enforcement mechanisms are weak.

To facilitate the process of strengthening the maize value chain, the International Fund for Agricultural Development (IFAD) hired a consultant in July 2008 to:

(i) coordinate activities to facilitate interactions between producer organizations, service providers (research and extension) and various private sector firms (input firms, maize traders and banks);
(ii) facilitate the development and implementation of a partnership between smallholder farmers/producer organizations and traders in order to ensure smallholders receive a fair price in this value chain; and
(iii) supervise small grant activities including capacity building of producer organizations, support to production and post-harvest activities, and marketing.

The objective of the intervention was to intensify maize production and create a more effective, transparent and reliable trading system.

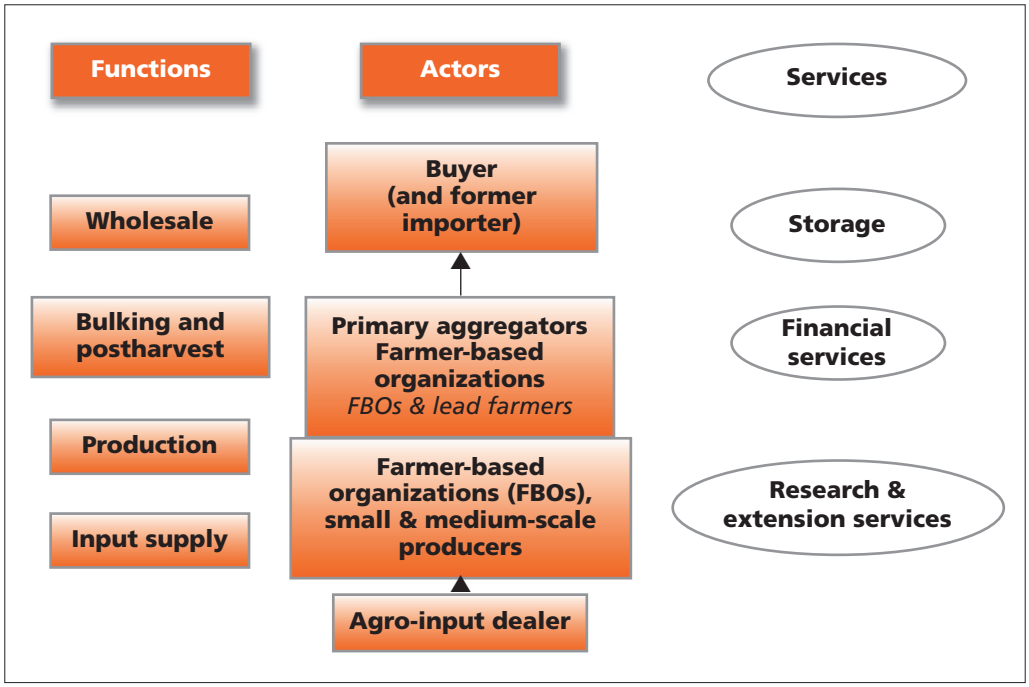

Figure 11. Short Value Chain

The outcome of facilitating the maize value chain (Figure 11) was that a major maize importer and a large local buyer were identified and linked to producers in the Brong Ahafo and Northern regions, two of the main maize producing regions of Ghana. Over 6,000 individual

farmers and some 50 farmer groups were directly involved. Technical advice on production was provided by a United States Agency for International Development (USAID)-funded project in the two regions. Most farmers, who invested in improved seed and fertilizers, on average, doubled their yields from 1.5 t/ha to 3.2 t/ha. Those who could not afford the inputs continued to have poor yields, in spite of the technical advice they received. Over 50% of the smallholder producers, the primary target of IFAD, did not benefit substantially from this pilot project because they could not make the cash investments required to intensify their maize production.

Interestingly though, there was a striking difference between the two regions. In the Northern region, the buyer provided both seed and fertilizer on credit and signed a contract with the producers to buy the maize at an agreed price; and the trader bought all the maize produced by about 2,000 farmers. However, in the Brong-Ahafo region, the buyer and the producers preferred an informal verbal agreement with no fixed price. This buyer did not engage in input provision and ultimately only bought about 10% of what was produced by around 4,000 farmers in their area of operation.

Creating an enabling environment for innovation

The mixed success of the initiative holds some lessons. Innovation did happen, and this can be attributed to a number of elements that supported the facilitation effort. At the same time however, it must be acknowledged that in terms of **desirable** innovation, a better result was anticipated than the actual outcome. The unfortunate conclusion was that the ultimate target groups of the initiative – smallholder maize producers – were not the main beneficiaries. So what happened? We will explore some of the enabling and constraining contextual factors.

What in terms of the context, enabled innovation?

(i) Ghana's government agricultural policy, referred to as the Food and Agriculture Sector Development Policy (FASDEP), takes a value chain approach to agricultural development. This makes it possible for development organizations, such as IFAD and USAID, to intervene with the objective of value chain improvement.

(ii) The government introduced a 50% price subsidy on fertilizer (NPK, urea and ammonium sulphate) targeted at maize production. Coupons for the subsidy were distributed by the district agricultural offices to farmers who wanted to buy fertilizer and they bought them from privately accredited input shops.

(iii) Although the buyer received a 25% matching grant from IFAD to establish a number of post-harvest service centres to provide shelling, drying and cleaning services, these were not realized in the first year due to a lack of capacity on the part of the buyers to follow the rules for grant disbursement and procurement. The lack of post-harvest centres meant that some of the farmers did not receive the necessary services required to improve the quality of the maize and meet the standards required by the buyers.

(iv) For one of the buyers, a contract was signed with an agreed price and delivery schedule, which was respected by all despite changes in the anticipated price at harvest time. In the other case, both the buyer and the producers were skeptical about signing a formal contract and opted for an informal agreement; each looked forward to taking advantage

of fluctuating spot prices, which is a common feature of the maize market. In this second chain scenario, only 10% of the anticipated maize was traded.

What hampered desirable innovation?

(i) In spite of the 50% subsidy on inputs, the majority of smallholder producers were not in a position to invest cash in inputs; credit was not available for those smallholders. This, coupled with the lack of market security, made them wary to risk investment. As a result, farmers could not intensify their production. In the first year, there was no credit involved although a number of banks were contacted. However, six months into the programme, one bank agreed to provide credit to the value of US$ 1 million to both the farmers and one of the buyers for the next cropping season. Unfortunately, this did not materialize: there was an election in December 2008 wherein the incumbent government lost power, which led to changes in the bank's hierarchy and subsequent cancellation of the deal.

(ii) Investments in post-harvest service centres by the traders were delayed as a result of the inability of the trader to fulfil the procedures by IFAD to access this matching grant. The service centres were essential in terms of allowing smallholders to meet the minimum quality standards set by buyers.

(iii) The lack of a contractual agreement between the trader and producers in the Brong Ahafo region resulted in a loose relationship and low volumes of maize sold through direct marketing between the producers and the trader. On the other hand, the agreement between the other trader in the Northern region and the farmers, where the farmers had an assured market and also received input credit intensification was successful, yields doubled and all the maize pledged to be sold to the trader was bought and several hundred more farmers have expressed interest in joining that scheme.

(iv) Almost all donor-supported agricultural projects support the value chain approach and there are an emerging number of professionals trained in value chain analysis and development. However, this is largely seen in the NGO and private sector, whilst the larger public sector lags behind. Most government research and extension organizations do not have the capacity to facilitate the process of linking various stakeholders, which is required for this approach. Good communication skills, and capacity for information and experience-sharing and deal brokering are some of the skills required, but these are generally not emphasized in the training of research and extension workers (see Part Two for more on facilitating innovation).

Contextual factors for successful value chain innovation

This case demonstrates how a number of external institutional factors – from policies and regulations to norms and values – had an impact on the success and failure of value chain development. In the section below, the elements that played a role in the success of the case study are re-formulated in a more generic fashion so that they can be used to examine other cases.

Institutions defined: we draw from institutional economics to defined institutions. They are the 'rules of the game': that is to say, the formal rules – laws, regulations, policies, as well as the informal rules – cultural norms, values, habits, and ways of doing things – that govern how people behave. Institutions reduce uncertainty by providing structure to everyday life (North, 1990).

Government policies vis-à-vis practice. Inconsistent policies inhibit innovation. For example, in this case, a change in government led to a change in the leadership of a government-owned bank; this in turn resulted in the cancellation of an approved credit scheme. This damages the trust that actors have of the financial system and inhibits innovation development. A clear government policy that supports agricultural system improvement – in this case using a value chain approach – can be a success factor in innovation efforts. But good policy needs to go hand-in-hand with the capacity to implement it amongst the different actors charged with this role.

Institutions: business level formal and informal rules and behaviour. In a business environment, trust, communication and common understanding, finance, capacity (of all stakeholders), and governance and leadership to sustain the process, are each important enabling factors for innovation.

- ***Trust***

Trust is probably the most critical factor in business transactions and is invaluable in establishing efficient and competitive value chains. In poorly developed value chains, short-term profit-seeking often prevails over business relationship building. This is what happened in the form of botched deals between the buyer and maize producers in the Brong Ahafo region. The lack of trust between the buyer and the producers led to long price negotiations and most farmers either kept their produce or sold it to other buyers on the open market. To build trust, dialogue is needed to find solutions to problems and manage disagreements as they arise.

Agreed 'rules of the game'. Good collaboration at the business level demands that clear rules of engagement be agreed between the various actors. Agreeing on a set of rules can reduce conflicts and is important to minimize situations of side selling[7], especially when dealing with smallholders. The process of coming to an agreed set of rules of engagement can build trust.

- ***Communication and common understanding***

A clear and common understanding of the public benefits of better functioning value chains greatly helps in terms of the willingness of individuals to invest time and effort in improving system functioning. When individual actors fail to see the advantages of improved collaboration, innovation in the organization of production and marketing is unlikely.

Innovation system improvement happens at multiple levels. Through practical interventions, contextual bottlenecks of an innovation process are made explicit and brought out in the open. When this happens, the constraints can then be discussed and addressed. Initiatives to facilitate innovation should be prepared and ready to improve the environment in which innovation processes unfold. This includes identifying and tackling the need for evidence-based policy change. The effect of these efforts to improve the enabling environment can be much greater than a one-off manoeuvre to get around the barrier being faced.

7 Side selling is when a producer agrees to sell a product to a particular buyer at an agreed price but decides to sell the same produce to another buyer after harvest. This happens mainly when prices on the open market are higher than the agreed price.

- ***Finance***

Well-adapted financial services are key to the success of market innovation, especially if the innovation concerns the intensification of production through inputs. Inadequate credit and finance from both primary and secondary financial institutions for all actors in the chain constrains innovation. This is common in developing countries where agriculture is seen as a risky business and therefore most banks shy away from financing the sector.

- ***Capacity (of all stakeholders)***

Lack of capacity to implement agreed actions promptly affects the process of facilitating innovation development: capacities (or lack thereof) not only of farmers but all stakeholders, including big industry players. For instance in the Ghanaian maize case study, a buyers who had agreed to establish post-harvest centres failed to do so; this was mainly due to their lack of capacity to understand and operate within the procurement rules of the donor, which led to delays.

In addition, building the capacities of both research and extension workers in the public sector to enable them to play a facilitating role in innovation processes is a sound starting point. This entails going beyond the occasional workshop or short course. Facilitation, and how to engage in changing the environment in which innovation takes place so that it is more conducive, must be included in the curriculum for training research and agricultural practitioners within universities and in vocational training, as well as in-service professional development.

- ***Governance and leadership to sustain the process***

In the case study, a number of issues that had been planned and agreed upon were not implemented due to administrative changes or lack of capacity as described in the previous paragraph. An additional issue is sustainability in terms of the facilitation of innovation processes beyond an initial pilot phase when an 'outside' facilitator is involved. To ensure sustainability, it is important to identify a chain leader amongst relevant stakeholders who has the following characteristics:

  - 'personal' or corporate interest in the success of the process;
  - legitimacy and is accepted as a chain leader by the other actors; and
  - capacity to play the leadership role.

To successfully develop and sustain innovations, the necessary government policies, and other institutions must be in place. Constraints in the context in which innovation takes place can be difficult to resolve, sometimes requiring considerable resources, political will and changes in social behaviour.

References

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Chapter 20

Successful innovation: what made it possible?

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Key Message: The context within which an innovation process takes place is not static: it evolves, develops and responds. Innovation processes are in dynamic, iterative interplay with the environment in which they happen; and they can change that environment to make it more enabling. Understanding the opportunities for this change can be gleaned through analyzing six interlinked but discreet aspects of 'context', namely: support infrastructure, hard institutions, soft institutions, interaction networks, capable individuals and capable organizations.

Introduction

This chapter seeks to analyze and understand the enabling environment that allowed a process of innovation to be sparked, to evolve and to be effective in two cases: potato seed selection in Kenya, and institutional innovation through a national level platform in Cambodia. To contextualize, it is important to understand that this chapter was written after the writeshop, where most of the chapters in this book were produced. The authors have used the framework presented in the overview chapter of Part Three of this book and seek to validate is through examining, in retrospect, two practical examples that illustrate the six types of favourable conditions for innovation that were identified in the overview chapter to Part Three. The chapter builds on the concepts described and discussed in the introduction to Part Three.

We open the story by briefly describing two real-life cases of successful innovation processes in order to provide background and explain why we consider each example to be successful. We then identify and analyze the conditions that allowed innovation to develop and be (at least partially) successful. The chapter concludes by identifying specific actions within the innovation process that contributed to improving the environment in which the process took place. We demonstrate that, while for didactic and analytical purposes a distinction can be made between the innovation process and the environment in which it occurs, this distinction is, in fact, an oversimplification of reality. In practice, there is a constant interplay between the process of innovation and the environment/context in which it takes place.

Case descriptions

Both cases can be considered successful innovation processes, but they are entirely different in terms of the type of innovation that evolved. The potato case in Kenya is fairly straightforward and focused on developing and disseminating a technology. Conversely, the Cambodian case deals with an institutional innovation and focuses on upscaling (institutionalizing) an overall approach towards agricultural research and development in the country.

Case 1: positive seed potato selection in Kenya

The re-use of harvested potato tubers as seed for the following seasons results in gradually lower yields due to tuber-borne diseases. This can be avoided by regular replenishment of seed stocks with high quality seed potatoes. The specialized production techniques, distribution and quality control system required to produce high quality seed potatoes makes them expensive and inaccessible to the vast majority of potato producers in Eastern and Southern Africa. This results in a seed potato system where farmers depend on their own seed potatoes, and those of their neighbours; as such, seeds are often recycled for many generations (Gildemacher *et al.*, 2009). Here we find the bottleneck: most producers can't afford the specialized high quality seed potatoes so use their own or locally available options, yet interventions to improve seed potato quality have almost invariably focused on building a system of specialized seed potato growers. Considering the importance of farm-saved seed potatoes in Eastern Africa, national and international researchers in this sector in Kenya identified the need to improve seed potato quality management by ordinary ware (for human consumption) potato producers as an additional strategy.

Positive seed potato selection was identified by national (Kenyan Agricultural Research Institute – KARI) and international (International Potato Center – CIP) researchers as a potentially promising technology that could assist small potato producers in Kenya (Gildemacher *et al.*, 2007; Gildemacher *et al.*, 2011). Positive selection means marking the best potato plants in a field before crop senescence (before the leaves start dying) sets in to serve as mother plants of seed potatoes for the next season's potato crop. A research and training programme on positive seed potato selection was developed and implemented through a partnership between CIP, KARI and the district offices of the Ministry of Agriculture in Narok, Nakuru and Nyandarua, with two main objectives:

1. To assess the value of positive seed potato selection as an additional technology for smallholder potato producers.
2. To develop a (cost) effective methodology for training producers on positive seed potato selection.

Activities and results

The positive selection initiative focused on developing a training programme. Much like farmer field schools, a demonstration trial (testing the technology and comparing it to common farmer practice) was at its core. Farmer groups met regularly over the course of ten months (one and a half seasons) for experience-based learning, which was facilitated by trainers selected from within the public extension system, who received special training for this purpose.

During the long rains season of 2005 (April-July) a first pilot was carried out with four farmer groups in Narok district, Kenya. The next season, during the short rains of 2005-2006 (October-January), an additional 46 farmer groups from three districts, namely Narok, Nyandarua and Nakuru, took part in the positive selection training.

Much has happened as a result of this Kenyan pilot. Some of the highlights are:

1. The value of the technology in the hands of smallholders was convincingly demonstrated.
2. A comprehensive training method was developed; training curriculum and accompanying materials were translated into five languages.
3. Initial adoption of the technology in Kenya by 28% of the farmers trained and higher potato-derived income by these adopters (Gildemacher *et al*., 2012).
4. Currently positive selection training programmes are running in Angola, Burundi, Ethiopia, Kenya, Mozambique, Rwanda and Uganda.
5. Seed quality maintenance by smallholder potato producers is now recognized by international and national research organizations and policy-makers as a complementary strategy for seed system improvement, alongside building up commercial seed potato systems.

Conditions for successful innovation in Kenyan seed potato selection

In retrospect, a number of conditions coalesced to make positive selection a successful intervention. These are summed up in Table 11, following the categories proposed in the introductory chapter of Part Three.

With regard to **support infrastructure**, physical infrastructure such as roads and mobile phone communication must be mentioned. A functioning potato trade system is another prerequisite that falls under the support infrastructure category. In addition, the knowledge infrastructure of a research and extension system with the resources to operate can be included here.

Hard institutions were of less prominent importance. Kenyan seed law did not actually recognize the importance of self-supply seed potato. What did assist in the pilot implementation was the level of autonomy that the district agricultural offices had to engage in interventions of their choice.

Of more importance were a number of **soft institutions**, the first being the possibility to ignore the literal text of the seed law. The law does not allow reference to seed potatoes that have not been multiplied from basic seed; further they must be certified. Fortunately, this was not a barrier for research and extension service to engage in the initiative. Furthermore, the people involved were open to research-extension collaboration, and showed trust and appreciation for each other's roles, making informal collaboration possible.

Related is the importance of **interaction networks** for the success of this intervention. The solid already existing linkages between research and public extension were instrumental for implementation, as were existing farmer self-help groups already known to the locally-based public extension staff. Finally, there was a regional and intercontinental network of potato researchers working through CIP and the East and Central African potato and sweet potato network (PRAPACE) that created an environment through which the Kenyan pilot experiences could disseminate.

Individual capacities of the researchers and extension staff involved were complementary in terms of local potato system knowledge, as well as didactic, technical and socio-economic

knowledge. In addition, the people involved were genuinely motivated to make a difference in terms of improving the lives of potato producers alongside production levels.

However, probably the most important preconditions for the success of the positive selection initiative were put in place by the three main participating (and very capable) organizations. The staff of CIP, KARI and the district agricultural offices involved had the freedom to pursue the idea of testing positive seed potato selection, while this was against much of the conventional thinking as to how to improve seed potato systems. The different organizations secured the resources required for the pursuit of this idea despite scepticism about the approach.

Table 11. Characteristics of the enabling environment for positive selection success

Characteristic	Seed potato case
1. Support infrastructure	• Mobile phone network allowing easy coordination of the intervention • Public extension system with staff, offices, motorbikes and cars • Ready and functioning spot markets for potatoes • Farmer self-help groups throughout potato agro-ecology as a starting point for intervention • Roads in potato growing areas to reach and train producers and to truck out the produce
2. Hard institutions	• Seed law (negative effect) • High levels of autonomy of district agricultural offices
3. Soft institutions	• Disregard for the existing seed law and acceptance of the informal seed system • Open-mindedness towards research-extension interaction • Informal collaboration possible • Pragmatic approach towards managing and accounting for funds by all parties • No issues as to intellectual property, ownership technology etc.
4. Interaction networks	• Solid research-extension linkages • Already-existing farmer self-help groups • Linkage to NGO programme for additional funding • International network of potato researchers (PRAPACE, CIP)
5. Capable individuals	• Local organization with people who know the sector • Motivation and drive of research actors • Motivation and drive of most extension staff • National and international research staff with combined didactic, technical, socio-economic knowledge
6. Capable organizations	• Organizations giving their employees the freedom to engage • Autonomous decision-making at district level within the extension system • Providing staff with mobility/access to cars/limited funds • Backstopping by senior scientists • Timely availability of the resources required

Effect of the intervention on the enabling environment

The success of the pilot activities proved a powerful trigger to get better partnership, leverage more funding, and also to get engagement from the national ministry level. The success of the intervention was that it changed the thinking about seed potato systems – slowly, but

substantially. This was what we refer to as a change in the soft institutions as a result of the intervention. There was a shift from a singular focus on seed production by specialists to considering seed production and maintenance by ordinary farmers as a complementary approach worthy of supporting and improving. This successful pilot in Kenya has also influenced seed systems in many other countries (e.g. Angola, Burundi, Ecuador, Ethiopia, Malawi, Mozambique, Peru, Rwanda and Uganda).

Case 2: institutionalizing participatory approaches

Prolinnova – Promoting Local Innovation – is an international network aimed at promoting more demand-driven, participatory, agricultural research and development. The network is active in over 15 countries. In each of these countries, a national or provincial level multi-stakeholder platform coordinates and provides direction to the programme. Activities are jointly discussed and implemented by the platform members. Prolinnova draws on the assumption that changing the way agricultural research and development take place – to include a more prominent and active role of farmers – depends on changing mindsets and behaviour. It believes that getting extension, researchers and NGO staff to work together with farmers on the basis of farmers' own ideas, will demonstrate to these actors that farmers are capable of playing an active role in the innovation process. As such, the innovation aimed at by the Prolinnova programme (and the related country platforms) is of an organizational and institutional character: changing the way organizations work and think.

Organizational and institutional change only happens when partners learn together and share their experiences, frustrations and successes. Many authors refer to this process as social learning (Leeuwis & Pyburn 2002; Wals, 2007). Beers *et al*., (2009) look at social learning as the outcome of the interplay – outcome of interaction – between partners. This interaction is directly linked to (and dependent on) the commitment of partners and their mutual trust, and the fact that they work towards a common interest (shared frame) play a decisive role (Figure 12).

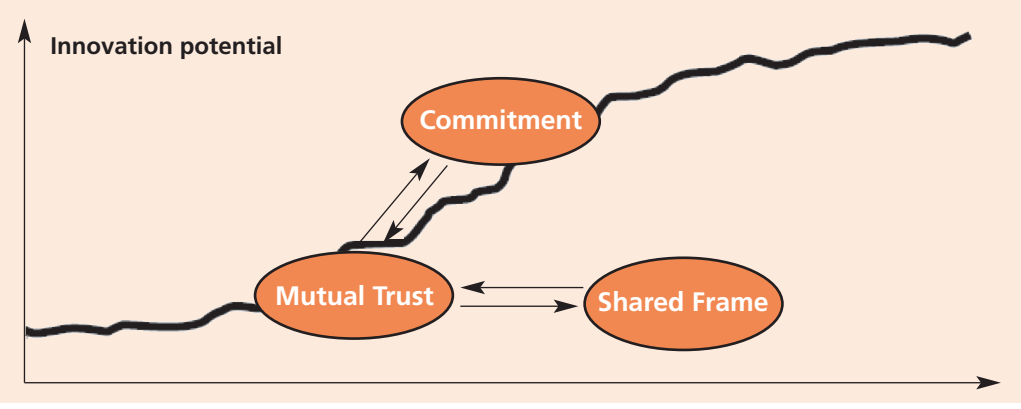

Figure 12: Social learning is the dynamic interplay of shared frame, mutual trust and commitment
(Source: Beers *et al.*, 2009)

In Cambodia, the Prolinnova network started in 2005, and has since been coordinated by CEDAC (Cambodian Center for Study and Development in Agriculture, from the French acronym), a Cambodian NGO. At national level, the Prolinnova national platform is composed of around 23 actors, including government organizations (Ministry of Agriculture, provincial departments of agriculture – responsible for extension services), NGOs, farmer networks and universities. These partners have jointly planned for, and implemented, a large number of activities, including: university lectures and field trips to show students farmers' own ideas and initiatives; local experimentation supported by extension services and NGOs on several commodities and thematic areas, but very often on rice; publication of a magazine which serves as a catalogue for farmer innovation; and training of practitioners at several levels on participatory research and extension methods.

The programme defines its objectives as:

- To build an inter-institutional partnership in promoting local innovation and participatory approaches in agricultural research and development.
- To institutionalize participatory approaches in agricultural research, extension and education institutions (www.prolinnova.net)

From the start, Prolinnova-Cambodia has purposefully involved a number of policy-makers and extension service providers in the national platform. This was a strategic move: involving these individuals meant that they felt that they were a part of the platform, and had 'ownership' of the idea of promoting change within their own organizations. CEDAC built on its personal contacts and carefully chose specific individuals to participate in the platform. These individuals showed a history of openness to similar ideas and were well-positioned within their organizations. They were, for example, heads of provincial departments of agriculture: individuals who could take decisions and ensure the commitment of the organizations they represent. In addition, they had good personal contacts with the staff involved in the project. This tactic worked: after a few years, government institutions – at least at high level management – expressed a high degree of ownership over the ideas behind Prolinnova.

Importantly, the platform did not feed on discussions and meetings. Instead, it fed on actions and evidence from pilots being carried out by all the partners involved, which shared (in a transparent manner) resources and responsibilities, and rotated their roles within the platform over time. Capacity building, through training and on-the-job coaching, played a key role in ensuring that organizations participating in the platform could strengthen their individual capacity to become involved in multi-stakeholder partnerships at different levels: from joint experiments between farmers and extension workers to national level policy dialogue between NGOs and the Ministry of Agriculture on new policies and initiatives. Since its inception, the programme has involved and benefited over 250 students, 500 farmers and 150 extension workers.

Exerting influence over government policy was particularly important in Cambodia in order to guarantee the involvement of government institutions and trigger change. Instead of taking a confrontational approach to influencing policy, Prolinnova-Cambodia opted to dialogue and to convince policy-makers and others of the need to change by letting them see

the results of the programme's work (and in fact work together!) in a number of pilot areas. Policy-makers and high level management of key governmental organizations have been constant and active members of the Prolinnova platform. They participated in joint experimentation with farmers, trainings and documentation of farmer innovation.

A recent study on the degree of institutionalization of participatory approaches in the government extension services of one province in Cambodia – Takeo – states that the hierarchical organizational culture in Cambodia, potentially a limiting factor for innovation, has been used instead to support the innovation process. Verbal support from high-ranking officials and acknowledgement of Prolinnova increased acceptance of the approach by other officials at the Ministry of Agriculture and at the provincial level extension services. The policy dialogue established with the Ministry (and with the Minister himself) was relatively successful, resulting in a gradual change in the culture of nationwide agricultural extension in terms of more attention to farmers' own capacities and ideas as a source for agricultural development (Birke *et al*., 2010).

The same study concludes that the combined effect of the activities implemented in the hierarchical context of the Ministry of Agriculture and the Provincial Department of Agriculture (PDA, i.e. extension services) in Takeo, coupled with social ties between the extension services provincial director, the Minister of Agriculture and the CEDAC president, and the personal commitment of the PDA director, have led to important practical changes. These changes include, for example: importance being placed on identifying and promoting local innovation as part of the annual plan in the provincial extension services; initiatives for collaboration with other organizations to promote participatory approaches; and, inclusion of such approaches in proposals by PDA to other donors (Birke *et al*., 2010).

Recent discussions with the Ministry of Agriculture Fisheries and Forestry on a new national fund for innovation also show that the ideas promoted (and practised) by those involved in Prolinnova Cambodia have taken them a long way towards informing policies at national level.

In the case of Prolinnova-Cambodia, the environment of the agriculture innovation system presented key challenges related to **soft and hard institutions**, and **organizational capacity**. Rather than being demotivated by this fact, the programme chose to build on important conditions in the enabling environment (**informal network links, capacity within a few organizations**), in order to change the context in which it was operating.

Conditions contributing to successful innovation: Prolinnova-Cambodia case

Table 12 provides a quick overview of how, in the case of Prolinnova-Cambodia, the environment played a role in supporting or hampering the innovation processes.

Table 12. Overview of Prolinnova-Cambodia

Characteristic	Prolinnova
1. Support infrastructure	• Public extension system with staff and offices, but with few resources and often low levels of training and/or education • High staff turnover for extension services and within the local NGO • Ready market for rice • Farmer groups operating in many communities • Local NGOs operating some (but not all) provinces • Weak public research facilities and activities
2. Hard institutions	• Agriculture development strategy in place • National innovation strategy under development • Ministry of Agriculture functioning under a centralized, hierarchical authority
3. Soft institutions	• Open mindedness towards research-extension collaboration • Informal collaboration possible • Outspoken and articulate farmer groups • No issues around intellectual property: farmers believed that their knowledge should be shared widely, which was in line with the ideology of the programme • Hierarchical organizational culture • Flexible and supportive donors
4. Interaction networks	• Strong informal and formal networks between research/extension/NGOs • One individual working at both university and NGO (CEDAC) • Previous history of collaboration between NGOs, farmer groups and extension workers on a similar theme • Building on other programmes for additional funding
5. Capable individuals	• Platform members with strategic vision • NGO (CEDAC) with active and efficient staff • Extension services staff with previous experience in working with farmer field school methodology: that is to say, a participatory methodology where farmers play an active role • Extension service provincial directors were open and ready to realize the benefits of collaboration and to build links between organizations
6. Capable organizations	• Organization ensured programme continuity despite the departure of staff • Continuous backstopping by senior NGO staff • Relatively autonomous decision-making at district level in the extension system • Staff were provided with access to a car and limited funds

What do we learn from the Cambodia and Kenyan cases?

The two cases presented here are very different: the Kenyan case focuses on a technology, whereas the Cambodian deals with an approach towards locally driven research and development. In Kenya, the innovation was triggered and coordinated through informal partnerships; in Cambodia, through a formalized partnership, with oversight bodies and implementation teams. In Kenya, the process was triggered and lead by researchers; in Cambodia, by NGOs.

Despite these differences, the six elements identified in the introduction chapter of Part Three do, based on the two cases analyzed here, provide a useful framework for analysis. This framework does more than simply pointing out the elements that have to be present to trigger and allow innovation to take place. It provides a good starting point for a critical analysis of the environment in which an intervention will have to operate. In both cases use was made of the existing enabling characteristics, such as a rudimentary extension infrastructure as well as openness to research-extension collaboration, to achieve initial results. A quick analysis of the enabling environment may be helpful to identify those enabling characteristics that can be banked on for initial success.

At the same time, such an analysis may well help define the strategies that can be embraced for addressing those characteristics that are not yet very favourable for innovation, thus improving the enabling environment on-the-go. In other words, the framework allows us to see which elements of the environment could be used to advantage to change others – for the better. Both the Kenyan and Cambodian cases demonstrate that the environment in which innovation takes place is not static. Rather, it is influenced and shaped by innovation processes as they evolve.

Early success triggers openness towards change. In both cases initial success proved to be a powerful push towards further improvement of the environment for innovation. The success triggered interest and stronger partnerships – making both hard and soft institutions more enabling for collaboration and joint learning. It has also helped to leverage more funding at the local level and to ensure a more solid engagement with the national government. In Kenya, the initial success resulted in a stronger buy-in and the integration of training methodology in the Ministry of Agriculture strategy, but also in the more successful leverage of funding for replicating the training approach. This has now reached a point where different public, NGO and producer organizations are using the training methodology in an integral or adapted manner in several countries in collaboration with CIP, but also independently.

In Cambodia, initial partnership activities focused on training and experimentation on the ground, allied with key policy-dialogue initiatives at national level. The capacity of CEDAC and its partners to involve a larger number of farmers, researchers, students and extension workers in these activities, and to widely publicize its achievements, have led to greater commitment of partners. These partners saw the advantages of joining (or remaining) part of the programme even if that meant that they had to contribute with funds from other sources to keep it alive. This commitment, in turn, is essential for eventually promoting policy change. Strong coalitions and partnerships are particularly important when policy change and institutional innovation is the aim, as in the case of Prolinnova-Cambodia (Hall *et al*., 2004).

Document and share successes via informal linkages and networks. In both cases, success achieved by working together has changed the way that the organizations involved think. By documenting the successes (both in Cambodia and Kenya), experiences were shared more broadly, and have helped to inform and influence institutions and organizations. In the case of potatoes, a shift can be observed in terms of appreciation for the role of smallholder ware potato producers in the seed potato quality maintenance and even multiplication by decision

and policy-makers, not only in Kenya, but also in Angola, Ethiopia, Malawi , Mozambique, Rwanda and Uganda. In the case of Prolinnova-Cambodia, local level experiences were documented and strategically fed to policy-makers (who were in fact also partners); the platform made use of existing informal linkages and networks. This has helped to change the way extension services work in Cambodia and may soon change the way agricultural innovation is financed.

Capacity building. As argued by Heemskerk *et al*. (in the introduction to Part Three), perhaps the most important enabling environment factors are capable organizations and individuals. In Cambodia, on-the-job and formal trainings have played a significant role in enabling individuals and organizations (e.g. extension services, universities) to play a more active role in participatory interventions. After being trained and having seen other peoples' experiences, they were better able to understand the implications of working together with farmers (and not for farmers). In Kenya, the intervention improved the capacities of CIP to partner with national research and the existing extension infrastructure improved, which served the initiation of similar programmes in Ethiopia, Rwanda, Uganda, and a number of other countries. The KARI station improved its capacity to train trainers and play an active role in capacity building programmes. The Kenyan extension system improved its capacity to engage in with farmer groups in an effective manner, adapted to their potential in terms of resources and human capacity.

This is not to say that these experiences managed to overcome all constraints or obstacles faced. In Cambodia, the extension services have a long way to go before fully institutionalizing a more participatory approach: they need to invest in more capacity building, resources and a more conducive internal environment (i.e. within the extension service) for learning. In Kenya, recent implementation of large-scale training through the district offices of the Ministry of Agriculture has become more expensive as a result of substantial increases in field allowances. In addition, the programme suffered a set-back in the beginning as a result of the transfer of many of the trained extension staff following the appointment of a new permanent secretary of agriculture. In most of the countries with training programmes on positive selection, these depend largely on project-based international funding rather than government programmes or through resources from the potato sector. Challenges will always be there. The joint capacity of the partners to look for new solutions – to innovate – is, in itself, as important as the innovation they come up with.

What becomes clear in comparing these two very different cases is that the six characteristics provide a helpful framework to identify existing strong points to use, as well as systemic constraints that could be addressed during the intervention. Addressing the systemic constraints will become possible through creating momentum and buy-in as a result of first pilot success and the fact that the constraints can be made visible during the intervention.

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Dealing with the context "cheat sheet"

Policies, institutional frameworks AND stakeholder interaction must all be enabling in order for innovation to be nourished. Policies and institutional frameworks are not enough. An enabling environment must also foster and facilitate stakeholder interaction; this improves the opportunities for innovation and learning.

Funding channels can be a critical aspect of an 'enabling environment'. Private sector innovation through socially and environmentally progressive businesses faces a major constraint due to a disconnect between NGO, private, and public funding avenues. The institutional setting – enabling environment – for innovation can be changed through dialogue amongst funding actors with diverse objectives with triple bottom line entrepreneurs. Integrating and distinguishing funding flows can lead to better synergies but linking public and NGO funding for business development requires coordination.

Open, transparent and democratic governance is key to innovation. This refers both to the dynamics of specific projects and to the wider policy environment.

Linking public and private investment in research must be done strategically and in a coordinated manner. Separating research funding from research implementation ensures higher levels of accountability.

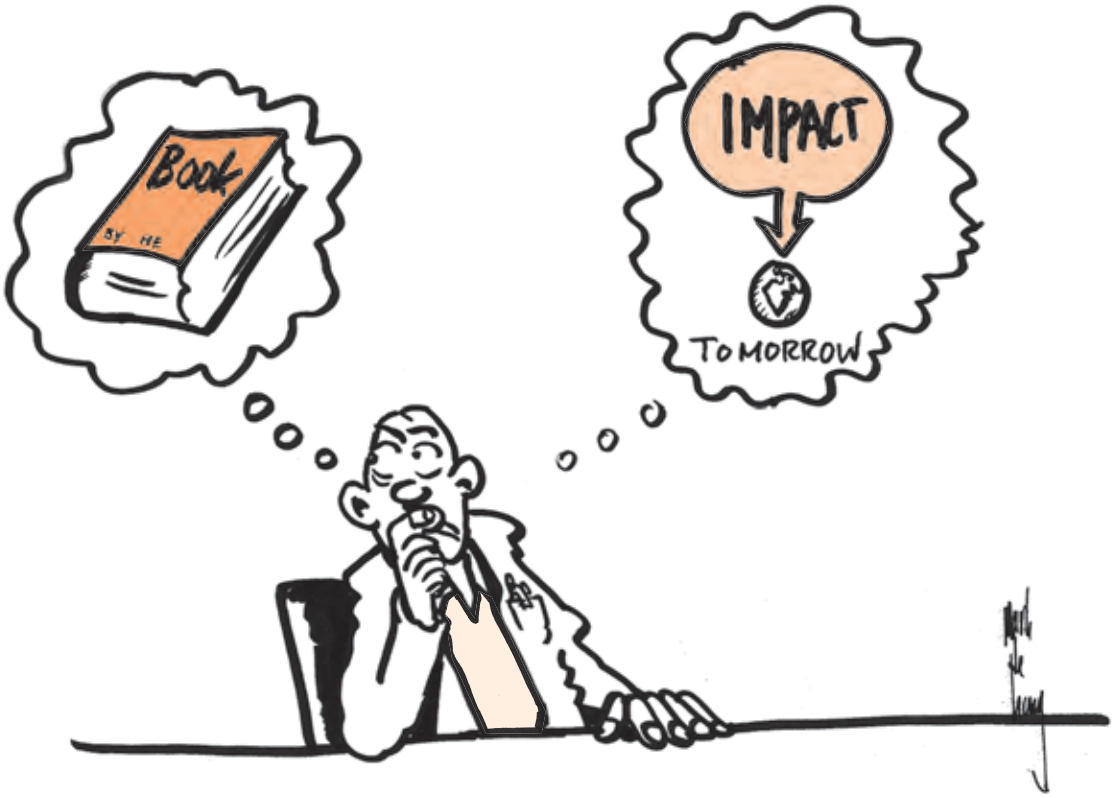
Innovation can also be systemic (i.e. an innovation in the context in which opportunities for change and improvement emerge). Innovation is increasingly focused on value chain development; that is to say, on engaging with and changing the enabling environment itself. Value chain innovation underscores the importance of both formal and informal institutional factors when it comes to creating new structures within the context in which innovation takes place.

The context within which an innovation process takes place is not static: it evolves, develops and responds. Innovation processes affect and are affected by the context in which they take place. This is a dynamic and iterative relationship. The environment in which innovation happens can change becoming more (or less) conducive for innovation. Understanding where the opportunities for this change can occur can be done through analyzing six interlinked but discreet aspects of the context, namely: support infrastructure, hard institutions, soft institutions, interaction networks, capable individuals and capable organizations.

Chapter 21

Conclusions

Jim Woodhill and Rhiannon Pyburn



At the beginning of this book we laid out the enormous challenges a new generation of agricultural graduates will face as they work on the task of sustainably feeding upwards of 9 billion people. In the chapters that followed, ideas and practical examples were provided as to how agricultural professionals can contribute to tackling these challenges by catalyzing and accelerating change. Our aim was to provide inspiration for how new graduates can become brokers of innovation and, by doing so, make a very real difference.

When today's graduates begin looking back on their careers in some 40 years' time, the world will be radically different. Economic power is likely to have completely shifted from North to South, the world population will have nearly stabilized and we will have sorted out how to deal with climate change, or we will be on the brink of catastrophe. This next generation will be living through perhaps the most innovative, uncertain and dynamic period of human history. It is impossible to imagine everything that lies ahead but, looking forward, we already know at least a few of the really big tasks that will confront emerging agricultural professionals. These include, for example: doubling food production, while at least halving the ecological footprint; transforming small-scale agriculture so it can be commercially viable

yet still support the livelihoods of billions; working out how to feed very rapidly growing urban populations many of whom will remain very poor; and creating forms of 'climate-smart' agriculture. Taking on these challenges requires an integrated set of competencies combining the biophysical and social sciences with the people skills to bring about change. Developing these competencies is a key responsibility of the higher education institutes who will train these new agriculturalists. This calls for a change in how agricultural education is structured, developed and delivered. The future requires professionals inspired to think 'out of the box' and who can inspire others to, in order to drive the scale of innovation that must be unleashed.

This concluding chapter draws together threads woven throughout the book to look at implications for the required competencies of this new generation of agriculturalists and for the functioning of the knowledge institutes who train and educate them. Education and research institutions are not always quick to change and, unfortunately, traditional modes of disciplinary-based education with little focus on graduates being agents of change, still dominate. We hope that the frameworks and examples in this book will also inspire change in what, and how, undergraduates are taught.

Interdisciplinary perspectives

We have laid out the shift from a linear techno-centric approach to research, development and extension towards a learning centric, multi-stakeholder approach that acknowledges complexity (Chapter 2). Throughout the chapters we see examples of what this means in practice, including:

- **Integrating a technical focus with marketing**: a special auction in Ethiopia bringing exporters together with farmers in the project resulted in them being paid 70%, which in turn raised the price paid by local traders (Chapter 3); weighing the pros and cons of different crops and different markets for maize and potatoes in Rwanda – so-called entrepreneurial monitoring and evaluation (Chapter 14).
- **Grasping value chain development beyond just production**: rural innovation is not limited to production, but can happen further up the chain in processing, marketing, consumer relations, and so on. We saw a good example from southern Togo where the focus of the International Fertilizer Development Center's (IFDC) attention shifted from agricultural production and productivity to chain performance (Chapter 10). Moving beyond just production was key to innovation for potato crisps in Uganda – a value chain approach and understanding the full chain was critical (Chapter 11).
- **Coupling new technology with an interactive learning process**: bringing scientific (banana tissue culture) and local knowledge together to improve banana production in Kisii district, Kenya (Chapter 4); likewise in Uganda, drawing together the many actors in the potato crisp chain led to trust and social networks being strengthened, and better information flows alongside the development of technical knowledge and skills (Chapter 11)
- **Facilitating learning for innovation**: is highlighted in the International Centre for development oriented Research in Agriculture's (ICRA) mandate and methodology for building capacities and competencies for innovation at individual and organizational levels. This

requires process skills – understanding and being able to facilitate and communicate well – alongside expertise in a particular sector (Chapter 7). This was also taken up in Chapter 12 where the role of intermediaries as catalysts of change was fleshed out further and we see a good example of the benefits of co-learning in the cassava sector in Uganda (Chapter 17). See also Part Two of the book on facilitating innovation.

- **Rebuilding/influencing public policy**: for an innovation to take root requires communication, a good grasp of scientific research and development, market incentives and investment. Policies can enable or constrain this process (Chapter 5). From a water and sanitation project in Ethiopia, we learn how they developed new ways of conducting research, and producing and translating knowledge to influence not only practice but also policy (Chapter 15). Understanding policy processes becomes part of the new agriculturalist toolkit alongside technical know-how (Part Three).
- **Sensitivity to gender dynamics, power and inclusion**: integrating a gender and rights framework into agricultural innovation systems thinking to ensure better and more relevant 'solutions' are generated that reflect the needs and contributions of the different categories of male and female actors involved (Chapter 8). Power dynamics are at play in multi-stakeholder processes and must be managed (Chapter 10).
- **Creating partnerships**: was seen in the dairy partnership in India wherein a Dutch company, specialized in animal nutrition, partnered with a rural development NGO, a non-profit development research foundation, and a well-established dairy cooperative to create value for these different partners with diverse interests (Chapter 9).
- **Awareness of funding and finance mechanisms**: related to a social enterprise's experiences in the Indian cotton sector, we learned that navigating between private and public sector funding requirements and expectations can be a massive challenge. Knowledge of these different avenues, and facilitating communication and coordination amongst them, can open up possibilities for funding innovation (Chapter 16). Looking to sub-Saharan Africa, finance is also addressed. This time, the focus is on one part of the agricultural innovation system – specifically the financing of research and technological innovations, underlining the importance of linking public and private investment in research (Chapter 18).
- **Understanding institutional development**: understanding that innovation can also be institutional – e.g. the agreement to pay cassava farmers at source in Uganda (Chapter 17) – is important for the new agriculturalist. The characteristics of an enabling institutional environment in Ghana were taken up and fleshed out (Chapter 19). And, based on positive seed potato selection in Kenya and experiences with an approach in Cambodia, an analytical framework for the institutional environment emerges (Chapter 20). A good grasp of institutions, institutional economics and institutional change, and development are also part of the toolkit.

Increasingly, interdisciplinary approaches and more holistic schools of thought are coming to the fore. But interdisciplinarity is not simply 'sticking old disciplines together'; it demands an integrated perspective on change. It is about thinking across, between and among disciplines. Interdisciplinarity can support the new agriculturalist in taking on the complex challenges facing agri-food systems and rural development. The changes necessary are more likely to emerge when diverging thoughts and think patterns are brought together around a common problem to work towards joint action.

Competencies for a new generation

So what does all this mean for the capabilities needed by agriculturalists and education programmes? When we look across the chapters in this book, we gain a good sense of what the emerging professional is facing, what they will be expected to do, and the capabilities they will need. Capability or competency is now well understood to involve three elements – knowledge, attitude and skills (Lizzio & Wilson, 2004; Baartman & Bruijn 2011). Indeed, most modern curriculums are based around the concept of competencies. Table 13 defines these terms and provides some examples as to the sorts of competencies needed by a graduate working from an innovation system perspective.

Table 13. Defining terms

Knowledge: Having sufficient information and understanding about 'how things work' to be able to act effectively in a particular situation. *(To drive you need to know the road rules and how a car works – but this alone is not enough)*	Examples of relevant knowledge for a new generation of agricultural professionals include: • an understanding of how complex adaptive systems function; • technical knowledge about agricultural production systems; • understanding market dynamics and the incentives in value chains; • being aware of what generates conflict, and strategies that can be used to improve cooperation between people.
Skills: Ability to effectively perform specific tasks *(To drive you need to develop the skills of manipulating the mechanics of the car while constantly adjusting to what others are doing on the road)*	Examples of skills required for the new agricultural professional include being able to: • conceptualize and make sense of messy situations; • facilitate group learning and the decision-making process; • actively listen and communicate well; • use the latest communication technologies; • understand and translate between opinions, views and interests.
Attitudes: The way we think, feel and behave in situations. *(Drivers on the road can be careful and courteous to others or aggressive, careless and dangerous)*	Examples of the attitudes needed by the new agricultural professional include: • comfortable with uncertainty; • willingness to take risks; • interested in the perspectives of others; • prepared to challenge convention; • humility towards your own role: catalyze and accelerate change, rather than be the central driver.

As part of the elements of competency – the knowledge part – a graduate wishing to work as an innovation broker needs to operate from the interdisciplinary starting point described in the previous section. However, historically the tendency is for education and training almost entirely based on technical science and technical skills. Typically, graduates leave their studies heavily laden with knowledge about technical subjects but are missing the attitudes and skills needed to be effective in tackling real world issues. A shift is needed, from a purely knowledge-based education, towards a broader set of capabilities that enable a truly interdisciplinary approach. New professionals need the skills to think about changing

the institutional environment; and an attitude which will allow them to do it. Above all a new generation of graduates will have to be adaptive. Knowledge institutions, we believe, need to focus on the following four areas to ensure that they are producing graduates that have the rounded competencies to be effective professionals in the years to come:

1) **A 'systems perspective'**: An ability to 'see the big picture' and look at problems in a holistic way, recognizing the inherent complexity and uncertainty of natural and human systems.

2) **Technical and biophysical understanding**: Knowledge and understanding of the biophysical and technical foundations of agricultural production systems.

3) **Market dynamics and social science understanding**: Knowledge and understanding of the incentive structures, market dynamics, human motivations and politics that shape change in agricultural and food systems.

4) **Facilitation and brokering competence**: Capabilities to inspire and support learning, systems thinking and collaborative action by those with whom graduates will work in the agricultural and food sectors. This includes a capability to manage ones 'life-long' learning and being able to operate in an 'entrepreneurial' and politically astute way to help facilitate change.

There is no question that this is an ambitious list. It is impossible to expect all graduates to be highly capable across all these areas. Tackling future challenges will require teams of professionals who have different capabilities and strengths but who have the foundations to be able to work in a systemic and interdisciplinary way. Broadly, one can imagine two main graduate profiles: those who are the technical or disciplinary experts, and those who are the synthesizers and facilitators of change.

Implications for higher education and research institutes

Research and education institutions have a critical role and responsibility. The future relevance of knowledge institutions to food security issues will largely depend on their ability to combine scientific excellence with societal engagement. This implies research that goes beyond the generation and testing of new ideas and approaches. Some would argue that this would make knowledge institutes act 'out of mandate'. However, here we have made a case that acting out of this mandate is exactly what is required of knowledge institutes to effectively contribute to agricultural change. By acting out of mandate and engaging more directly in the process of change, the contribution of knowledge institutes can improve as they come to better understand what is actually required, in practice (system understanding). A better understanding of the system will improve the quality of service provided by research. Secondly, knowledge institutes have a number of capacities that are of use in the process of change:

- Knowledge institutes hold the building blocks of knowledge and expertise for interdisciplinarity. However, just having all disciplines housed in one institute does not ensure interdisciplinarity.

- Knowledge institutes are fairly constant in their presence, in comparison to, for example, private companies, NGOs, and farmer organizations, and can thus provide some continuity to change processes.
- Knowledge institutes have the expertise to accompany experimentation, analysis and adaptation.

The real added value of research and education institutes will come from combing and integrating traditional research and education functions with a much stronger focus on leading, supporting and facilitating change. This is what Richard Bawden refers to as 'critical engagement' (Fear et al., 2006). Critical engagement implies that knowledge institutions combine and invest in the following functions:

- generating scientific understanding;
- synthesizing and brokering knowledge in an interdisciplinary and policy/practice relevant way;
- leadership by assisting leaders to be informed and thoughtful about longer-term issues and consequence of decisions;
- providing practical integrated solutions to systemic problems;
- supporting informed societal learning;
- providing independent and critical analysis;

To undertake this broader range of functions, new partnerships, funding mechanisms, incentives and human capacities are required.

Box 22. The Hawkesbury experience

The ideas presented in this book are not necessarily new. Back in the early 1980's an experiment was begun with one of Australia's oldest agricultural colleges. Richard Bawden, the newly appointed dean and his colleagues, embarked on an educational transformation that ended up having a worldwide influence. Seeing many of the issues for agriculture we are now talking about, the team at Hawkesbury brought together the ideas of systems thinking, action research and experiential education into a new paradigm of agricultural research and education. The new curriculum had three core competency areas: systems thinking, effective communication and autonomous learning. The basic philosophy was that you can never teach a graduate everything they will need to know . Instead, you need to set them up to be life-long learners, instill an approach of interdisciplinary and systems questioning, and enable them to be highly-skilled communicators to work effectively with their 'clients'. Students started their course with a systems analysis of the college dairy farm. In their first year , they were already engaging with rural communities and undertaking projects in small working groups. Lectures largely turned into facilitated learning tutorials, and exams became a process of students having to take responsibility for their own learning goals and for demonstrating to staff that they were developing their required competencies. Students became drivers of their own learning programme. Not all was perfect, the programme was demanding on staff abilities and time and it did not fit easily into the standard procedures of how universities work. But, still, it provides a great example of how education can be radically different. Interestingly, medical faculties have also been quite progressive in recognizing that being a good doctor requires going outside the traditional format for education.

If knowledge institutes are to prepare young professionals to broker innovation, then they need educators who have actually played this role. A challenge is getting people with field experience as teachers/lecturers. How can knowledge institutes get more interplay between doers and thinkers? That is to say: more practical experience and practical know-how into the curriculum, and teaching content and methods. This requires that practical field experience should be valued, rather than focusing solely on publications and theory development.

Messages for education and knowledge institutes

Critically engage
Education and knowledge institutions must demonstrate to their students how to be effective brokers of innovation and agents of change. This means engaging in real world problem solving and innovation through partnerships with business, policy makers, NGOs and communities. Knowledge institutions do need to bring a critical perspective through good science, critical analysis and balance perspectives. But this should not be a barrier to researchers and students actively engaging with other stakeholders to facilitate innovation and change.

Educate for systemic change
Curriculum must be development from the ground up to create critical, systemic thinkers who can broker and facilitate innovation. Knowledge alone is not enough. Graduates need to combine this with practical skills for engagement and the right attitude. This can only come from experience so education programs must build in substantial real world engagement and problem based learning activities.

Reward diversity
The good intentions of many education and research establishments quickly become unstuck because of the way academics are judged and rewarded through scientific publication. Institutions that want to be serious about brokering innovation must look closely at the incentives for staff to engage with real world problem solving and to create types of education programs needed for graduates to be agents of systemic change.

Messages for the emerging professional

Expect failure and plan for it
Large numbers of failures are necessary for a small number of successes. Approach challenges with an experimental mindset, and make the experiments 'safe-fail' (Cognitive Edge, no date); that is to say, ensure that failure will not be catastrophic. When facing complex problems, trying out a variety of possible solutions is a sensible approach. Avoid 'overprotecting' initiatives as it constrains the process of adaptation over time.

People and processes matter
Build sustainable relationships and invest time in people. Do not be naïve about power (including gender dynamics).

Keep sharp
There are lots of resources out there as well as other people's experiences to draw from. It is important to find mentors, ask questions, and watch/observe how people you respect operate in the field. Read the theory and keep track of your own experiences (e.g. keep a work journal): iterate between theory and practice to keep both skill sets (the thinker and the doer in you) sharp.

Situate yourself

Be self-aware and know where you sit in the system in which you are engaging. Be aware of your mindset as well as that of others, especially when it comes to assumptions or understandings as to how change happens (internal theories of change). Know where you sit within the innovation system. Know your own strengths and weaknesses and have an ongoing and evolving list of skills/concepts you are working to improve. Continual improvement is critical. As human beings, learning is a lifelong endeavour.

Nurture humility

As a process facilitator, do not expect praise for your role – it is often invisible or unrecognized. Instead, get your satisfaction from the success of others and the success of the objectives defined by the people you are working with. Remember that small changes can often lead or contribute to bigger changes. Be humble.

'Just do it'

Learn by doing – get out in the field, facilitate, try things out. By all means, read guidelines, absorb advice, learn from others, but ultimately follow your own intuition and develop your own style. As the famous Nike© running shoe commercial says, 'Just do it'!

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Fear, F.A., C.L. Rosaen, R.J. Bawden and P.G. Foster-Fishman. (2006). *Coming to Critical Engagement: An Autoethnographic Exploration*. University Press of America, New York.

Lizzio, A. and K. Wilson. (2004). Action Learning in Higher Education: An Investigation of its Potential to Develop Professional Capability. *Studies in Higher Education*, 29: 469-488.

Recommended reading

Chambers, R., A. Pacey and L.A. Thrupp. (eds.). **(1989)**. *Farmer First*. Intermediate Technology, London.

This classic presents a new paradigm for agricultural research. The authors argue that farmers in resource poor areas are innovators and adapters, and that agricultural research must take farmers' own agendas and priorities into account. Based on a collection of papers and case studies, it is shown that farmers' capacities and participation need to be part and parcel of developing solutions for pressing problems in complex, diverse and risk-prone smallholder farming systems. This book shook thinking at the time of publication and remains an important read for professionals in this field.

Checkland, P. and J. Scholes. (1990). *Soft Systems Methodology in Action.* Wiley, Chichester.

Peter Checkland combined systems thinking with real-world practice to develop the soft systems methodology. This classic distinguishes between 'hard' systems thinking, in which parts of the world are taken to be 'systems' which can be 'engineered', and 'soft' systems thinking in which the focus is on making sure the process of inquiry into real-world complexity is, itself, a system for learning. This is an important read for situating innovation systems thinking and for understanding the shifts in how research-extension-farmer relationships have evolved.

CTA, UNU-INTECH, and KIT. (2005). *Analyzing the Agricultural Science Technology and Innovation (ASTI) Systems in ACP Countries.* Technical Centre for Agricultural and Rural Cooperation (CTA), Wageningen.
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This paper describes the methodology for a research project looking at the strengths and weaknesses of the local science, technology and innovation system in the agricultural sector in order to build the innovation capacity in African, Caribbean and Pacific countries.

Douthwaite, B. (2002). *Enabling Innovation: A Practical Guide to Understanding and Fostering Technological Change*. Zed Books, London.

An agricultural engineer takes a critical look at his research work in Asia in designing technologies for and with small-scale rice farmers, and reflects on the many failures in developing 'appropriate technology' when there is no awareness of the social processes involved in innovation and technology diffusion. Using not only these experiences, but also examples from industry, economy and information technology in both industrialized and developing countries, he argues that successful innovation is based on opening up to diversity, grasping opportunities and mobilizing creativity among people. Innovations emerge out of a complex process of multi-agent interaction and adaptation, as different agents learn and select improvements. The final chapter is a guide to launching a 'learning selection' approach to understanding and catalyzing technological change.

Engel, P.G.H. and M.L. Salomon. (1997). *Facilitating Innovation for Development: A RAAKS Resource Box.* Royal Tropical Institute (KIT), Amsterdam.
www.kit.nl/kit/Publication?item=1512

RAAKS, the rapid (or relaxed) appraisal of agricultural knowledge systems, is a participatory action-research methodology developed by the authors of this book, Paul Engel and Monique Salomon. RAAKS is being used to encourage innovative capacity development and social learning processes at the community level among rural organizations and institutions and, more recently, in agricultural market chains. The RAAKS resource box contains: a book, *The Social Organization of Innovation*, which details RAAKS' theoretical background; a manual, *Networking for Innovation*, which addresses the method itself; and two sets of cards, *Windows*, which help to 'open up' new perspectives on the analysis, and *Tools*, which help in gathering and processing information. The RAAKS toolkit is an extremely useful set of tools for work in the field and for untangling the specifics of the innovation system under analysis. Engel is Director of the European Centre for Development Policy Management (www.ecdpm.org).

Hall, A. (2006). *Public Private Sector Partnerships in an Agricultural System of Innovation: Concepts and Challenges*. UNU-MERIT Working Paper Series 2006-002. United Nations University – Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT), Maastricht.

This paper argues that public private sector partnerships need to be viewed in the framework of an innovation system and a development scenario where networks of agro-enterprises and intermediary organizations underpin rural development and poverty reduction. Andy Hall discusses the importance of embedding public research organizations within these local networks, but also highlights that constraints to building partnership often relate to habits and trust. Hall suggests that efforts should be focused on building social capital in agricultural innovation systems and cautions that this should be done in contextually relevant ways. Hall is a key contemporary thinker on innovation systems who is known to challenge established thinking on innovation. He is widely published on the topic. We include just a few examples here, to get you started.

Hall, A., V. Sulaiman, N. Clark and B. Yoganand. (2003). From Measuring Impact to Learning Institutional Lessons: An Innovation Systems Perspective on Improving the Management of International Agricultural Research. *Agricultural Systems*, 78(2): 213-241.

This journal article argues that impact assessment has not made more of a difference because the measurement of economic impact has poor diagnostic power. In particular, it fails to provide research managers with critical institutional lessons concerning ways of improving research and innovation as a process. The authors suggest that the linear input-output assumptions of economic assessment need to be complemented by an analytical framework that recognizes systems of reflexive, learning interactions and their location in, and relationship with, their institutional context. The innovation systems framework is proposed as an approach where institutional learning is explicit. Three case studies of recent developments in international agricultural research are presented to illustrate these points.

Hall, A. (2005). Capacity Development for Agricultural Biotechnology in Developing Countries: An Innovation Systems View of What It Is and How to Develop It. *Journal of International Development*, 17(5): 611-630.

In this journal article, Andy Hall presents different approaches for capacity development, and argues that it is *innovation capacity* rather than science and technology capacity that has to be developed. Hall suggests that policy needs to take a multidimensional approach to capacity development in line with an innovation systems perspective. But he also argues that policy needs to recognize the need to develop the capacity of diversity of innovation systems, and that a key part of the capacity development task is to bring about the integration of these different systems at strategic points in time.

Hawkins, R., W. Heemskerk, R. Booth, J. Daane, A. Maatman and A.A. Adekunle. (2009). *Integrated Agricultural Research for Development (IAR4D)*. A Concept Paper prepared for the Forum for Agricultural Research in Africa (FARA) Sub-Saharan Africa Challenge Programme (SSA CP). FARA, Accra.
www.worldfishcenter.org/sites/default/files/Integrated%20agricultural%20research%20for%20development%20(IAR4D).pdf

This concept paper describes the defining principles of IAR4D – Integrated Agricultural Research for Development – the theories and experiences behind these principles, and actions that put these principles into practice. The paper also discusses the individual, organizational and institutional capacities that are needed to create the enabling environment for IAR4D, and reviews case studies based on these principles and the capacity-development challenges. Hawkins (ICRA), Heemskerk (KIT) and Maatman (IFDC) are co-authors of this book and are all very active in the field of innovation systems thinking.

Hemmati, M. (2002). *Multi-stakeholder Processes for Governance and Sustainability – Beyond Deadlock and Conflict.* Earthscan, London.
www.earthsummit2002.org/msp/book.html

This book is about how people and organizations from very different backgrounds can work together in an increasingly complex political, social and economic environment. It presents a framework for designing multi-stakeholder processes (MSPs), in order to produce practical solutions to complex environmental and developmental challenges. The book first presents building blocks for the suggested framework for designing MSPs. It then describes the possible steps for such a process identifying five stages: context, framing, inputs, dialogue, and outputs.

Hirvonena, M. (2008). *Tourist Guide to Systems Studies of Rural Innovation*. LINK Policy Resources on Rural Innovation Series 1. United National University – Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT), Maastricht.

This guide charts the emerging landscape of systems studies on rural innovation, and reviews and provides an annotated bibliography of what are considered some of the key publications contributing towards the current outlook on rural innovation. It is an easy-to-read overview of key developments in this field.

KIT Value Chain Series

The Royal Tropical Institute (KIT) has co-published a series of books on value chain development since 2006. These books tackle cutting edge issues in value chain development in easy-to-understand language, drawing on cases from practice. Links to digital versions are listed.

KIT, IIRR and Faida Mali. (2006). *Chain Empowerment: Supporting African Farmers to Develop Markets*. KIT Publishers, Amsterdam.
http://www.kit.nl/kit/Publication?item=1952

KIT and IIRR. (2008). *Trading Up: Building Cooperation Between Farmers and Traders in Africa.* KIT Publishers, Amsterdam.
http://www.kit.nl/kit/Publication?item=2501

KIT and IIRR. (2010). *Value Chain Finance: Beyond Microfinance for Rural Entrepreneurs.* KIT Publishers, Amsterdam.
http://www.kit.nl/kit/Publication?item=2740

KIT, APF and IIRR. (2012). *Challenging Chains to Change: Gender Equity in Agricultural Value Chain Development*. KIT Publishers, Amsterdam.
http://www.kit.nl/kit/Publication?item=3289

Klerkx, L. and C. Leeuwis. (2008). Matching Demand and Supply in the Agricultural Knowledge Infrastructure: Experiences with Innovation Intermediaries. *Food Policy*, 33(3): 260-276.

This journal article gives an overview of the different kinds of innovation intermediaries that have emerged in The Netherlands, and reports on their contributions and the tensions that are being experienced with regard to their functioning. The authors argue that the state should play a role as a 'market facilitator', by funding such innovation intermediaries. In later articles, Klerkx takes up these questions further. Laurens Klerkx and Cees Leeuwis are key thinkers in innovation systems in the Netherlands, based at the Knowledge, Technology and Innovation group at Wageningen University. Leeuwis is the Professor of the Knowledge, Technology and Innovation group. Klerkx is an Associate Professor who keeps close watch over developments in theory and publications in this field. They both work with West African universities in, for example, the Convergence of Science Programme (www.cos-sis.org).

Klerkx , L., and C. Leeuwis. (2008). Establishment and Embedding of Innovation Brokers at Different Innovation System Levels: Insights from the Dutch Agricultural Sector. *Technological Forecasting and Social Change*, 76(6): 849-860.

This journal article provides an overview of the literature on innovation brokers, and discusses the experiences with different types of innovation brokers in the Dutch agricultural sector. The authors analyze the role of innovation brokers and their position in the agricultural innovation system as perceived by other stakeholders. Both authors write extensively on different aspects of innovation.

Kusters, C.S.L., S. van Vugt, S. Wigboldus, B. Williams and J. Woodhill. (2011). *Making Evaluations Matter: A Practical Guide for Evaluators.* Centre for Development Innovation, Wageningen University and Research Centre, Wageningen.

This practical guide is primarily for evaluators working in the international development sector. It presents guiding principles on how to design and facilitate evaluations that matter, bringing together concepts, methods and tools that work well in the field. Furthermore, it explains how to get primary intended users and other key stakeholders to contribute effectively to evaluation and learning processes. The authors of this chapter are based at the Centre for Development Innovation at Wageningen University. The lead author, Cecile Kusters, works extensively on monitoring and evaluation (M&E) and is co-author of the M&E chapter in this book. Jim Woodhill is a co-editor of this book.

Leeuwis, C. and A. Van den Ban. (2004). *Communication for Rural Innovation: Rethinking AgriculturalE xtension.* Blackwell Science, Oxford; CTA, Wageningen.

Building on previous editions, this book takes a new look at the field of extension but is far more than just an updated version. It discusses insights and conceptual models of agricultural extension. It reflects the changing concepts and thinking in agricultural extension and the need for more diverse communication strategies for development in agriculture. This book is aimed at those who use communication to facilitate change in agriculture and resource management. It was developed and is used as a university text book. Cees Leeuwis has already been introduced above. Emeritus Professor Anne Van den Ban preceded Leeuwis as the Professor of what used to be Extension Studies at Wageningen University, which developed into Communication and Innovation Studies, and is now called the Knowledge, Technology and Innovation Group. This evolution reflects the changing nature of the field. In between these two Professors, Niels Röling also led the Chair group. He is introduced below.

Leeuwis, C. and R. Pyburn (eds.). (2002). *Wheelbarrows Full of Frogs – Social Learning in Rural Resource Management.* Royal van Gorcum Publishers, Assen.

A Dutch tradition is for retiring professors to be presented with a book from their colleagues that reflects the work and thinking of their time leading the Chair group. For the retirement of Niels Röling, in 2002, he was presented with this book, edited by Cees Leeuwis (introduced above) and Rhiannon Pyburn (editor of this book). The book has pieces written by some key thinkers and practitioners linked to Röling as PhD students, colleagues or partners for various projects. Authors include Jim Woodhill (co-editor of this book), Janice Jiggins, and Paul Engel, among the 50 contributors. Both practical and theoretical, the book has been widely read by both social science and practitioner audiences.

North, D. (1990). *Institutions, Institutional Change and Economic Performance.* Cambridge University Press, Cambridge.

This book is a classic on institutional economics that explains the nature and origins of institutions and how they affect economic growth and development. Douglass North develops an analytical framework for explaining the ways in which institutions and institutional change affect the performance of economies. Institutions exist due to uncertainties involved in human interaction. This book is insightful when it comes to understanding the roots of institutional innovation and why institutions are important.

Patton, M.Q. (2011). *Developmental Evaluation – Applying Complexity Concepts to Enhance Innovation and Use.* The Guilford Press, New York.

This book describes the use of innovative evaluation approaches to deal with complex situations. Developmental evaluation applies complexity concepts (e.g. uncertainty, non-linearity and emergence) to enhance innovation and use. Michael Patton explains how developmental evaluation can be used for programme development, adaptation of principles and practice to local contexts, generation of innovation and taking them to scale, and rapid response in crisis situations. Its application of complexity theory to monitoring and evaluation in a development context is quite sophisticated and, at the same time, easy to grasp.

Röling, N. (1988). *Extension Science: Information Systems in Agricultural science*. Cambridge University Press, Cambridge.

In this classic, Niels Röling describes the development of extension science, systematically discussing the concept of agricultural information systems, in which agricultural research, extensions and farmers are linked to form a dynamic and integrated system. The book examines the role of research-linked extension in a changing agricultural context. It emphasizes the strategic use of agricultural information as an instrument for achieving policy goals. Now Emeritus Professor, Röling chaired the Communication and Innovation Studies group at Wageningen University and inspired many students with his enthusiasm and very engaging style, including several of the KIT authors of this book!

Röling, N. (1992). The Emergence of Knowledge Systems Thinking: A Changing Perception of Relationships Among Innovation, Knowledge Process and Configuration. *Knowledge and Policy*, 5(1): 42-64.

This paper discusses models for knowledge, technology, policy and management underpinning agricultural innovation and describes the emergence of knowledge systems thinking and models, based on a 'soft' systems perspective.

Röling, N. and A. Wagemakers (eds.). (1998). *Facilitating Sustainable Agriculture: Participatory Learning and Adaptive Management in Times of Environmental Uncertainty.* Cambridge University Press, Cambridge.

This book examines the implications of adopting more ecologically sound agricultural practices, at individual farmer and larger-scale agro-ecosystems levels based on case studies taken from around the world. The emphasis of the book is on human and social aspects, rather than on agronomic or economic considerations. The authors focus on the learning processes necessary to initiate and facilitate learning through participatory approaches and appropriate institutional support and policy structure. An inspiring book in its time, the editors and authors brought discussions at Wageningen University to a new level with the exciting ideas presented therein by providing a framework for approaching ecological knowledge systems.

Rajalahti, R., W. Janssen and E. Pehu. (2008). *Agricultural Innovation Systems: From Diagnostics Toward Operational Practices*. Agriculture and Rural Development. Discussion Paper 38. The World Bank, Washington DC.

This discussion paper presents the converging views of participants at the international workshop on 'Enhancing Agricultural Innovation Systems' organized by the World Bank

Agriculture and Rural Development department. It presents an emerging agenda for an agricultural innovation systems approach and incorporates views and content from previous publications, as well as case studies of the innovation systems approach in different contexts.

Rey, C. and A. Waters-Bayer. (2001). *Farmer Innovation in Africa: A Source of Inspiration for AgriculturalD evelopment.* Earthscan, London.

This book presents a series of clear and detailed studies that demonstrate how small-scale farmers experiment and innovate in order to improve their livelihoods, despite the adverse conditions and lack of appropriate external support with which they have to contend. The studies are based on fieldwork in a wide variety of farming systems throughout Africa, and have been written primarily by African researchers and extension specialists. They show how a participatory approach to agricultural development, building on local knowledge and innovation, stimulates creativity, enhances productivity and strengthens the role of farmers in the policy-making process. Anne Waters-Bayer is based at ETC International in the Netherlands and writes and advocates extensively on smallholder agriculture and innovation (she is also a co-author of the following publication).

Sanginga, P.C., A. Waters-Bayer, S. Kaaria, J. Njuki and C. Wettasinha (eds.). (2009). *Innovation Africa – Enriching Farmers' Livelihoods.* Earthscan, London.

This book covers new conceptual and methodological developments in agricultural innovation systems and showcases recent on-the-ground experiences in different contexts in Africa. The contributions show how innovation is the outcome of social learning through interaction of individuals and organizations in both creating and applying knowledge.

Scoones, I. and J. Thompson. (2009). *Farmer First Revisited: Innovation for Agricultural Research and Development*. ITDG Publishing, London.

Twenty years after the publication of *Farmer First*, this book returns to the debates on farmer participation in agricultural research and development (R&D) and looks to the future. With over 60 contributions from across the world, the book presents a range of experiences that highlight the importance of going beyond a focus on the farm to the wider innovation system, including market interactions, as well as the wider institutional and policy environment. The authors call for a major rethink of agricultural R&D, the boosting of knowledge and capacities of farmers' organizations to innovate, the strengthening of networks and alliances to support, document and share lessons on farmer-led innovation, and the transformation of agricultural higher education. Ian Scoones and John Thompson are based at the Institute of Development Studies at the UK University of Sussex.

World Bank. (2006). *Enhancing Agricultural Innovation: How to go Beyond the Strengthening of Research Systems.* The World Bank, Washington DC.

This book assesses the usefulness of the innovation systems concept in guiding investments to support knowledge intensive, sustainable agricultural development for developing countries and its collaborators. It focuses on types of interventions that can be derived from an innovation systems perspective which can influence the generation and use of science and technology for economic development.

World Bank. (2012). *Agricultural Innovation Systems: An Investment Sourcebook.* The World Bank, Washington DC.
http://siteresources.worldbank.org/INTARD/Resources/335807-1330620492317/8478371-1330712129614/9780821386842-corrected.pdf

This sourcebook discusses how specific approaches and practices can foster agricultural innovation in a range of contexts. The authors draw on the emerging principles of agricultural innovation systems analysis and action to help to identify, design, and implement the investments, approaches, and complementary interventions that appear most likely to strengthen innovation systems and promote agricultural innovation and equitable growth. It's a very big book!

Internet resources on innovation systems

feeds.feedburner.com/aginfoassociations

Aginfo Associations and Networks. A site with links to agricultural associations and networks all over the world.

www.cgiar-ilac.org/content/ilac-briefs

Institutional Learning and Change (ILAC). ILAC seeks to increase the contributions of agricultural research to sustainable reductions in poverty. ILAC briefs aim to stimulate dialogue and to disseminate ideas and experiences for researchers and managers to use to strengthen organizational learning and performance. An ILAC brief may introduce a concept, approach or tool, summarize results of a study, or highlight an event and its significance. They have a good collection of briefs related to innovation. To request copies, write to ilac@cgiar.org.

www.prolinnova.net/resources/ptd-pid-circular

Prolinnova Circular. An annotated bibliography of publications, including 'grey' reports on work in progress, it also reports on past and upcoming events (workshops, training activities, exchange meetings etc.), on-going programmes and networking activities. To subscribe to the circular, e-mail pid-circular@etcnl.nl. You can also find them on ILEIA's website under 'Readings and Resources' (www.ileia.org).

www.researchintouse.com

Research Into Use was a programme that used innovation systems approaches that ran from 2006 until 2012. There are still many resources on the website.

rqsi.ulaval.ca/ang/index.php

Smart Practices Innovation Network's database. This database gathers smart practices, initiatives, public policies, programmes and research papers on innovation and local development. You can subscribe to the weekly newsletter to get the best content added to the database.

openknowledge.worldbank.org/browse?type=topic

World Bank Open Knowledge Repository. The World Bank has many freely downloadable publications on agricultural knowledge systems and innovation systems.

infed.org

The Encyclopedia of Informal Education provides background on and a review of work by key thinkers like Peter Senge, Chris Argyris, Donald Schon and Ulrich Beck. The encyclopedia also describes key trends (globalization, learning, etc.).

University and organizational contacts

ASARECA Association for Strengthening Agricultural Research in Eastern and Central Africa
Entebbe, Uganda
www.asareca.org

CDI – WUR Centre for Development Innovation
Wageningen University and Research Centre, The Netherlands
www.wageningenur.nl/en/Expertise-Services/Research-Institutes/centre-for-development-innovation.htm

CGIAR CGIAR
www.cgiar.org

CIP International Potato Center
Lima, Peru
www.cipotato.org

CORAF/ WECARD Conseil Ouest et Centrale Africian pour la Recherche et le Developpement Agricole/West and Central African Council for Agricultural Research and Development
Dakar, Senegal
www.coraf.org

COS-SIS Convergence of Science – Strengthening Innovation Systems Programme
A PhD and post-doctorate programme between Wageningen University, Université d'Abomey à Calavi (UAC) in Benin, University of Ghana (UoG) in Legon, and the Institut Polytechnique Rural/Institut de Formation et de la Récherche Appliquée (IPR/IFRA) in Katibougou, Mali. The Royal Tropical Institute (KIT) is also a partner. This programme will be finishing in 2014.
www.cos-sis.org

CTA Technical Centre for Agricultural and Rural Cooperation
Wageningen, The Netherlands
www.cta.int

ECDPM European Centre for Development Policy Management
Maastricht, The Netherlands
www.ecdpm.org

ETC ETC International
Leusden, The Netherlands
www.etc-international.org

FARA	Forum for Agricultural Research in Africa Accra, Ghana www.fara-africa.org
ICRA	International Centre for Development-oriented Research in Agriculture Wageningen, The Netherlands www.icra-edu.org
IDS	Institute for Development Studies Brighton, UK www.ids.ac.uk
IFDC	International Fertilizer Development Center Accra, Ghana www.ifdc.org
IIED	International Institute for Environment and Development London, UK www.iied.org
KIT	Royal Tropical Institute Amsterdam, The Netherlands www.kit.nl/kit/development
KTI - WUR	Knowledge Technology and Innovation Group Wageningen University and Research Centre Wageningen, The Netherlands www.wageningenur.nl/en/Expertise-Services/Chair-groups/Social-Sciences/KnowledgeTechnology-and-Innovation-Group
ODI	Overseas Development Institute London, UK www.odi.org.uk
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture Kampala, Uganda www.ruforum.org
UN-MERIT	United Nations University – Maastricht Economic and Social Research Insitute on Innovation and Technology Maastricht, The Netherlands www.merit.unu.edu
World Bank	www.worldbank.org

Glossary of key terms[1]

This glossary should not be seen as definitive as the terms tend to be defined differently by different writers/users, though often those distinctions are quite academic or theoretical. We have chosen what we think are some of the most important concepts and provided a definition to get you started and orient you to its meaning.

Action-research — A process where the main objective is to effect change (the action) and learn from that change (the research), not just generate new information.

Actor — See 'stakeholder', below.

Adaptive management — A systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. (Hassan *et al.*, 2005).

Agency — The capacity of an agent (an individual person or other entity) to act independently and make their own free choices, and to impose those choices on the world. (Pyburn & Laven, 2012:41).

The ability to define one's goals and act on them. Agency is about more than observable action, but also encompasses the meaning, motivation and purpose an individual brings to an activity – their sense of agency or 'power from within'. (Kabeer, 1999).

Agri-business cluster — Agri-business clusters are defined as a collaboration between all actors needed to build profitable commodity-based value chains (producers and their organizations, input suppliers, finance suppliers, processors, warehouses managers, traders, business development services, etc.). (ICRA, 2SCALE). (See also **Box 8**, this book).

Agricultural innovation system — An agricultural innovation system (AIS) is defined as a set of organizations and individuals that are involved in generating, disseminating, adapting and using knowledge and information of socio-economic significance, as well as the policy and institutional context that governs the way such interactions and processes take place. Also referred to as a **rural innovation system**.

Biotechnology — Any technological application that uses biological systems, living organisms, or derivatives thereof to make or modify products or processes for specific use. (Hassan *et al.*, 2005).

Capacity — The ability of individuals and organizations to perform functions effectively, efficiently and in a sustainable manner. (IFAD 2002).

1 Thanks to Richard Hawkins of ICRA for providing a basis for this glossary of terms.

Capacity building A process of strengthening or developing human resources, institutions, organizations, or networks. Also referred to as capacity development or capacity enhancement. (Hassan et al., 2005).

Codified knowledge Codified is formal or written knowledge that is easily passed on and based on theory (Foray & Lundvall, 1998). It is readily transferable and explainable through written or spoken words. Also known as explicit knowledge. (see also **Box 2**, this book).

Competency A mix of knowledge, skills and attitudes required in a particular context.

Complex problem A situation which most people agree is unsatisfactory in some way, but where different stakeholders have different ideas about the exact nature of the problem. Solutions therefore have to be negotiated between stakeholders, and their coordinated actions are needed to make significant and lasting improvements to the situation.

Emergent property Properties that can neither be predicted nor understood in terms of their constituent parts. (Vickers, 1983 cited in Woodhill & Roling, 1998:57.

Enabling conditions Critical preconditions for success of responses, including political, institutional, social, economic, and ecological factors. (Hassan *et al.*, 2005).

Experiential learning Learning from experience. This concept was developed by David Kolb, who broke it down into the four stages of active experimentation, concrete experience, reflective observation, and abstract conceptualization (Kolb, 1984).

Facilitate Literally, 'to make something easy' (from the Latin 'facile' = 'easily'). In innovation practice, facilitation implies helping a team or a group of diverse stakeholders work together to clarify their different perspectives and their context, agree on shared objectives, and formulate joint actions.

Facilitator A person who helps members of a group conduct a meeting in an efficient and effective way but who does not dictate what will happen. (IFAD, 2002).

Gender equality Gender equality denotes women having the same opportunities in life as men, including the ability to participate in the public sphere. (Reeves & Baden 2000).

Gender equity Gender equity denotes the equivalence in life outcomes for women and men, recognizing their different needs and interests, and requiring a redistribution of power and resources. (Reeves & Baden 2000).

Indicator Information based on measured data used to represent a particular attribute, characteristic, or property of a system. (Hassan *et al.*, 2005).

Indigenous knowledge The knowledge that is unique to a given culture or society. Also referred to a local knowledge. (Hassan *et al.*, 2005).

Innovation A social process of interactive inquiry that actors carry out in order to construct or reconstruct their practices. The main elements are experimentation and networking, which may result in developing new methods and materials (technical, social or other) or in adaptation of ideas, practices and other elements developed by others. Because innovation requires interaction among actors, it can be seen as the outcome of a process of mutual learning. (Engel & Salomon, 1997). A new product, process or forms of organization brought into economic use (Hall *et al.*, 2006).

Innovation platform An innovation platform is a group of stakeholders who are brought together by their interest in shared issues. The platform can be a virtual or physical forum for exploring joint opportunities and to investigate joint solutions (Nederlof *et al.*, 2011). (See also **Box 9**, this book).

Innovation system A network of organizations, enterprises, and individuals that focuses on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance. Innovation systems not only help to create knowledge, but also provide access to knowledge, share knowledge, and foster learning. (Hall *et al.*, 2006).

Institution The 'rules of the game' that guide how people within societies live, work, and interact with each other. Formal institutions are written or codified rules. Examples of formal institutions would be the constitution, the judiciary laws, the organized market, and property rights. Informal institutions are rules governed by social and behavioural norms of the society, family, or community. (North, 1990).

Learning Reflecting on experience to identify how a situation or future actions could be improved, and then using this knowledge to make improvements. Learning can be individual or group-based. Learning involves applying lessons learned to future actions, which provides the basis for another cycle of learning. (IFAD, 2002). (See also **Box 7** on single, double and triple loop learning, this book).

National agricultural research system (NARS)	A NARS comprises all of a country's organizations and institutions that are responsible for organizing, coordinating and implementing research with the explicit aim of contributing to agricultural development and the maintenance of the natural resource base. (GTZ, 2004).
Reflexivity	Reflexivity is an act of self-reference (Woolgar 1988). It refers to the capacity of an agent (an individual or an organization) to be conscious of the social and societal forces at play and to alter their place in the social structure (context). Van Mierlo and Reeger (2010) refer to reflexivity as: "the ability to affect and interact with the environment within which an innovation system operates." (Pyburn & Mur, 2014). (see also **Box 18**, this book).
Scaling-out	Expanding the impact of an innovation beyond the stakeholder group initially involved and/or beyond the time duration of the project.
Scaling-up	The creation of conditions that enable the sustained use of the innovation (e.g. through policies and institutional support).
Social learning	Social learning reflects the idea that the shared learning of interdependent stakeholders is a key mechanism for arriving at desired futures. (Leeuwis & Pyburn 2002:11).
Stakeholder	An agency, organization, group or individual who has a direct or indirect interest in the project/programme, or who affects or is affected positively or negatively by the implementation and outcome of it. (IFAD, 2002). Also referred to as an **actor**.
Structure	Structures are the patterns of social behavior that both come from people's actions and at the same time determine the possibilities for action. They are the rules, customs, laws, habits and traditions guiding human behavior. (Giddens, 1984; Kabeer, 1999). (See also **Box 8.3**).
System	An arrangement of physical components related in such a way that they act as a whole, where the properties of the whole arise from the relationships between the component parts, and where the whole has a purpose, or is of interest to someone.
Systems thinking	Thinking about the whole instead of the separate parts, with emphasis on the relationships between the different components, rather than the components in isolation. Also implies taking into account the context, circumstances or environment that surrounds the particular system being studied.

Tacit knowledge Tacit knowledge is informal, internally held knowledge that is often hard to capture in words or written language, so difficult to transfer (Foray and Lundvall, 1998). (See **Box 2**, this book).

Transfer of technology A model of change that assumes that new technology drives innovation, that generation of this technology is mostly by publicly-funded research institutes, and that this technology is then 'transferred' to farmers by extension workers in a supply-driven process. This model was largely based on the very influential theory of 'diffusion of innovations' developed by Everett Rogers in the United States.

Value Chain A specific type of supply chain – one where the actors know each other well and form stable, long-term relationships. They support each other so they can together increase their efficiency and competitiveness. They invest time, effort and money to real a common goal of satisfying consumer needs. This enables them to increase their profits. (KIT & IIRR, 2008).

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Some definitions of innovation as food for thought[2]

Innovation is insight plus creativity transformed through action. *Mike Arauz*

Innovation is newness for the sake of creating value, not for the sake of newness. *Ryan Karpeles*

Innovation is the process or result of combining previously separate ideas or technologies in useful and valuable ways. *Karl Long*

Innovation is a new take on a pre-existing idea, concept, product, etc. *Andrew*

Innovation is bold experimentation against a backdrop and goal of change, evolution and progress. *JJ*

Innovation is looking at the same thing in new ways. *Valeria Maltoni*

Innovation is the successful exploitation of ideas generated at the intersection of invention and insight, which leads to the creation of social or economic value. *Doug Meacham*

Many times innovation is thought of something radical but innovation is a continuous process of improvement creating value and progress. *C.O'Co*

Innovation is the realization of a creative idea. *Ed Roberts*

Innovation is ONLY defined by its realization – you know it when you see it. *Paul Soldera*

Innovation is a new product, service, or process that has immediately or potentially useful applications. *Cam Beck*

Innovation is – doing something different but better. *Jason Peck*

Innovation means being open to new ways, methods, markets and models. Innovation is progress. *CK*

Innovation is solving an old problem in a new way. *Miko Coffey*

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2 These lay definitions of innovation remind us that, while there is a whole body of knowledge specific to innovation systems, regular people have their own takes as well.

Many thanks to Richard Hawkins from ICRA (see contributor list for details) who selected and compiled these definitions of innovation that were discussed here: http://jburg.typepad.com/future/2007/08/innovation.html

Innovation is getting to the future, first. *Greg Verdino*

Innovation is seeing and thinking what everyone else has, and coming up with a new twist on it. *Will*

Innovation means creatively solving a problem that you didn't even know you had. *David Armano*

Innovation means... never having to say you're sorry – actually taking chances that might fail because you are trying something new. *Ted Shelton*

Innovation is making the obvious easy for everyone. *Joe Marchese*

Innovation is the process of moving ideas forward. *Ethan Kraus*

Innovation is accurately guessing, anticipating and predicting social needs and trends before they are sensed. *Christian Bissainthe*

Innovation is a place where everything old is new again, but better. *Rachel Haley*

Challenging common practice with radical ideas/opportunities, in a hope to push forward. *Michael Sondak*

Innovation in never about luck, it's the culmination of preparation, a willingness to present the same idea a number of times and the stubbornness to work with people who don't share your vision. If innovation was easy, there wouldn't be books about how to do it better. There's never articles about keeping the status quo. *Anon*

Innovation... a small, final change or improvement... oftentimes leading the world along to think in a brand new way. *Lou Susi*

Making the mundane extraordinary as you create something to improve the daily tasks. What ever you innovate should make a difficult task easier. *Mike Walker*

Innovation begins as providing a solution to a problem you didn't know you had and evolves into something you can't imagine living without. *Jen Brown*

Innovation is an idea or a radical change that gives birth to new dimensions never before conceived or explored. *Christian Bissainthe*

Whether it's Big 'I' or little 'i' - it's change that adds value vs. invention – defined as something new, novel and without precedent. *Tricia Zenobi*

Innovation is something that has the following three features: never been done before; different means of implementation that addresses goals in a unique way; leveraging

invention or evolution in products, technology or service to create a new path for success. *Jordan Bitterman*

Innovation is inspiration for sale. *Justin Evans*

Innovation is energy, excitement, and advanced thought, all wrapped up in a brand new idea. *Rich Burg*

Innovation is simple: creative ideas executed within the limits of the problem/question (creative ideas are easy, innovation is difficult because you are activating a creative idea within the set limitations of defined by problem or question). *Mike Hildebrandt*

Innovation is: mashing together a unique combination of ideas to create value. *Greg Johnson*

Innovation is shorthand for creative problem solving. *Steve Patrizi*

Innovation is seeing the issue, understanding the problem, visualizing the solution and making it reality for all to participate. *Ken Ashley*

Innovation is essentially doing what's been done before in a crisp, forward fashion. *Luke Luckett*

Innovation means never accepting the predictable. *Charles Whittingham*

Innovation is the transformation from idea to reality. *Saul Shapiro*

Innovation is the process through which something that wasn't becomes something that is. *Craig Lachman*

An innovation is something that you didn't know you needed before it existed, but now that it's been created you can't live without it! *Tina Basle*

Innovation means...
- you'll first be laughed at and called a kook
- then kicked around
- then picked up and brushed off by someone courageous
- then celebrated as a genius. *Eric Ludwig*

Innovation is not reinventing the wheel... it's allowing the wheel to operate at a capacity/level that it wasn't capable of prior. *Scott Buckler*

Innovation is not simply about new technology or devices; it is about new ways of thinking. To me, innovation means overcoming economic, societal, or technological barriers in order to create something new that changes the world, at least in a small way, for the better. *Ryan Swagar*

Add your own definitions of innovation below …

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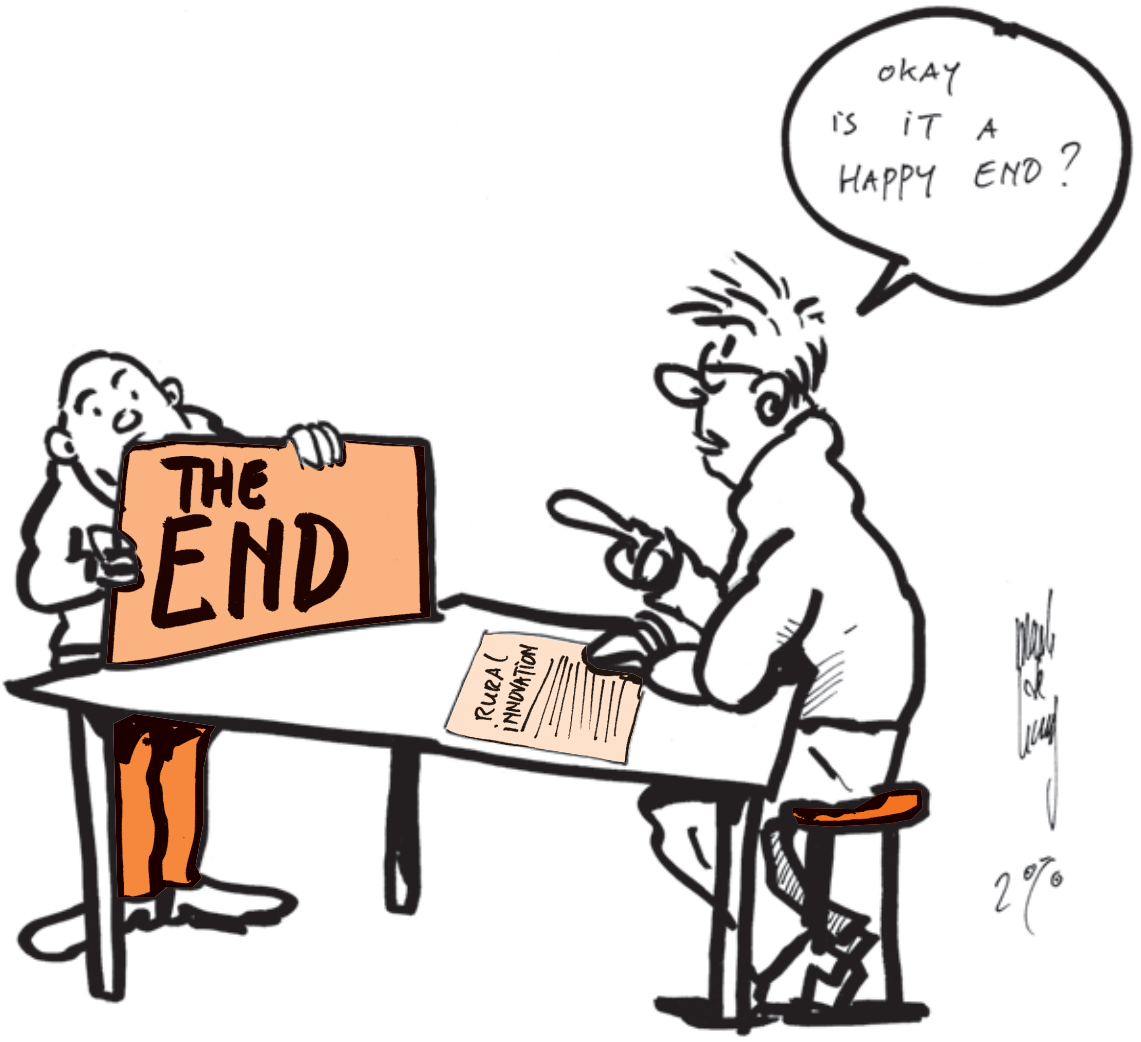
START WITH .. ...



Feeding the world in a sustainable and fair way is the challenge that a new generation of agricultural professionals must face. This will demand not just technological solutions but a whole package of social, economic, market and political innovations. Central to the challenge is enabling people and organisations with different perspectives and different interests to work creatively together. All this demands new ways of thinking and new sets of competencies.

This book offers young professionals and students insight into the theory and practice of 'innovation systems'. It covers important background and concepts, the 'how to' of facilitating innovation, and the role of the broader context. The book is about the dynamics of rural innovation – how to work with the changing nature of both the context and people involved in rural innovation processes and how to facilitate networks of stakeholders to stimulate innovation. The aim is to support agricultural and rural development professionals, especially young ones, as enablers and facilitators of stakeholder-led innovation. Inspirational stories illustrate how different people – from farmers to extension officers, business leaders, traders, NGO staff, and policy makers – have collaborated to make new and successful things happen.

The Royal Tropical Institute (KIT) and Wageningen University's Centre for Development Innovation (CDI) bring more than 30 years of experience working with partners in developing countries on agricultural innovation processes and social learning. This book capitalises on these experiences and brings together both conceptual thinkers and practitioners in the writing process to articulate lessons. The book is targeted towards undergraduate (BSc) and masters (MSc) level students in Africa as well as development practitioners aspiring to use innovation systems thinking in their work.

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