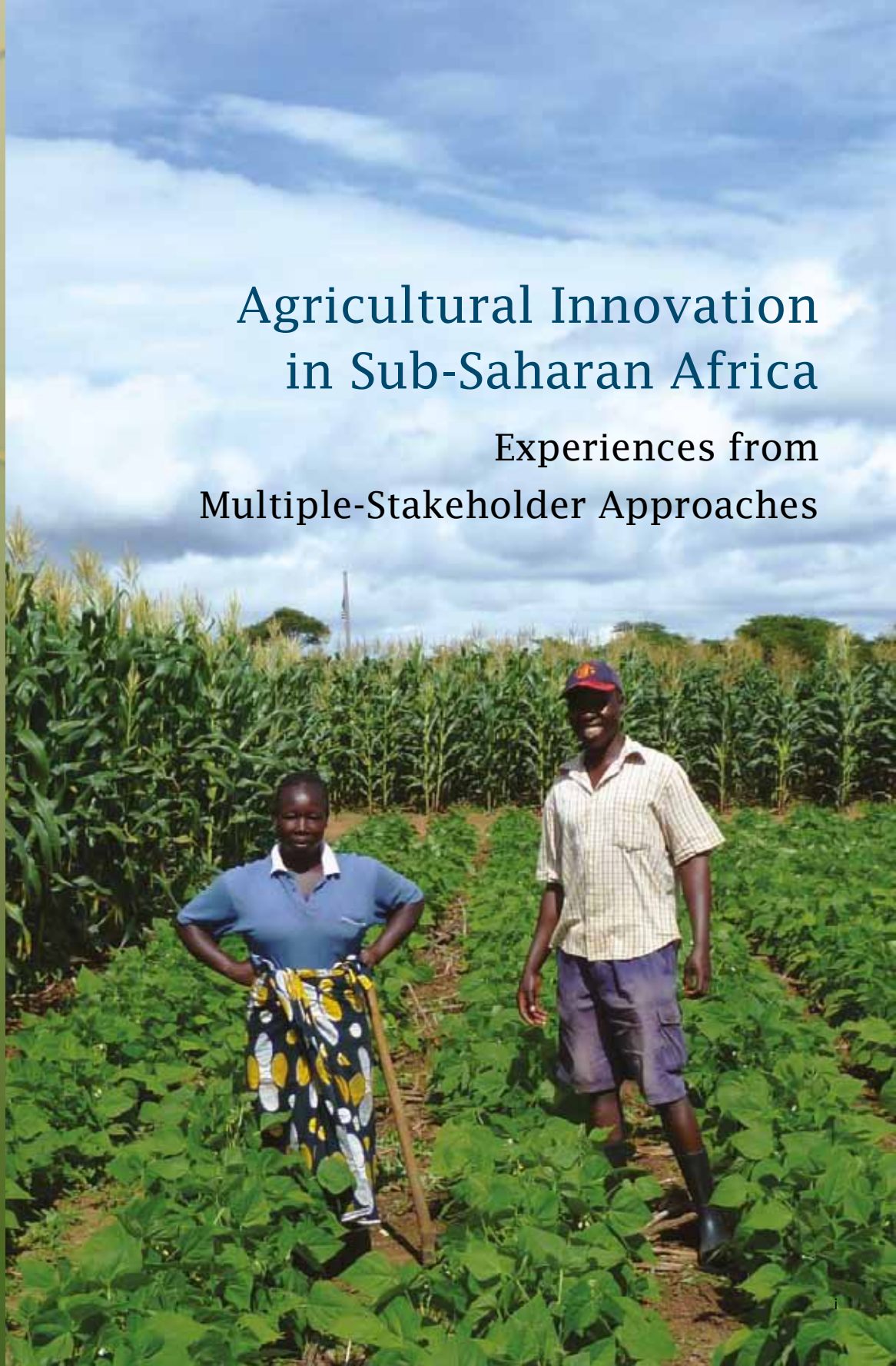
Agricultural Innovation in Sub-Saharan Africa

Experiences from Multiple-Stakeholder Approaches



Cover photograph: J Ellis-Jones

Maize and soybeans in Zambia where the Phiris have been practising conservation agriculture for 4 years on their 3-hectare farm, growing 2 hectares of maize, and one of legumes including soybeans, beans and groundnuts.

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Foreword

Sub-Saharan Africa (SSA) faces critical challenges with more than 40 percent of its population living on less than US$1 per day and one in three people being undernourished. Yet, agriculture being the largest employer of labour in Africa, responsible for over half of export earnings has the potential to play the major role in the continent's development. Agriculture underpins the livelihoods of over two thirds of Africa's poor and assumes even greater importance in the continent's poorer countries. Unfortunately agricultural productivity especially in SSA has been stagnating for many years. Low levels of land and labour productivity have meant that per capita agricultural production has fallen over the last four decades. Although agricultural research has generated many technologies with the potential to address this situation, their impact on productivity, livelihoods and quality of life has been disappointing. Among the many reasons for poor agricultural performance the way in which research has been undertaken is a key.

To redress this, the Forum for Agricultural Research in Africa (FARA) has promoted the integrated agriculture research for development (IAR4D) approach based on an innovation systems framework. This brings together multiple actors along a commodity value chain to address challenges and identify opportunities to generate innovation. The approach creates a network of stakeholders or partners who are able to consider the technical, economic, social, institutional, and policy constraints in an environment. The network facilitates research and learning that not only generates new knowledge, products or technologies, but also ensures the use of research products. The IAR4D approach is being tested at three pilot research sites across SSA: in Eastern and Central Africa around Lake Kivu (Democratic Republic of Congo, Rwanda and Uganda); Southern Africa (Malawi, Mozambique and Zimbabwe); and West Africa (Niger and Nigeria). This has involved the establishment of 36 stakeholder innovation platforms thus: creating functional linkages between farmers, the private sector, and service organizations; integrating productivity, natural resource management, markets and policy; establishing effective mechanisms for organizing and learning processes for farmers; and ensuring action research oriented toward problem-solving and impact. There are strong indications that IAR4D is an effective concept, applicable across a broad spectrum of agricultural systems.

FARA is, however, aware that there have been a few success stories in the agricultural sector across SSA, where multiple stakeholders have worked closely together to foster agricultural innovation. Documenting and identifying the reasons for these successes can further enhance the usefulness of innovation systems approaches.

This is why FARA undertook this study to further stimulate discussion and understanding of how IAR4D and innovations systems approaches can be used to address the need to increase agricultural productivity in SSA, in ways that will improve the livelihoods and quality of life for Africa's smallholder farmers.

Monty Jones
Executive Director, FARA

An overview

Innovation systems approaches

FARA has been a key player in developing and promoting integrated agriculture research for development (IAR4D), which uses an innovations systems approach to bring together stakeholders as partners within innovation platforms (IPs). There are a few cases of stakeholders working successfully together before the development of IAR4D or innovation systems approaches, whose projects may or may not have been suitable for this approach. This report documents experiences from 21 case studies in sub-Saharan Africa (SSA) to identify reasons for success and to learn lessons that could be used in other development initiatives.

Innovation systems approaches are often based on commodity value chains in which knowledge and/or research products with purchased and farm- or household-provided inputs are: used in natural resource based production systems; marketed and processed for sale and consumed. Inevitably this involves many actors in the supply chain from producer to consumer. Interventions to support an innovation vary with purpose and are influenced by both the initial context and the capacity of different stakeholders. Typically an intervention to support innovation requires a phased approach from initial engagement with stakeholders, through planning, implementation, learning and assessment to a final phase that ensures continuity and sustainability within a dynamic innovation environment.

Purpose

This review seeks to assess the usefulness of innovation systems approaches in the context of IAR4D in guiding research agendas, generating knowledge and use in improving food security and nutrition, reducing poverty and generating cash incomes for resource-poor farmers. The report draws on a range of case studies across SSA to compare and contrast the reasons for success from which lessons can be learned.

The case studies

Twenty-one case studies, six in Eastern Africa, eight in Southern Africa and seven in West Africa including five supported by FARA's SSA Challenge Programme Pilot Learning Sites (SSA CP PLS), were used to assess the usefulness of multiple stakeholder innovations systems approaches. These case studies were drawn from:

- Traditional sectors including subsistence crops
- Niche sectors involving special crops
- Sectors integrated into global markets through export commodities
- Sectors offering large employment opportunities for the poor, aimed at either local or export commodities.

Prior to starting an innovation process each case study faced a wide range of challenges. Key ones included weak institutional structures, often with little or no contact between stakeholders. In most cases a lack of farmer organisations hampered farmers taking the initiative. Such problems were compounded by poorly developed markets, poor infrastructure and a lack of knowledge, or by inadequate extension often associated with inappropriate research. Consequently, use of unsuitable varieties and poor management practices with limited access to input or output markets resulted in low, often declining, yields and low incomes for farmers.

Stakeholders came from the entire spectrum of public, private, non-governmental organisation (NGO) and community-based actors across the economy with roles that often evolved over time. Interaction, collaboration and coordination featured in each case study. Often these were achieved through a facilitation process that assisted in bringing the actors together; in changing attitudes and building partnerships based on shared concerns and a need to identify opportunities for improvement. In some cases farmers themselves took an active role in the early stages, but in most the public sector was the dominant stakeholder, often providing research and other support. However, in some cases it was NGOs or private commercial companies who took the early initiative. Donor-funded support played an important role in most cases.

The case studies demonstrated that successful innovation is dependent on a wide range of factors and interventions, the most important being the existence or creation of a network of research, training and development stakeholder groups drawn from public, private and NGO sectors. Such groups need to have the capacity, capability and willingness to interact and work together in an environment that encourages cooperation, builds trust and establishes a common vision for the future. For this to occur the participation of effective and representative farmer organisations able to communicate with members who often require support and capacity development was very important. Facilitation is frequently required to encourage: dialogue, joint planning, agreement on partner roles, and implementation responsibilities. It is also necessary to promote collaborative learning and assessment. Although research is an important component, it may not be the central one, while in the early stages of intervention, access to and use of existing knowledge and learning processes is essential. Ultimately, local participants build sustainability on ownership with effective back up from research and development organisations from both private and public sectors.

All of the 21 case studies had succeeded to a greater or lesser extent, although there were often new challenges that needed to be addressed to ensure long-term sustainability. Eleven cases could be regarded as sustainable, while the other ten were still addressing ownership by local participants.

Key factors contributing to success

The case studies demonstrated that successful multiple stakeholder approaches are dependent on a wide range of facilitating and inhibiting factors. Enabling public policies and regulations, including deregulation of markets, whilst ensuring competition and compliance with minimum standards often provide a solid foundation. The creation of a network of stakeholder groups drawn from both public and private sectors is a prerequisite. Such groups need to have the capacity, capability and willingness to interact and work together in an environment that encourages cooperation, builds trust and establishes a common vision for the future. The establishment and participation of effective and representative farmer organisations able and willing to communicate with members is vital. In most cases this required support and capacity development.

Clearly, improved infrastructure, particularly roads, communication and power provide the basis for ensuring inputs can be made available at affordable prices and outputs delivered to market. This was often a precursor in seeking opportunity to add value along market chains.

Although research can be an important component, it is often not the central one, and in the early stages, interventions to build capacity, access and use existing knowledge, and foster learning are required. Easy and timely access to inputs, including finance, is crucial and needs to be based on effective and competitive marketing, whether domestic or export, and to address social and environmental concerns.

Looking to the future

As Africa faces the challenge of creating favourable conditions to enable the innovation required to stimulate poverty reduction and agricultural growth, the context for this is changing. Increasing population, rapid urbanisation, land resource degradation, climate change and the present disarray in world commodity markets pose serious challenges. Global integration of many agricultural supply chains is placing increasing control in the hands of large retailers, processors and exporters, whose compliance conditions are often difficult for smallholder farmers.

Interventions to encourage innovation depend on the initial context and how this changes over time. Interventions should not primarily focus on developing research capacity, but should be developed from the outset in a way that encourages interaction between public, private, NGO and civil society organisations. Key elements include:

Building and supporting partnerships

- Engagement and collaboration between stakeholders is a pre-requisite that requires awareness raising, development of trust, a willingness to work together, and creation of a shared vision for the future.
- Facilitating or brokering alliances is critical and incurs an indispensable and unavoidable cost that is often overlooked. Such alliances also require ‘champions’: either individuals or institutions, which understand the often-complex institutional and regulatory structures that underpin, encourage and support the building of networks.

- An IP comprised of partner organisations represents a strong approach to empowering participating stakeholders, building capacities and identifying opportunities able to analyse, alleviate constraints and add value to a value or systems chain.

Strengthening farmer organisations

- Strong farmer organisations able to speak with an informed and unified voice and engage with other stakeholders at all levels have a critical role to play.

Involving the private sector and ensuring use of market driven approaches

- A well organised private agribusiness sector needs to be involved, not only in the supply of inputs and purchasing outputs, but also in developing market opportunities, capacity building and engaging with both public and NGO sectors.

Improving access to information, knowledge and training

- New knowledge from research is only one component required to encourage innovation in agriculture. Improving access to information can create an effective demand for research products. For instance, use of local radio programmes will compliment training, knowledge sharing and other learning events. If such programmes involve suppliers, technical experts, farmers, government and NGOs, this will help to build partnerships and networks.

Scaling up and adding value to country agricultural strategies

- National stakeholder platforms, linked and interacting with local or district platform initiatives can support the complexity of scaling up successful pilot initiatives.
- The SSA CP PLS particularly those in Malawi demonstrate the links with, and the benefits from, contributing to a country's national planning processes.
- FARA-supported activities provide a functioning model of district- and community-level IPs that fit with local priorities within District Development Plans that reflect national priorities identified within Malawi's Agricultural Sector-Wide Approach Programme (ASWAp) As such the IP structure and its activities are proving to be a useful model for the implementation of the Malawi Government's agricultural programme at district level.

Sustainability

- Sustainability requires capacity strengthening throughout the process to ensure local people and organisations assume ownership and leadership. This should be continuous and not undertaken as a one-off activity, requiring long-term funding commitment.

Implications for integrated agricultural research for development

The case studies have shown that increased agricultural productivity is driven by the ready availabilities of new technologies together with improved incentives for farmers and agribusiness supported by enabling government policies. It is increasingly recognised that IAR4D and innovation systems approaches have a major role to play in introducing new ways of working. This requires facilitation to ensure working relationships and involve partners

in alliances that will stimulate innovation. The implications for accelerating agricultural development in SSA include :

- An increased focus on the interface between research and the rest of the sector requires the creation of links in ways that encourage interaction between public, private, NGO and civil society organisations. This necessitates support for facilitation of engagement and alliances between partners that create the environment for innovation.
- Support to encourage institutional innovation with expertise that includes a wide knowledge of markets, agribusiness and rural finance that can compliment specialist technical expertise.
- IAR4D and innovation systems approaches can support New Partnerships for Africa's Development (NEPAD)'s Comprehensive Africa Agricultural Development Programme (CAADP) country processes.

Innovation approaches and interventions

Investments in agricultural research and knowledge generation have been strong components in strategies to promote sustainable and equitable agricultural development in most African countries. The context for this investment has evolved over time. During the 1980s, agricultural research focused on strengthening the research supply system at both international and country levels. During the 1990s, the focus shifted to improving the links between research, education and extension together with identifying farmers' needs for research. However, during both decades the links remained linear with research knowledge being generated for extension, which was expected to transfer new technologies to farmers. More recently the focus has changed, as it became apparent that the supply and demand for knowledge was far more complex that the linear approaches implied. It was increasingly realised that an approach involving many stakeholders was needed to speed the use of knowledge for income generation. This has come be known as an innovation systems approach. The approach embraces the totality of interactions between stakeholders required to encourage the use of research products for innovation that will benefit a wide range of actors (World Bank, 2007).

Such interactions provide new opportunities for understanding how a country's agricultural sector can better use both existing and new knowledge in designing interventions that go beyond research alone to involve the many stakeholders in partnerships that will drive development. The concept has been used in developed countries to explain patterns of economic development and more recently in the agricultural sector in developing countries. The use of innovations systems approaches are now expanding rapidly, with donors, international and regional organisations, national governments, and non-governmental organisations (NGOs) increasingly seeking to promote stakeholder partnerships involving both public and private sectors in supporting agricultural development.

For instance, the country-level support provided by the Common Market for Eastern and Southern Africa (COMESA) through the Comprehensive Africa Agricultural Development Programme (CAADP), (Box 1) for the planning and implementation of national Agricultural Sector-Wide Programmes (ASWAps) is based on key national stakeholders from the public, private and NGO sectors agreeing a strategy and working together in its implementation. This requires a clear process for stakeholder interaction that can be seen as a 'National Coordinating Innovation Platform'. Many donors are supporting such processes and are increasingly encouraging value-chain approaches that stimulate stakeholder participation, so that systems constraints can be identified and opportunities to work together in finding solution found.

Box 1: CAADP/FARA-related research reforms in Africa

The African Union–New Partnerships for Africa's Development (AU–NEPAD)'s CAADP operates through four 'Pillars', 1. Land water management, 2. Market access, 3. Food supply and hunger and, 4. Agricultural research and its uptake. FARA is mandated to deliver Pillar 4 through supporting member organisations in Africa.

Since 2006 FARA and two sub-regional organisations, *Conseil ouest et centre Africain pour la recherche et le développement agricoles*/West and Central African Council for Research and Development (CORAF/WECARD) in West Africa and Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) in Eastern Africa have made important strides with a process of integrated reform of the way research is done. These have centred on the introduction of an impact- and client-oriented 'business unusual' that addresses weaknesses in African agricultural research to target the Millennium Development Goals (MDGs). This includes:

- *Reform of technological research to be more demand-led and appropriate*
- *Enhancement of policy and institutional research*
- *Strengthening of capacity in the sub-regions*
- *Meeting demand for information.*

FARA has the responsibility of running the SSA Challenge Programme that is built around the IAR4D paradigm within a broad innovation systems context.

Source: NEPAD–CAADP, 2011

FARA has been a key player in developing and promoting Integrated Agricultural Research for Development (IAR4D), which uses an innovations systems approach in bringing partners together within Innovation Platforms (IPs), a concept that was also developed by FARA. For example, FARA's Sub-Saharan Africa Challenge Programme with Pilot Learning Sites (SSA CP PLS) in Nigeria's Kano and Katsina States and Niger's Maradi Province (KKM), around Lake Kivu in the Democratic Republic of Congo, Rwanda and Uganda, and in Zimbabwe, Malawi and Mozambique (ZMM) are playing an important role in this process (FARA, 2009). In addition the UK's Department for International Development (DFID)-funded Research-Into-Use (RIU) programme that covers a number of African and Asian countries is based on encouraging an innovations systems approach. There are many other instances where stakeholders have worked successfully together before the concept of innovation systems approaches was promulgated. This review documents the experiences of 21 case studies in SSA, to identify the reasons for their success and the lessons to be learned from these initiatives

Innovation systems approaches are often based on improvements in a commodity value chain (Figure 1), in which knowledge and/or research products, together with purchased and farm- or household- provided inputs are used in natural resource based production systems, marketed and processed for sale and consumed. Inevitably such a supply chain involves many actors from producer to consumer.

Any value-chain approach requires identification of the actors involved in all stages along the chain, followed by a systematic analysis to identify constraints and opportunities thus ensuring a fair reward for all, particularly producers, who are often major target beneficiaries. Innovation can be shaped in different ways, depending on the initial context, whether the key actors are from public or private sectors and whether they operate at international, regional, national, district, local government or community levels (Table 1).

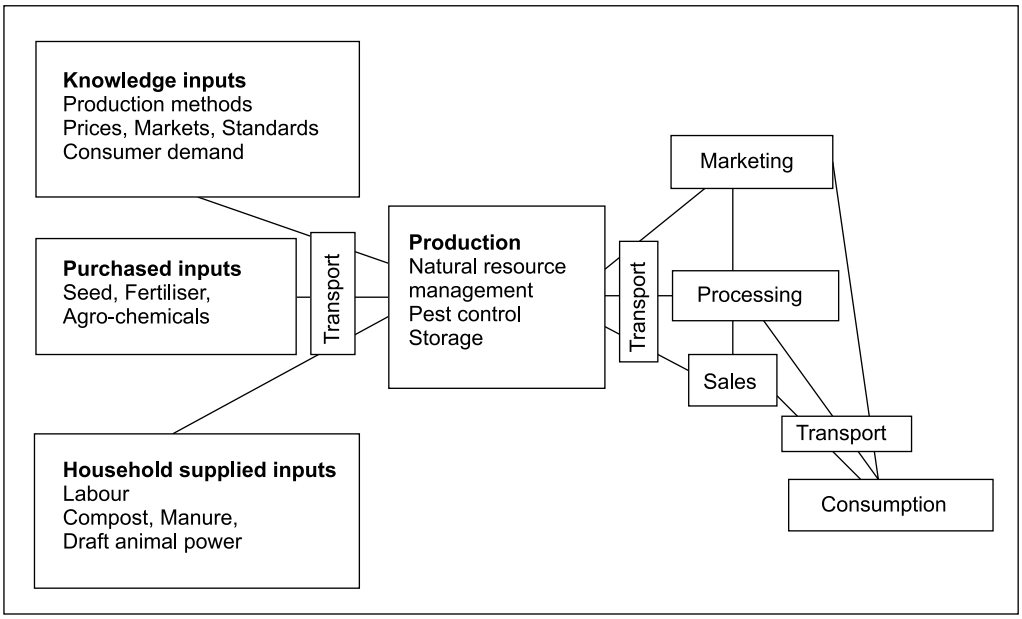

Figure 1: A typical agricultural commodity value chain

Table 1: Typical public and private sector actors involved in innovation

Level	Pivotal actors driving innovation		
	Public/NGO sector	Private sector	
		Commercial sector	Farmer representatives
International and Regional	Donors CGIAR research centres FAO, SROs, NGOs	International input and output marketing companies	
National[1]	MoA (Research, Extension) NGOs	Input supply companies Wholesalers Processors Supermarkets, hotels Representative associations	Farmer unions National farmer associations
District or Local Government	District/ Local Government councils District Agricultural Officers (DAOs) Local research Schools, hospitals NGOs/projects[2]	Agri-dealers Transporters Traders Processors	Farmer associations or cooperatives
Community	DAO Extension staff		Farmer groups or clubs Individual farming households

1. National actors are often linked to regional or international initiatives
2. Donors and NGOs often support either or both public or private sectors

Box 2: Types of innovation (derived from World Bank, 2007)

Planned innovation includes:

A *foundation stage* that government supports through research and/or policy interventions, during which priority sectors and commodities are identified.

An *expansion phase*, where government intervenes with projects or programmes to link actors in the innovation system.

Opportunity-driven innovation includes:

A initiation stage, where the private sector, sometimes with the support of NGOs, takes the lead, and companies or entrepreneurs identifies market opportunities.

An emergence stage, where the innovation takes off, often with rapid growth driven by the private sector, but is recognised by government and sometimes supported by NGOs.

Prior to this there may be an *uncoordinated or remedial phase*, when the innovation faced stagnation or pressure to innovate further because of competition, particularly from other countries, changing consumer demands, or trade rules.

Self sustaining innovation

The ultimate phase of development for both planned and opportunity-driven innovation is a dynamic system that is neither public nor private sector led, but characterised by a high degree of public and private interaction and collaboration in planning and implementation. Such a system is agile, responding quickly to emerging challenges and opportunities and delivering economic growth in a socially inclusive and environmentally sustainable way.

Factors that trigger innovation tend to be either policy- or market-driven (World Bank, 2007). Either the public or private sectors can initiate them. The initial context helps to shape both the type of intervention and by which sector it is initiated. Both public and private can lead to self-sustaining and dynamic systems of innovation (Box 2 and Table **2**).

Table 2 outlines the elements and characteristics of planned and opportunity-driven innovations, showing in the planned innovations movement from the initial context, either a pre-planning or uncoordinated stage where individuals and institutions are in place but working in isolation, often with limited trust and collaboration. In this situation little appropriate research takes place often in an 'ivory tower', access to information is difficult and training is limited. In public sector led innovation, two stages are identified: a foundation and an expansion phase. In the foundation stage, a strong public sector works alongside an increasing or emerging private sector. Research may still take place in isolation with limited interaction between stakeholders, but may be more relevant than in the initial context, even in the absence of incentives for this to occur. During the expansion phase public, private and civil society actors take an increasing interest and coordinating bodies for innovation are likely to emerge, often with individuals as 'champions' that can drive and coordinate new initiatives.

Two stages (initiation and emergence) have also been identified in opportunity-driven innovation. The starting point is often stagnation in the sector, where actors may be in place, but there are few linkages and little coordination. There may be independent but uncoordinated efforts at making improvements, but with weak collaboration and an absence of incentives for

Table 2: Elements and characteristics of public and private sector initiated innovation

Element/ stages	Initial context For either public- or private-sector led		Planned innovation (usually public-sector led)		Opportunity-driven innovation (usually private-sector led)		Sustainable innovation
	Pre planning	Uncoordinated	Foundation	Expansion	Initiating	Emergent	
Main actors	Public and private sector	Actors in place but little coordination	Strong public sector Increasing private sector	Public, private and civil society actors Emerging coordinating bodies	Private sector and civil society actors in place with some coordination	Primarily private sector accords	Coordination bodies well positioned to support all actors
Attitudes and practices	Ivory tower – working in isolation Limited trust	Uncoordinated independent attempts at improvement	Traditional roles predominate	Willingness for collaboration	Opportunistic behaviour from the private sector	Self-reliant private sector	Openness in partnering, collaboration and inclusion
Interaction patterns	Very limited interaction Lack of access to information	Weak collaboration	Limited interactions occurring	Interaction well developed within clusters	Limited networking	Informal private sector networks Limited contact with research	A dense network of interactions
Enabling environment	Very limited or inappropriate research and training available	Incentives for research, training and finance not in place	Research and training occurring Limited incentives for private sector	Incentives for training and private sector activity in place	Very limited or inappropriate research and training available	Incentives for research, training and financial sector participation not in place	Incentives for research, training and financial sector participation
Phase based on Figure 2	-		1	2	1	2	3

Source: Modified from World Bank, 2007

appropriate research and training. The initiation phase is characterised by opportunities being identified either by a private sector or civil society organisation even when limited networking and research or training are available. As with planned innovations, this usually requires an individual or institutional 'champion' to take an initiative. This can lead to the emergence of private-sector initiatives and informal networks developing, even in the absence of incentives.

Both planned and opportunity-led innovation can lead to a system of sustainable innovation where coordinating bodies have been established that in turn encourage and support other actors. Attitudes change, reflecting openness in partnering and collaboration, with inclusion of all stakeholders. This gives rise to a dense network of formal and informal interactions with a drive to achieve systems improvements. Such progress is facilitated by incentives for appropriate research and training, and importantly, by financial-sector participation in activities.

Integrated agricultural research for development

FARA has promoted the use of innovations systems approaches encouraging processes that have become known as Integrated Agricultural Research for Development or IAR4D. This has four defining principles (Hawkins *et al*., 2009), which integrate:

- Perspectives, knowledge and actions of different stakeholders around a common theme.
- Learning that stakeholders achieve through working together.
- Analysis, action and change across environmental, social and economic dimensions of development
- Analysis, action and change at different levels of spatial, economic and social organisation.

To put these principles into effect requires joint knowledge sharing, joint analysis and joint action and change, which necessitate individual, organisational and institutional capacities that ensure these activities take place. This requires different stakeholders, individuals and organisations from both public and private sectors to come together on a level playing field. IAR4D can be viewed as a set of good practices that adds value to existing research and development processes and therefore should be viewed as an approach or a framework fostering the quality of the processes. IAR4D is therefore concerned not only with technology or policy outputs but also with markets, institutional and infrastructural outputs and improved capacity and behavioural processes that will ensure that new knowledge is put into use. This requires the creation of favourable organisational and institutional environments that may require changes in governance structures, leadership and management, resources procedure and culture to ensure that IAR4D becomes part of mainstream research and development practice.

Interventions to support the innovation process vary with purpose and are influenced by both the context and the capacity of different stakeholders.

Figure 2 demonstrates a typical three-phased process from initial engagement with stakeholders, through planning, implementing, learning and assessing to a final phase of ensuring a continuing and sustainable and dynamic innovation system. These three phases compare with those identified in Table 2 in both planned and opportunity-driven innovations: Phase 1 including the foundation or initiating stages, Phase 2 the expansion or emergence stages and Phase 3 the sustainable innovation stage.

At each phase in the innovation process, the role of the participants is likely to change, in the case of local participants, from one of interest to active collaboration and finally ownership and leadership. At the same time the role of research and development organisations needs to change from initial leadership to facilitation of the process and finally to providing backstopping, when and as required. The role of the private sector is likely to mirror that of local participants in changing from interest to one of active collaboration and finally farmer support and commercial opportunity.

Interventions can occur in any of the three phases, key ones being shown in Box 3. Activities associated with each phase include:

Box 3: Typical interventions at each phase of the Innovation process

Phase 1: Engagement with stakeholders

- *Building and supporting partnerships*
- *Creating common vision, trust and awareness raising*
- *Building capacity to understand problems and identify opportunity*
- *Developing attitudes, practices and incentives*

Phase 2: Planning, learning and assessing

- *Assessing input and output markets, value-chain analysis*
- *Developing actions plans for systems improvement, value addition and market opportunity*
- *Agreeing partner roles*
- *Innovation research and development*
- *Learning, assessing performance and capacity development*
- *Enhancing collaboration across actors and sectors*

Phase 3: Ensuring sustainability

- *Setting in place new innovations (products, technologies, management practices, institutions, marketing and policies)*
- *Ensuring ownership by local participants*
- *Maintaining agility and ability to identify new opportunities,*
- *Providing backstopping as required.*

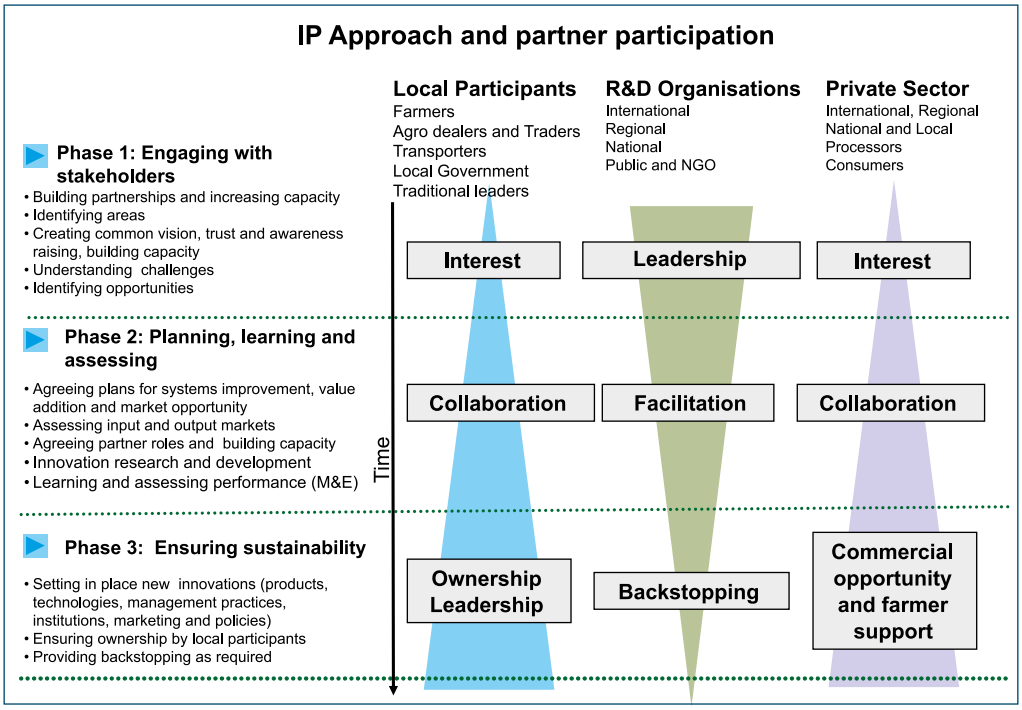

Figure 2: Conceptual framework for IP approach, establishment and functioning *(modified from Devaux, 2005)*

Purpose and methodologies used

This review seeks to draw on the experiences of multiple stakeholder agricultural innovation approaches in the context of IAR4D in guiding a research agenda, subsequent knowledge generation and its use in improving food security and nutrition, reducing poverty and generating cash incomes for resource-poor farmers. The report draws on a range of case studies across SSA to compare and contrast the reasons for success from which lessons can be learned.

The key tasks undertaken to identify the lessons for successful innovation were:

- Identification and analysis of a range of successful applications of multiple stakeholder approaches, learning lessons and establishing the reasons for success through comparative analysis. The case studies selected include those initiated by FARA in its SSA CP PLS as well as other planned and opportunity-driven innovations
- Review of available literature on each case study
- Discussions with stakeholders and other key informants associated with the case studies
- Comparative analysis of the challenges addressed, institutional arrangements and stakeholder interaction, the benefits arising (including production development or added value to products) and, where possible, the number of beneficiaries
- Identification of the technological, policy and institutional innovations that fostered the success stories
- Critical review of the successes, their outcomes, and lessons learned.

A total of 21 case studies, six in Eastern Africa, eight in Southern Africa and seven in West Africa included six funded under FARA's SSA CP were used. Selection was based on a representative sample across the three sub-regions and included:

- Traditional sectors, including subsistence crops – sometimes processed
- Niche sectors, including specialist crops
- Sectors integrated with global markets through export commodities
- Sectors offering large employment opportunities for the poor, aimed at either local or export commodities.

In many cases more than one of these sectors was applicable. Other factors included: intensifying staple food production and developing processing techniques; integrating people and the environment; developing local organisations; establishing of public–private

Table 3: Innovation case study characterisation

Region	Country	Commodity	Operational Level[a]	Innovation types			Planned or Opportunity driven	Stage reached	Approx. no. of farmers involved
				Institutional	Technical	Policy			
Eastern Africa	Ethiopia	Coffee[2,3]	District	x	x		Opportunity	Sustainability	87,000
	Kenya	Dairy[1,3]	National	x	x	x	Planned	Sustainability	1,500,000
		Horticulture[3,4]	National	x	x		Opportunity	Sustainability	20,000
		Sweet potatoes[1,3]	National	x	x	x	Planned	Assessment	3,000
	Rwanda	Climbing beans[1,5]	National / District	x	x		Opportunity	Assessment	50,000
	Uganda	Dairy[1,3]	National	x	x	x	Planned	Sustainability	1,200,000
Southern Africa	Botswana	Beef cattle[1,3]	National	x	x	x	Opportunity	Sustainability	250,000
	Malawi	Cotton[3,4]	National	x		x	Opportunity	Sustainability	200,000
		Groundnuts[1,4]	District	x	x	x	Opportunity	Sustainability	3,000
		Legume seed[1]	National	x		x	Planned	Assessment	150,000
		Conservation agriculture - maize and tomatoes[1,5]	District	x	x		Planned	Assessment	3,000
		Soil fertility -maize and legumes[1.5]	District	x	x	x	Planned	Assessment	3,000
		Vegetables[1,2,5]	District	x	x		Planned	Assessment	3,0000
	Zambia	Conservation agriculture – maize, cotton and legumes[1]	National	x	x	x	Planned	Sustainability	175,000
West Africa	Cameroon	Bananas[3]	National	x	x	x	Planned	Sustainability	10,000
		Garlic[2,3]	District	x	x		Planned	Sustainability	3,000
	Ghana	Pineapples[3,4]	National	x	x	x	Planned	Sustainability	15,000
		Cassava[1]	National	x	x		Opportunity	Assessment	5,800
	Niger	Vegetables[1,2,5]	District	x	x	x	Planned	Assessment	2,500
	Nigeria	Cassava[1]	National	x	x	x	Opportunity	Assessment	150,000
		Rice[1,5]	District	x	x	x	Planned	Assessment	20,000

[1]Traditional crop, [2]Niche crop, [3]Export commodity,[4]High labour input, [5]FARA SSA CP pilot learning site

[a]District is used generically to mean County, District or other name for Local Government

partnerships; expanding the role of markets: diversifying from major cereals, root and tubers; reforming economy-wide policies; improving food quality and human nutrition.

Most of the crops in the case studies had been grown traditionally, either as a staple or on a small scale for local consumption. In many cases opportunities for processing had been identified and developed for consumption in either domestic or export markets. In most cases the entry point was the commodity, although in Southern Africa concerns about the sustainability of production methods resulted in NRM being the focus in three case studies. Four cases of high-value niche crops, a specialist coffee, garlic, and two vegetables showed that development of both local and export markets were able to benefit producers. Three case studies concerned livestock, two dairying and one beef cattle. Two case studies illustrated the importance of employment opportunities for large numbers of poor people. Public–private partnerships, policy changes and the development of local organisations were important factors in most of the cases.

Researchers familiar with each region undertook the assessments collecting data primarily through interviews with key informants including farmers, researchers, extension workers, private companies, NGOs, coordinating organisations, and government ministries. Each case study has been summarised. Annex 1 provides detail of stakeholder roles during the innovation process, Annex 2 the specific role of the public sector and Annex 3 the key interactions that supported the innovation activities.

THE CASE STUDIES

Eastern Africa

Southern Africa

West Africa

Ethiopia's *Sidama* coffee

This case study examines the production of *Sidama* coffee, a premium coffee, grown primarily by smallholders. When coffee prices collapsed during the 1990s, farmers were faced with decreasing yields, poor quality and low prices. The establishment of the *Sidama* Coffee Farmers Cooperative Union (SCFCU) in 2001 and subsequently the Ethiopian Government's policy change to allow direct exports from recognised sources like SCFCU played a major role in resuscitating the *Sidama* coffee industry. SCFCU's involvement in vertical integration of production, processing and marketing has resulted in yield, quality and price increases for producers. Additionally, SCFCU service to members that includes training, advice, inputs, savings and credit ensures yield and quality maintenance. Simultaneously, Government has provided important support for research in improved varieties and management practices.

Initial context. Ethiopia is the world's sixth largest exporter of coffee, produced primarily in the southern and western parts of the country. The Sidama region is the second largest producer, after Oromiya, but its coffee has unique qualities that are acknowledged by importers. There are four main types of coffee production systems in Ethiopia: forest, semi-forest, garden and plantation. *Sidama* is a garden type grown near homesteads at lower than normal densities, ranging from 1000 to 1800 plants per hectare. Prior to 2001, smallholder producers sold their coffee primarily to private foreign traders, who were not farmers, often receiving low prices and facing high production risks, especially during the 1990s after the market was liberalised.

Initial challenges. The challenges faced by *Sidama* producers included: poor infrastructure, old coffee trees, reliance on traditional cultural practices, scarcity of finance and limited use of modern inputs, all of which contributed to low-quality coffee. In the early 2000s world coffee prices collapsed and farmers were faced with a period of major price fluctuations. Furthermore, traders who were neither farmers nor Ethiopians marketed good export coffee. Producer incomes remained low and the proportion of the consumer price reaching the producer was not known.

Innovation triggers. The *Sidama* Coffee Farmers' Cooperative Union (SCFCU, 2005) was established in 2001 to mitigate some of the initial challenges and support farmer welfare. SCFCU subsequently obtained special Government permission to bypass organised coffee auctions and sell directly to clients.

Interventions and the roles of different stakeholders. Farmers now produce and market coffee berries to SCFCU, which provides many production services along the value chain. Such services include: processing, developing producer/buyer linkages, warehouse services, quality promotion, training and education, and provision of credit and savings services to members. Specific SCFU arrangements encompass:

- Provision of advice at all levels along the coffee value chain
- Primary cooperatives to arrange inputs for members, although this is minimal as *Sidama* coffee is organically produced without the need for purchased inputs
- Savings and credit services for members, although individual members can also obtain credit from other financial organisations, such as the Cooperative Bank of Oromia, the Commercial Bank of Ethiopia and Awash International Bank
- Direct involvement in processing. Coffee berries are handpicked and sorted, then sold to primary societies for wet processing. Pulping and natural fermentation are undertaken at primary society pulperies, after which the fermented coffee is washed, soaked and dried. Dried 'parchments' are then stored in warehouses, before delivery to a central dehulling facility, which completes the processes, packages and labels the produce for export. SCFCU has its own vehicles but occasionally hires private transporters whenever there is need. The Cooperative now operates over 90 pulperies, a hullery, and 133 warehouses with a capacity of some 5,000 tonnes.

The Ethiopian Commodity Exchange (ECX, 2011) provides a marketplace that compliments the role of SCFCU. This provides a forum where buyers and sellers come together to trade and be assured of quality, delivery and payment. It deals in six commodities including coffee, sesame, haricot beans, teff, wheat and maize. Any *Sidama* export coffee that is not marketed by SCFCU can be auctioned through ECX.

The Ethiopian Coffee Growers, Producers and Exporters Association (ECGPEA) is a members' association involved mainly in advocacy. This becomes necessary when farmers need to engage Government or other stakeholders on policy concerns along the value chain.

The Government, at Jimmah Agricultural Research Centre, provides coffee research that includes: the collection and classification of indigenous landraces, variety development, improving management (especially pest and disease control) and providing technical support to coffee producers. Haramaya University, in its academic programmes, complements general research and development efforts in the coffee sub-sector.

Achievements. There are now over 87,000 individual SCFCU members producing over 35,000 tonnes of *Sidama* coffee from 70,000 hectares. SCFCU includes 45 primary producer societies each of which typically has some 2000 coffee producers (SCFU, 2011). Two of SCFCU's primary societies have been certified for organic *Sidama* coffee production and SCFCU has become a registered member of the Specialty Coffee Association of America. SCFCU's vertical integration from production to export of coffee beans is ensuring a quality product at fair prices, with the exploitative role of private traders being minimised. At the same time ECX complements the marketing functions of SCFCU. By selling directly to the customers SCFU ensures that the value paid to the producer has increased substantially

SCFCU success is based on vertical integration through: producer–buyer linkages, direct export of members' coffee, provision of warehouse services, and provision of saving and credit services for members. Coffee quality has been improved by education and training to ensure quality production and processing from seedling production to export, with SCFCU committed at every step in the chain.

Emerging or unresolved challenges. Production problems including pests and diseases, especially coffee wilt disease affects both yield and quality and requires ongoing research and improved management practices. Although the volume of coffee exports and its quality is high, coffee sold locally is often of lower quality.

The use by Ethiopia of a number of coffee trademarks requires resolution with international corporations.

Lessons learned for scaling up. Vertical integration along the value chain has ensured that producers obtain a fair share of the final value. SCFCU involvement in production, processing and marketing has ensured good quality at reasonable prices with the whole sector being owned and managed by farmers and their employees.

Kenya's dairy sector

The dairy industry in Kenya is largely based largely on intensive smallholder production supported by free-market processing, transport and marketing. Technologies that have supported growth of the industry include improved breeds, zero-or semi-zero grazing and feeding regimes, and market liberalisation that enabled smallholders to participate in formal milk markets. The industry evolved from an initially open market system in the first half of the 20th century to a near monopoly industry for much of the second half, before being liberalised during the 1990s. During this latter period rapid upward trends in milk production have occurred with over 70 percent of farm households and 600,000 smallholder farmers producing over 75 percent of national milk production. The country's per capita dairy production is ranked the highest in sub-Saharan Africa (SSA). A broad array of support institutions, both public and private, has played key roles at different stages in the country's dairy development. Government regulation has driven many of the key policy changes while donors, NGOs and the private sector have supported smallholder production and marketing initiatives.

Kenya was selected as a Dairy Centre of Excellence in 2011.

Initial context. Kenya's dairy industry emerged during the first half of the 20th century with the introduction of improved breeds of cattle by white settlers. At that time dairy production was mainly a large-scale commercial farmer activity supported by public sector quarantine laws, veterinary and artificial insemination (AI) services. The dairy industry evolved from a free market during the first half of the 20th century to a monopolistic and finally a liberalised industry from 1992 (EPZA, 2005). The drivers of innovation in the dairy industry have been multifaceted,

including policy, production, markets and research, supported by different stakeholder investment strategies. The integration of smallholder producers started from the mid-1950s, with political tensions inducing Government to open dairying to smallholders. Government support included AI and veterinary services, extension and controlled marketing. After Independence in 1963, land transfer to smallholders, expanded support of public extension, other support services and price controls modified to encourage smallholder production saw national milk production grow at more than 10 percent per year. By the mid-1980s smallholders accounted for most of the marketed milk. Land intensification, in particular zero- and semi-zero grazing, was widely adopted by many smallholder dairy producer areas, as a result of the National Dairy Development Project (NDDP), which operated between 1980 and 1994 and provided financial and technical support. The success of these initiatives is attributed to the farmers' interest and financial and technical assistance, the economic viability of dairy as compared to other enterprises, and supportive Government priorities (Muriuki, 1994).

Initial challenges. While interventionist strategies requiring considerable state control and subsidies were justified in increasing the economic participation of smallholder farmers, they proved unsustainable in the longer term. When AI and veterinary control and extension services started deteriorating the lack of credit, poor marketing infrastructure and low milk prices resulted in productivity declines. Milk marketing remained controlled, with Kenya Cooperative Creameries (KCC) enjoying a protected monopoly. However liberalisation in 1992 saw a dramatic increase in the number of players, both formal and informal, a phenomenon that, at the outset, almost crippled the industry.

Innovation triggers. With strong donor encouragement and support, the Government initiated a set of broad economic reforms aimed at reducing the role of the state while stimulating the growth of a more competitive and productive private sector. The Smallholder Dairy Project (SDP) (1997– 2005) encouraged and supported policy change in the industry through the inclusion of many small-scale primary players. This resulted in the current Dairy Industry Policy (MLFD, 2006), which allowed the participation of many small-scale players who had earlier been excluded from the industry.

Interventions and the roles of different stakeholders. The dairy industry's development over the past 100 years has involved many stakeholders. Government regulation has driven many of the changes, sometimes for better and at other times for worse. During the first half of the 20th century regulation favoured large farms discriminating against smallholder producers through land allocation, grazing controls and imposed illegality of raw milk sales in urban areas. From 1954 onwards support focused on helping smallholder dairy farmers gain access to formal processed milk markets. Though reversing the bias towards larger-scale farmers, raw milk markets remained illegal. The broad deregulation of 1992 broke KCC's processing monopoly permitting the emergence of many privately owned processors, and encouraged raw milk traders in urban areas.

The major interventions noted for the sector's success include:

- The introduction of improved breeds of cattle by white settlers in the first half of the 20th century

- From about 1966 to 1969 the Government supported smallholder acquisition of the white settler farms and dairy stock, and the development of disease control and artificial insemination services. Smallholders, even those outside settlement areas also developed an interest in commercial dairy production
- In the late 1970s, the initial stages of the NDDP, a bilateral initiative between the Governments of Kenya and The Netherlands, identified land constraint as the major problem facing smallholder dairy farmers. Intensification of land use by zero-grazing was recommended, a production system that has been adopted in almost all the smallholder dairy production areas
- In 1992, the dairy industry was liberalised, removing the protected monopoly enjoyed by the KCC. Many small processing outlets have since become established
- Between 1997 and 2005, the SDP, with funding from DFID (UK) carried out research and development to support sustainable improvements to the livelihoods of poor households through their participation in the dairy sub-sector (SDP and ILRI, 2004). The Ministry of Livestock and Fisheries Development (MLFD), the Kenya Agricultural Research Institute (KARI) and the International Livestock Research Institute (ILRI) jointly implemented SDP. The project, led by the MLFD, worked with many collaborators, including public, private and civil society organisations
- In 2000 the draft Dairy Development Policy, which explicitly provided institutional guidelines to support smallholder milk production and informal marketing was released. The policy redefined the role of the Kenya Dairy Board (KDB) to go beyond regulation and become a catalyst for dairy development (SDP and ILRI, 2004)
- The Kenya Dairy Sector Competitiveness Program (KDSCP) funded by the United States Agency for International Development (USAID) and implemented by Land O'Lakes Inc., was a 5-year effort from 2002 that was intended to wean the industry from its hitherto dependence on subsidised business development services. In the past the Government, donors and NGOs subsidised many of the services, including extension, animal health, AI, and input supplies. It was argued that these tended to distort the markets and were unsustainable. The Kenya Dairy Development Program (KDDP) was an effort to enhance efficiency and effectiveness throughout the dairy value chain for smallholder farmers
- In 2006 the Minister for Livestock Development released the new National Dairy Policy that recognised and legitimised the significance of the participation of the informal sector in the dairy industry
- From 2007 the Bill and Melinda Gates Foundation (BMGF) has funded the East Africa Dairy Development Project (EADDP). This is a regional industry development program led by Heifer Project International (HPI) in partnership with ILRI, TechnoServe, the World Agroforestry Centre (formerly ICRAF, the International Centre for Research in Agroforestry) and the African Breeders Service. Total Cattle Management, is being implemented in Kenya (and Rwanda and Uganda). It aims to lift farmers living on small areas of 1.5 acres or less out of poverty through more profitable production and marketing of milk.

Achievements. The evolution of the industry has seen an increase in milk production, from 2.8 billion litres in 2002 to 4.2 billion in 2009 (MoA, 2010). The industry, at all levels of the value chain: production, processing, packaging and marketing is comprised of formal and informal players. The formal sector licensed by Government comprises 27 milk processors, 64 mini-dairies, 78 industries, 1138 milk bars and 757 primary milk producers (KDB, 2010). Milk marketed through the formal sector has grown from 150 million litres in 2001 to over 400 million litres in 2009 (KDB, 2010). Since liberalisation, private processors have almost fully taken over the formal market with milk production presently accounting for 80 percent of marketed milk supplies. The size of the informal sector, difficult to estimate due to lack of data, has been estimated to be at least four times that of the formal sector.

Dairying now accounts for over 30 percent of farm household income nationwide with some 75 percent of households being engaged with it (Ngigi *et al*., 2010). For over 25 percent of households, dairying contributes more than half their income, being particularly important for lower-income groups. This underlies the importance of dairying as an integral component of smallholder farming systems with cattle making a significant contribution to nutrient recycling through the manure they provide. In high-potential areas many households use all their land for fodder production, purchasing other household food requirements.

Kenya's annual per capita milk consumption, estimated at over 145 litres, is considerably higher than that in other SSA countries, with milk and milk products constituting the largest share of Kenyan household food expenditure (ILRI and DFID, 2010).

As a result of these achievements, the Eastern Africa Agricultural Productivity Project (EAAPP) coordinated by the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), selected Kenya as the Dairy Centre of Excellence in 2011.

Emerging or unresolved challenges. On average smallholder dairying households own three head of cattle with an average land holding of 2.6 hectares. Some 20 percent of dairy households rear exclusively exotic breeds, while 40 percent rear exclusively indigenous breeds (Ngigi, 2005). This suggests considerable scope for upgrading local herds, through AI services. Given continuing pressure on land, increased intensification remains a challenge. Pasture and fodder shortages especially under rainfed conditions result in uneven milk supplies during the year, requiring costly purchased feed supplements to make up shortfalls. In some years, farmers discard milk for lack of markets, while in others, the country's imports of dairy products rise. Other challenges include the need to ensure that AI, animal health and disease control, and extension services remain within reach of smallholder farmers. At the same time lack of financial services geared to dairy industry needs remains a problem for many producers.

With regard to marketing, private trade in raw milk remains highly profitable. Given the lack of processing costs, raw milk retails for about half the cost of pasteurised milk. Raw milk traders pay slightly higher prices to farmers leading to both consumers and farmers preferring raw milk markets. Challenges and opportunities therefore exist to develop a low-cost processing, packaging and transport infrastructure. Processing industries could take advantage of periods of milk surplus and invest in milk preservation in various forms. The private sector could invest in business development services, if the industry is indeed to continue to be successful.

Lessons learned for scaling up. The promotion of market-orientated smallholder dairy production, which significantly raises household income, can have a profound effect on poverty reduction. In Kenya, development has been built on efficient market systems, AI and disease control, infrastructure provision, research and extension in support of smallholder production. Government support has been crucial for this. At the same time subsidised support systems proved to be unsustainable requiring a balance between public and private action. Government provision of public goods needs to compliment incentives for private marketing, processing and input supplies.

The development of a successful smallholder industry requires two complimentary elements. Firstly, increased productivity requires improved livestock breeds, strong disease control and veterinary services and improved quality and quantity of feeds. Given the need to encourage many smallholder dairy producers, delivery of support services remains dependent on local institutions and their development.

Secondly, expanding market institutions with facilities for milk bulking and collection, and group organisational structures are essential and can be most effectively supplied by the private sector. Although formal licensed markets based on processed milk products are important, informal markets selling raw milk, informal dairy products with low-cost processing remain an essential component of a successful dairy industry.

Kenya's sweet potatoes

This case study concerns the research and development of an orange-fleshed sweet potato, high in β-carotene, invaluable for improving household nutrition and food security especially in times of hunger or drought, and for pre-natal care and households affected by Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome (HIV/ AIDS).

New varieties were developed as a result of a ten-year research programme. Government extension services and a number of NGOs have subsequently participated in programmes providing training, propagation and distribution of vines, processing and the linking of producers to markets. These programmes covered many parts of Kenya but in particular Coast, Eastern, Rift Valley, Nyanza and Western Provinces.

Over 2,660 households, including many vulnerable ones, have benefited, with sweet potatoes being grown for eating as fresh vegetables and processed product. Traditionally regarded as a women's crop sweet potatoes have made an important contribution to improving the livelihoods of women, both as a food and a cash crop. Full commercialisation is now taking place through promotion in urban areas with a

value chain from producers through traders, wholesalers and retailers to consumers, slowly being established.

Initial context. Sweet potato is the third most important tuber in Kenya, after potato and cassava. For many years it was grown purely for subsistence, more particularly in times when grain staples were in short supply. However, increasing dependence on grain since the 1980s resulted in a decline of sweet potatoes production, with negative consequences for food security. A Government initiative in 2004, which gave attention to root and tuber crops, resulted in a modest increase in sweet potato production (GoK, 2004). With both food security and health attributes of sweet potatoes increasingly being recognised, orange-fleshed sweet potato (OFSP) varieties have been particularly favoured for development over the past decade.

There are over 2000 sweet potato varieties grown in the country, with various attributes, and at various levels of production and utilisation.

Initial challenges. The development and utilisation of OFSP faced a number of challenges including the following:

- Sweet potatoes being considered a 'woman's crop' with promotion often not receiving the enthusiasm it might have deserved, especially from male audiences
- Neglect of advocacy and awareness creation of the nutritional value of sweet potatoes
- OFSP with its high β-carotene content has a lower dry matter content than traditional varieties. Unfortunately Kenya consumers prefer varieties with high dry matter content. This meant an initial low demand for OFSP
- Since sweet potatoes are vegetatively propagated from vines and ensuring regular supplies of healthy planting material of OFSP in significant quantities requires special measures. The OFSP varieties are early maturing and their vines are short-lived, hence a challenge for availability of planting material.

Innovation triggers. Hidden hunger and nutrient deficiencies triggered increasing interest in OFSP, among other micronutrient dense sources. Rather than continued dependence on micronutrient supplements, which many people could not afford, or access, Harvest Plus, a global alliance of research institutions, funded projects that explored bio-fortification, and OFSP was identified as a rich source of vitamin A.

Interventions and stakeholders roles. Although research on sweet potato in Kenya by KARI (Kenya Agricultural Research Institute) and the International Potato Center (CIP) with their global partners has been ongoing for over 20 years, research, mainly breeding and dissemination on OFSP has occurred only over the past ten years. The work involved acquisition of initial planting material, identification of suitable landraces for breeding, breeding activities for nutrient content, yield, taste and disease and pest resistance, and dissemination initiatives. Other stakeholders in the intervention have included a number of NGOs that support production and utilisation projects, as well as producer and consumer organisations, notably Kilimo Trust, Sweet Potato Action for Security and Health (SASHA) Community Research in Environment and Development Initiatives (CREADIS), Rural Energy Food Supply Organisation (REFSO),

Appropriate Rural Development Agriculture Program (ARDAP), Majasio Human Development, (MAHUDE) and Farm Concern International.

Different stakeholders along the OFSP product value chain include farmers, seed multipliers, market traders, extension agents, processors, media, and community based organisations. Promotion of sweet potato now occurs country wide, with greatest activity in Western Kenya. KARI and CIP continue to undertake research in developing new varieties, to obtain combinations of dry matter, β-carotene, disease and pest resistance with appropriate yield and taste attributes. The Mama SASHA Project (2009–14), a component of CIP's sweet potato activities, links health with agriculture, targeting women who require pre-natal care. Such women are provided with vouchers at clinics for obtaining sweet potato planting material. The vouchers are exchanged with farmers for six-kilogram starter packs of sweet potato vines. The farmers are then reimbursed at about two US dollars for each six-kilogram pack distributed. In the first four months of distribution, 836 women received vouchers from four health facilities, with more than 500 vouchers being redeemed vine starter packs. Follow-up visits to the homes of 216 women found that 81 percent of them had planted the vines (DONATA, 2011). Dissemination of New Agricultural Technologies in Africa (DONATA), a network supported by FARA enhancing the uptake and adoption of the OFSP technologies, in Kenya Ethiopia, Rwanda, Tanzania and Uganda, has been using an IP approach since 2008. Two IPs have been formed each with its own institutional arrangements to support the up-scaling process (DONATA, 2011).

An NGO, Farm Concern International has initiated sweet potato promotions in Nairobi grocery stores to assist in developing the urban market for OFSP.

The public sector, private sector, NGOs and farmer groups have all played key roles in the success of OFSP including the following:

- Approval and funding by the public sector of research and development agenda from various players, and registration of NGO efforts
- KARI and CIP spearheading the research effort into the development of the OFSP, fine tuning of technologies and quality control
- The Ministry of Agriculture (MoA) and various NGOs are part of innovation platforms in western Kenya with the MoA being responsible for technology dissemination and up-scaling in the innovation platforms
- Farmers link up through the SASHA project to provide planting material although commercial multiplication remains to be achieved
- Private traders purchase the crop where commercialisation has taken root, like in Kabondo in South Nyanza and in Busia and Bungoma in Western Province. Concern International also links traders to markets.

Several cottage industries process sweet potatoes with Busia Farmers' Training Institute, a government organisation, training farmers in many aspects of sweet potato utilisation

- Financing of the enterprises is by private arrangements, other than in the SASHA project which funds the purchase of planting material for mothers in pre-natal stage

- Transport is handled by private traders, who also engage in marketing and market information
- NGOs like CREADIS, REFSO, ARDAP, and MAHUDE have been involved in coordination of activities and mobilisation of community groups, documentation of activities and outcomes, coordination of planting material multiplication and postharvest processing
- Representatives of groups handle their interests in the innovation platforms.

Achievements. Many stakeholders are now involved with sweet potato. There are over 2000 varieties grown with different attributes and research work is still on going. The DONATA network has made an important contribution in planting material multiplication, training on production and utilisation, and promotion activities. About 880 farmers have directly participated in the multiplication and distribution of planting material and by the end of 2010; about 2660 end users had received planting material. The project has trained 48 trainers on OFSP agronomy and vine multiplication and 37 trainers on postharvest processing. The trained trainers later reached a total of 653 farmers (550 farmers on agronomy), postharvest processing (71) and business skills (32). The project also trained 24 MoA extension staff on business skills.

One OFSP processor (Mukunya, 2011) indicates that a market has finally been established and according to one farmer representative (Agri-Hub Kenya, 2011) there are approximately 7000 farm households in southern Nyanza producing local varieties, and will be willing to produce if assured of market contracts. Farmers have been organised into around 40 producer groups with umbrella marketing cooperatives. The area produces over 50 percent of the country's sweet potatoes and is therefore a potential supplier for the emerging market.

Achievements of the research and development efforts are acknowledged, yet the major reason for the development of the OFSP, the contribution of the β-carotene health attribute is still unknown. Many users of OFSP flour including homes that care for HIV/AIDS sufferers indicate positive outcomes, although this is yet to be scientifically studied.

Emerging or unresolved challenges. The demand for OFSP is now outstripping supply: "We have been selling OFSP flour for a few years now and all of a sudden farmers are not finding the varieties interesting enough (for their pockets) and just as the market looks ripe for growth, the tuber is nowhere to be found" (Mukunya, 2011). Commercialisation of the sweet potato is still in the intermediate phase, where the suppliers, traders and consumers have not yet established a stable value chain, despite several initiatives in the crop in the country.

Attempts to develop varieties that are resistant to the potato weevil have not yet been successful. Mitigation of weevil damage includes use of short-season varieties and deeper storage of roots.

Lessons learned. Production of the OFSP or other commodities grown by smallholders who are participating in group initiatives can be successful if there are contract markets to provide the stability for increasing production. It also requires support for breeding, production and utilisation. Greater involvement of nutrition research activities may have contributed even more to the ongoing success.

Kenya's horticulture with special focus on vegetables

Kenya's horticultural industry has grown steadily over the past 50 years becoming a key sector for foreign exchange earnings and employment in primary production and agri-processing, involving many stakeholders in a well-developed value chain. However increasing focus by importing countries on food quality and safety, sustainable production practices and workers' welfare and safety, required action to meet with export standards.

This required major change to organised networks of production and marketing processes, from casual purchase of produce by traders who had engaged farmers in production with little emphasis on marketing and the standards required. The horticulture industry now encompasses both the domestic and the export markets with production for export market based mainly in Eastern and Central provinces. There are now over 2,500 GLOBAL Good Agricultural Practice (previously EUREP)(GLOBAL GAP) certified farms with more than 20,000 farmers linked to these and growing fresh produce for export supported by policy, institutional, infrastructure and technological innovations.

Initial context. At Independence, GoK recognised the potential of horticulture as a viable solution to the country's need to export. Potential benefits included crop diversification, income generation, enhanced nutrition, employment creation, foreign exchange earnings, as well as a source of raw materials for upcoming agri-processing industries. As a result the Horticultural Development Council (HDC) was established in 1966, and later became the Horticultural Crops Development Authority (HCDA). HCDA was mandated not only to regulate the industry but also to provide advisory and marketing services, steering the industry and especially encouraging smallholder producers. The growing and processing of horticultural crops now employs over four million Kenyans directly and indirectly, contributing over 13 percent of the country's gross domestic product.

The horticulture industry in Kenya is based on both a domestic market with production nationwide and an export market based largely in Eastern and Central Provinces. The successful performance of the industry has attracted a great deal of attention over the past two decades, particularly due to the growth of its exports to Europe. However, the domestic market is much larger in both quantity and value, with the attractive export market representing only a small fraction of the overall industry (Tschirley *et al.,* 2004). Over 90 percent of all fruits and vegetables produced are consumed locally, with only two percent of smallholder horticulture farmers producing directly for export. The horticulture industry is now a very important foreign exchange earner, second only to tourism, with tea being a close third. Export horticulture has seen a major change over the past decade, with the introduction in 2003 of EUREP GAP and later GLOBAL GAP certification requirements (GDLN *et al*., 2010). Prior to 2003, exporters relied on purchasing produce from growers through brokers. Such arrangements relied on minimal records with no indication of incomes from the various stakeholders.

Initial challenges: The steady growth of Kenya's horticultural industry has not been without challenges, a main one being the emergence of the food safety and security concerns of

major consumers of export vegetables. International trade conditions introduced over the past decade, through the implementation of certification requirements, saw large numbers of farmers stop export production. For instance, in 2003, exporters were sourcing produce from over 9,000 farmers but by 2006, 60 percent of these farmers had dropped out of GAP schemes due to problems with implementation of the necessary export standards (Graffham *et al*., 2008). The major problem with the new arrangement was funding, not just for the initial compliance but also because of the need to remain compliant through annual audits, renewals of certification and changing levels of compliance. By 2007 an average a farmer was incurring costs of US$ 500 for compliance, for returns of about US$ 400 (Muriithi, 2011). The required cash outlays were beyond the reach of many farmers.

Other challenges faced by producers include a lack of adequate extension services and rapidly increasing costs of inputs.

Innovation triggers: The focus on liberalised markets and globalisation brought concerns of food quality and safety, sustainable production practices, and workers' welfare and safety. Government's response to these concerns was to introduce measures to ensure compliance with EUREP GAP standards.

Stakeholders and their roles: The key stakeholders and their role in meeting the challenges included the public and private sectors, NGOs and farmer organisations include:

- MoA and HCDA are responsible for policymaking, and the development of industry growth strategies with HCDA also providing exporters' licenses
- KARI and the public universities spearhead most of the research on horticultural crops including: production, protection, processing and marketing
- MoA, HCDA, Fresh Produce Exporters Association of Kenya (FPEAK) and some private organisations provide extension services with farmers being trained on sanitary and phytosanitary issues, worker welfare and social responsibilities, and the safe use of pesticides
- Production and marketing financed privately, with *Kilimo Biashara* (Farming as a Business), a new government initiative now in place, but so far only financing potato production
- Meteorological services include weather forecasting, although many farmers are yet to identify with this
- Pest Control Products Board (PCPB) licensing and registering all pest control products thus ensuring safe use of approved pesticides
- Inputs privately purchased or provided on credit by the exporting companies that contract the farmers
- Some seed is imported while some is produced locally. The seed sector has a number of reputable companies, e.g., Simlaw Seeds, East African Seed, Western Seed, Syngenta, Highlands, Monsanto and Amiran. Smallholders also produce their own seed, especially for indigenous vegetables
- Contracting firms and middlemen purchase fresh produce from the farmers. GLOBAL GAP standards apply

- Some horticultural products are processed before export. This is the fourth most important product group, after flowers, vegetables and fruit
- Private arrangements for financing ensure compliance with GAP
- Transport arrangements are contracted privately, and sometimes involve exporting companies
- Insurance arrangements are provided privately where applicable
- Stakeholders provide support for indigenous vegetable production, seed production, and vegetable drying
- FPEAK is a premier association of growers, exporters and service providers; it is a focal and coordination point for the horticulture industry, and provides technical and marketing information and training, acts as an information centre, and also runs active lobbying and advocacy programes to enhance the sector's competiveness
- Kenya Flower Council (KFC) promotes specific codes of practice
- Farmer organisations support production and/or marketing, and represent producer groups at various levels.

Interventions. The horticulture sector continues to receive support from numerous stakeholders. MoA, HCDA, growers and exporters provide technical and advisory services, ensuring compliance with GAP standards. These include standards for food safety, environmental protection, occupational health safety and welfare, and animal welfare. Between 2003 and 2004 when the GAP scheme was introduced, the MoA and HCDA with financial support from the Japanese International Cooperation Agency (JICA) trained farmers on good agricultural practices that ensured ongoing preferential access to European Union (EU) markets. They also promoted value addition through postharvest processing. Both the Kenya Industrial Research and Development Institute (KIRDI) and the Jomo Kenyatta University of Agriculture and Technology (JKUAT) have developed solar driers for fruits and vegetables.

Farmers were encouraged to form groups to reap the benefits from training and working together. The group approach proved advantageous for certifying bodies unable to deal with many individual producers.

At the same time several other networks and projects have supported the sector since introduction of GAP. These include the Smallholder Horticulture Marketing Project (SHoMAP), Smallholder Horticulture Development Project (SHDP) and Smallholder Horticulture Empowerment and Promotion Unit Project (SHEPUP). These projects focused on smallholder infrastructure support, not necessarily addressing GAP certification requirements. Donors that have supported the horticultural production include JICA – supporting SHEPUP, International Fund for Agricultural Development (IFAD) – supporting SHoMAP, African Development Bank (ADB) – supporting SHDP, USAID – supporting the Kenya Horticultural Competitiveness Project (KHCP), and Swedish International Development Agency (SIDA) – supporting training and extension.

Success has been based on interrelated policy, institutional, infrastructure and technological innovations including:

- Policy: A National Horticulture Policy final draft (awaiting Cabinet approval) provides a comprehensive framework for production, support services, trade and value addition, infrastructure, legal, regulatory and institutional framework, cross-cutting issues and industry sustainability. Before this, the HCDA was directing the strategies for growth and development of the sector
- Institution: The MoA: provides policy, regulation and operational direction; Other government ministries which include Water and Irrigation, Health, Environment and Mineral Resources, Local Government, Trade, Industry and Regional Development are represented in the ad hoc Horticulture Task Force: their activities directly impact on the growth of the horticulture industry; Others include:
  - » HCDA: facilitates the development, promotion, coordination and regulation of the horticulture industry in Kenya
  - » KEPHIS: regulates plant health issues relating to phytosanitary and seed matters
  - » KARI: scientific research
  - » PCPB: regulates the import, export, manufacturing, distribution and use of pesticides
  - » Kenya Bureau of Standards (KEBS): promotes of standardisation in commerce and industry
  - » KIRDI: Research and development
  - » Export Promotion Council (EPC): identification of and intervention in constraints facing exporters and producers of export goods and services
  - » National Environmental Management Authority (NEMA): deals with environmental impact issues
  - » Universities and colleges of agriculture: research, and development of human capacity
  - » FPEAK, (FPEAK, 2011): Lobbying, information and marketing support; promotion of members' compliance with international standards
  - » GLOBAL GAP certification bodies: certification for compliance
  - » KFC: safe production of cut flowers in Kenya while protecting the natural environment and promoting the welfare of all farm staff
  - » Agrochemical Association of Kenya (AAK): includes manufacturers, formulators, re-packers, importers, distributors, farmers, and users of pest control products, whose primary objective is to promote safe and effective use of pesticide chemicals.
- Infrastructure: HCDA provided 47 pre-cooling vehicles and pre-cooling facilities at farm level in seven major producing areas of Kibwezi, Limuru, Machakos, Meru, Mwea, Sagana, and Yatta, with of 15 metric tons capacity in each facility. The main cooling infrastructure is a cold room in Nairobi, with a capacity of 100 metric tons
- Technologies: Production technologies have evolved that are compliant with EUREP GAP and GLOBAL GAP certification, requiring sanitary and phyto-sanitary compliance, safe use of pesticides, and promotion of worker welfare and social responsibility.

Achievements. A recent survey in Kenya, Uganda and Zambia reported general satisfaction with GAP standards, the greatest benefit being preferential market access. This provided financial benefits including credit, trade credit, quality inputs, and non-financial benefits relating to quality produce, improved field hygiene, increased knowledge of pesticide use and improved product management.

In Kenya participants include both multinational and local companies, large and smallholder producers with production and marketing in the hands of the private sector. HCDA has registered 1,338 fresh produce exporters, although only 258 are currently actively involved in production and export. Among these, nine started as small-scale contracted producers but are now promising exporters, also engaging other producers. By mid-2010 there were 2569 GLOBAL GAP certified farms (GDLN *et al*., 2010), and many out-growers now estimated at over 20,000 (Mwangi, 2009). It must, however, be noted that the number of farmers in the industry, especially for vegetables varies tremendously over seasons.

HCDA data (HCDA, 2010) show that in earlier years, specifically 2008, the country exported over 193 million kilograms of fresh produce worth about Ksh 58 billion. However this dropped to 147 million kilograms worth about Ksh 40 billion in 2010, attributed largely to adverse weather conditions. Notwithstanding this setback, the industry remains a principal foreign exchange earner.

Emerging challenges. Unresolved or emerging challenges include:

- High freight charges, double those paid by exporters in South Africa
- High cost of production inputs. The cost of GAP compliance remains a major constraint especially for smallholder farmers
- Rural infrastructure considering the need for fast transport of fresh produce to its destinations
- Competition from exporters in North Africa and South America, whose costs are relatively lower
- Production under rainfed conditions without irrigation and poor rainfall was responsible for the drop in vegetable exports from 82,000 tons in 2008 to 72,000 tons in 2009 (HCDA, 2010)
- There is an increasing trend for vertical integration of production, processing, and packaging, limiting smallholder opportunity. Large-scale exporters who are able to manage the vertical integration are therefore replacing small-scale producers who have dominated the market for years
- It is unknown what percentage of the consumer price primary producers receive and contracted farmers do not know what exporters are paid. The apparent information asymmetry is a concern for many small-scale producers.

Lessons learned for scaling up. Positive lessons include firstly the constructive interaction of the many stakeholders supporting the industry, with Kenya benefiting from foreign exchange contribution of export horticulture, and secondly a group approach for engaging small-scale producers in the export market has been brought significant benefits of scale especially in GAP compliance.

Lessons that militate against scaling up include:

- A lack of small-scale producer knowledge on varieties grown and chemicals used; simply carrying out instructions militates against increased industry efficiencies. Many small-scale producers have consequently opted out of export production
- Problems associated with static or falling prices for export vegetables, set against increasing costs of GAP compliance together with fluctuations in the local currency
- The need for irrigation infrastructure and equipment to ensure quantity and quality product reliability. These are additional costs for the often resource-poor smallholder farmers
- A need to assess the costs and benefits of the many organisations, networks and projects that support the horticulture sector. The country notes the significant foreign exchange contribution, but the costs for the many collaborators are not spelled out anywhere, even if they involve grants.

Rwanda's climbing beans

Before the 1980s farmers grew many local landraces of both bush and climbing beans. Research interest in improving bean varieties grew in the mid 1980s, with an initiative from the International Center for Tropical Agriculture (CIAT) and *Instutut des sciences agronomique du Rwanda* (ISAR). In January 2010, ISAR and CIAT released 15 improved climbing, bush and snap bean varieties. This was after some 10 years of intensive participatory breeding between researchers and farmers, most of whom were women. Over 20 improved varieties have now been released and are being adopted by households across different farm sizes, gender and socio-economic groups. The yields of the new climbing beans are about three times those of bush bean landraces and have generated an additional US$ 8–15 million per year for Rwanda. The advantages of climbing beans include their high yield potential; production stability and adaptability to intensification, especially relevant as population pressure is reducing arable land plot sizes. Climbing beans are acknowledged to grow easily. They contribute to food security with many nutritional benefits, being high in protein and iron and zinc, cholesterol-free and rich in dietary fibre. These health attributes contribute to the beans' acceptability by farmers, although a number of challenges remain. These include the need to ensure production costs remain affordable, and the shortage of stakes for supporting the climbers.

The introduction of District Stakeholder Innovation Platforms as part of a FARA initiative to seek opportunities for value-chain improvements appears promising,

Initial context. Beans have been the protein staple of Rwanda for a long time; with Rwanda having the highest per capita bean consumption in the world at 60 kilograms per annum (Mcharo and Katafiire, 2009). The people of Rwanda have typically grown beans as intercrops with banana, cassava, maize or sweet potato, often because of their small land parcels. Although beans occupy on average 40 percent of the total land cultivated by a household, the extent of the bean deficit remains far-reaching and severe (CIAT, 2008).

Initial challenges. The introduction of improved varieties of climbing beans in the 1980s faced a serious disease, root rot caused by *Fusarium* spp, resulting in many farmers abandoning the crop. Unfortunately improved varieties that are early maturing could only be grown in relatively high-potential moist highland areas.

Innovation triggers. Diminishing farm sizes, increasing population and root rot in the first generation of improved climbing beans, resulted in the introduction of a new regional bean improvement programme in 2000. This included a participatory plant breeding activities involving both researchers and farmers and led to the development of a number of new varieties being released, some which were specifically bred for drier parts of the country (Moore, 2010).

Interventions and the roles of different stakeholders. The initial development of climbing beans was initiated by CIAT and ISAR, through support from the Swiss Development Cooperation (SDC). Other institutions that have been involved include *Réseau pour l'amélioration du haricot* (Phaseolae) *dans la région de l'Afrique Centrale* (RESAPAC), Canadian International Development Agency (CIDA), The Rockefeller Foundation and more recently the Bill and Melinda Gates Foundation (BMGF). These partners have been involved in providing seed services, specific development projects, and extension work and farmer experiments.

Other donors, collaborators and partners that have supported ISAR's bean research and development in Rwanda include:

- Government of Rwanda
- USAID
- Pan Africa Bean Research Alliance (PABRA)
- East and Central Africa Research Network (ECABREN), on improving productivity and acceptability of bean varieties
- ASARECA
- The Rockefeller Foundation
- Alliance for a Green Revolution in Africa (AGRA)
- Pulse Collaborative Research Support Program/Michigan State University (PULSE CRSP/MSU)
- *Bundesministerium für Wirtschaftliche Zusammenarbeit* (BMZ) programme in Kenya, Malawi and Rwanda
- East African Plant Genetic Resources Network (EAPGREN)
- Local and international NGOs: Rwanda Development Organization (RDO), Adventist Development and Relief Agency (ADRA), World Vision (WV), Catholic Relief Service (CRS), CARE, CARITAS, *Développement de l'élevage dans la Région du Nord* (DERN)
- Rwanda Agricultural Development Authority (RADA)
- National University of Rwanda (NUR)
- Umutara Polytechnic University (UP)
- Farmers and farmer organisations and cooperatives
- FARA

Activities contributing to the latest new releases form part of Rwanda's Crop Intensification Program, the Economic Development and Poverty Reduction Strategy (EDPRS), and Vision 2020 Program for socio-economic and food security transformation (ISAR, 2009). In addition the agriculture sector's strategic plan supports both the development of roads to improve market access and farmer access to good seed, fertilisers and credit.

A new concept, Innovation Platforms (IPs) supported by FARA was initiated with farmers in a number of districts at the end of 2008. Each IP comprises farmers, finance organisations, input suppliers, extension staff, research staff and the private sector involved in both seed multiplication and marketing beans. Members of the IP consult on identifying opportunities for value chain improvement. RADA and ISAR together trained farmers in commercial seed production. According to farmers interviewed at an IP in Musanze District in February 2011, it is still too early to assess impact although they do see a bright future. For instance, some IP farmer members reported obtaining credit more readily from finance organisations. Other IP farmer members reported that they are now producing seed that commands high prices resulting in higher incomes.

Achievements. Over 20 improved climbing bean varieties have been released and been adopted by households across different farm sizes, gender and socio-economic groups. CIAT (2008) report over 94 percent adoption of new varieties in major bean-growing areas. Yields are typically three times those of bush beans, being 3–4 tonnes per hectare compared to 1 tonne per hectare for bush beans and have generated an additional US$ 8–15 million annually to the people of Rwanda. In January 2010, ISAR and CIAT released 15 new climbing, bush and snap bean varieties after 10 years of participatory breeding involving ISAR researchers and farmers, the majority of who were women

Three different successful aspects of the new bean varieties were identified by ISAR: improved taste, higher productivity, and market-preferred attributes among both farmers and consumers (ISAR, 2010). In addition, development of heat-tolerant varieties has benefitted not only Rwanda but also neighbouring countries. Yields for beans grown for both grain and seed are higher and farmers who venture into commercial seed production receive higher incomes than those who produce beans for food.

The role of women in the breeding and development process has been particularly noted. Women are quite precise about which variety to grow, in which soil type, with which intercrop and when in the season, along with which variety to cook for home consumption or sell in local markets.

Emerging or unresolved challenges. Despite remarkable adoption of new bean varieties and increased production several challenges still exist (Mcharo and Katafiire, 2009). These include: the scarcity of cultivable land with over 70 percent of rural households not growing sufficient beans for their home consumption, large yield losses still being experienced as a result of:

- Pests, diseases, drought and declining soil fertility
- Slow dissemination of new resistant varieties especially in the drier parts of the country

- Concerns about high labour requirements and input costs including a lack of staking materials for climbing beans (sticks are the strongest stakes but are susceptible to termite damage and have many alternative uses)
- Poor market information and inadequate extension services.

Lessons learned for scaling up. The IPs supported by FARA offer an appropriate means of integrating the concerns of stakeholders and identifying opportunities for value chain improvement at both local and district levels.

Uganda's dairy industry

The development of the dairy industry in Uganda contrasts with that of Kenya's dairy industry in that organised milk marketing and processing only began in Uganda during the 1960s, considerably later than in Kenya. It grew until the unfortunate civil crisis of the 1970s. However, the support of many stakeholders over the past two decades has allowed the industry's recovery from near collapse. The Dairy Master Plan of 1993 opened avenues for new development, which involved a key policy change from controlled to liberalised markets that encouraged increased production. Today, production, consumption, processing, trading and related services are on the increase, although a number of challenges remain the opportunity for expansion exists.

Initial context. Despite sharing a common colonial experience with Kenya, Uganda did not start commercial milk production until the late 1950s. Organised milk marketing and processing in Uganda began in the 1960s, with imports of fresh milk from Kenya (DDA, 2009). During this period the Government expanded the number of high-yielding cattle through imports mainly from Kenya but also from Europe, USA and Canada and by using local crossing to build disease resistance into herds. As a result production expanded and milk imports from Kenya fell steadily during the 1960s. Although the country already had an organised milk collection and distribution system developed by a private company, Uganda Milk Processing Limited, in 1967 Government sought to further the developing dairy industry by establishing a legal monopoly, a new parastatal, the Dairy Corporation (DC), by Act of Parliament. The Act charged the new corporation with responsibilities similar to those of the Kenya Cooperative Creameries in Kenya (KCC), including the regulation of production, marketing, pricing, processing, manufacturing and distribution of finished dairy products. By 1972 DC had established some 90 milk-collection centres across Uganda's major producing areas. However growth in the dairy industry collapsed during the civil crisis that ravaged the country form 1971 to 1986. Dairy production suffered from rustling, a decline in veterinary disease control and resurgence of animal trypanosomiasis. Public research and extension and marketing also collapsed, forcing farmers into subsistence farming.

When a new Government took over in 1986, it faced the challenge of designing a much-needed recovery programme. This identified the rehabilitation of the dairy industry as a national priority. Unlike previous efforts, which had focused on government intervention and control, the new programmes recognised the key role of the private sector in rebuilding the economy. The Government's rehabilitation effort centred on the restoration of production on dairy farms, improvement of milk collection, processing and marketing, and strengthening dairy extension services (Ngigi *et al.*, 2010).

Initial challenges. Studies confirmed the potential for dairying but the main challenge was in the design and implementation of initiatives to enable dairy farmers to exploit that potential. Priorities lay in measures to improve pastures and pasture management, improve dairy breeds, and breeding programmes to upgrade the productivity of indigenous cattle. At the same time the need to develop smallholder dairy technologies for milk processing and sale was recognised. Although early rehabilitation effort was successful in increasing production it was challenged by poor marketing, with farmers reporting discarding milk because no market existed.

Innovation triggers. In 1993, the Government, with support from the Danish International Development Agency (DANIDA), prepared a Dairy Master Plan, whose key recommendations included liberalisation of milk marketing and the creation of a dairy board to oversee the liberalised industry. Consequently, the Dairy Development Authority (DDA) was created by Act of Parliament and became operational in 2000, with the DC concentrating on milk processing and distribution. DDA was charged with regulating and developing the dairy industry and has steered it for the past decade to its current position. DANIDA supported the rehabilitation of processing infrastructure, including a processing plant in Kampala, collecting facilities in Mbarara, and the Entebbe Dairy Training School and Plant.

Interventions and the roles of different stakeholders. The Uganda dairy industry has enjoyed participation and intervention by many stakeholders, including Government, NGOs, farmer groups, traders, processors, and donors. The key stakeholder DDA was formed with representation from many of these stakeholders including dairy farmers, dairy co-operatives, dairy processing companies, the Uganda Veterinary Association, dairy traders, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and Ministry of Finance Planning and Economic Development (MFP&ED).

MAAIF is responsible for policy regulation, extension services to guide production management, and disease control. Other key government stakeholders include the Uganda Export Promotion Board, which identifies markets and supports farmer organisations, the Uganda National Bureau of Standards, which formulates and promotes quality control systems, Makerere University that through its academic and research programs, participates in various genetic, health, production and marketing research in the dairy industry, and the National Agricultural Research Organisation (NARO) with a research and development mandate. Other stakeholders include the Uganda National Dairy Farmers' Association, the Uganda National Dairy Traders' Association, and Uganda Dairy Processors' Association, responsible for the growing commercialisation of the industry. All have been involved in discussions to formulate a pro-poor livestock development policy in Uganda.

The United Nations Development Programme/Food and Agriculture Organization of the United Nations (UNDP/FAO) provided technical assistance in dairy development with a project supporting the rehabilitation programme from 1987 to 1992, using loan funds provided by the African Development Bank (ADB). The World Food Programme (WFP) donated dry skimmed milk and butter oil, which the DC reconstituted and sold to meet growing demand. Funds raised were used for the rehabilitation programme.

Land O'Lakes Inc. is a private sector dairy development programme funded by the United States Department of Agriculture (USDA) that started operating in Uganda in 1994, and was charged with forming cooperatives for milk collection and marketing. A number of primary dairy cooperative societies were formed, which combined to form seven district-level cooperative unions. By 2006 the district unions had formed an apex union, the Uganda Cranes Creameries Cooperative Union (UCCCU).

In 2008 the East African Dairy Development Project (EADDP), a 4-year poverty-reduction project funded by BMGF, focused on smallholder farmers building on early successes. By the end of 2012, it aims that some 45,000 farm households will have lifted themselves out of poverty. EADDP is implemented by Heifer Project International (HPI, 2008) in association with TechnoServe International, supporting business orientation (TechnoServe, Uganda, 2008), African Breeder Services – total cattle management, ICRAF – environment and cattle feed, and ILRI – research. Project activities support on-farm milk production, marketing, accessing production inputs through business delivery services, and reducing spoilage losses. HPI's roles include farmer capacity building, breeding using AI and quality semen, environmental protection, heifer distribution, bio-gas and chilling plant and mini milk cooler installation, enterprise development, dissemination of information on integrated best practices, education, advocacy, networking and collaboration with other stakeholders. Women in particular are being targeted through provision of heifers and training.

In 2009, stakeholders formed an IP involving: government extension, researchers, NGOs, farmers, traders, processors and consumers of milk to identify constraints in enhancing production, processing and consumption along the milk value chain.

Achievements. Uganda's dairy sector comprises both informal and formal actors along the value chain with nearly 400 coolers being installed in rural areas where primary transportation of milk is undertaken on foot, by bicycle and sometimes motor-vehicle. Some of the chilled milk is sold unprocessed while the rest is transported to processing plants in insulated milk tankers.

There are some 1.2 million smallholders and around 8000 larger farmers producing milk using both intensive and extensive systems. Intensive dairying is located primarily in the Southwestern and Central areas, which contribute about 49 percent of national milk production.

Although annual milk consumption in Uganda remains relatively low at 25–50 litres per person, only about 40 percent of production is consumed by producing households. The rest is sold through both formal and informal channels. The informal sector accounts for 80–90 percent of marketed milk and the formal sector, which processes and packages before selling, accounts for the remaining 10–20 percent. By 2009, there were 12 registered milk-processing plants and

mini dairies in the country selling pasteurised milk, ultra long life milk, yoghurts, ice cream, butter and ghee. Producers earn more from informal than from formal markets (DDA, 2009).

In February 2010 the industry launched the FAO Dairy Project with the purpose of updating the National Dairy Strategy as well capacity building among the stakeholder associations and unions (Dairy Uganda Forum, 2010)

Emerging or unresolved challenges. Despite the success of Uganda's dairy industry, several production and marketing challenges remain (Wozemba and Nsanja, 2008). These include:

- Inconsistent delivery of inputs and services, weak linkages between farmers, processors and milk-collection centres, weak public–private dialogue and little information sharing along the value chain. There is a tendency for farmers to be involved not only in primary production, but also in transport and processing
- Seasonal production fluctuations due to lack of feed especially during dry spells. Farmers address this through use of locally available fodder such as banana peel, brewers' by-products and leaves of some common trees. Further research is however required to determine such fodder's suitability and the actual balanced feed requirements
- Marketing of surplus milk in high-potential areas in the West and increasing production in the Eastern and Northern areas of the country through improving genetic potential, improved feeding, and rationalising the use of milk animals for draught work
- Ensuring that smallholder farmers can afford feed and veterinary and AI services
- Milk handling by producers, transporters and traders although low-cost and convenient often occurs in unsuitable plastic or metal containers, adversely effecting quality. Challenges include the high cost of milk cans, tankers, and coolers, lack of calibration for tankers used to transport milk to official channels, and rejection of milk on quality grounds by processors after delivery
- With an estimated 80–90 percent of marketed milk being unprocessed through the informal sector, issues of quality assurance remain. As in Kenya producers and consumers often favour informal markets. This provides opportunity for low-cost processing and value addition through traditional dairy products.

Lessons learned for scaling up. A key lesson is the need for ongoing discussions and coordination efforts by stakeholders along the value chain. This includes smallholder farmers and traders, development agencies, and policymakers. Although the dairy industry and its supporting services were liberalised, there is a need to coordinate business development services, involving farmer organisations, while avoiding direct subsidies that are known to stifle markets.

Botswana's beef sector

The beef and cattle industry has played a key role in Botswana's economic well being, export diversification and poverty alleviation. Yet until recently the sector faced a serious crisis with declining production, decreasing exports and losses experienced by cattle farmers. Change was initiated through stakeholder discussions on policy changes resulting in export-parity cattle prices and support to convert from the marketing of older cattle to long-weaner and feedlot production systems. At the same time Government negotiated successfully for tariff free entry of livestock products to EU markets. The Botswana Meat Commission (BMC) restructured its operations: reducing its cost base and improving throughput and processing efficiencies. This involved directly purchasing cattle from producers, with a focus on younger stock, which are fattened for 90 days in contractor-owned feedlots prior to slaughter. These actions resulted in increases in: producer cattle prices, herd take-off, incomes to farmers and land values. A record number of cattle were slaughtered in 2010 and abattoir use is now approaching capacity. The national herd demographic has become younger, as farmers realise they are able to increase their profits by selling younger animals.

Initial context. In Botswana, the bovine meat industry is one of three main sectors that are important to the economy, the others being diamond mining and tourism. The cattle industry is by far the largest contributor to agricultural production contributing in excess of US$70 million in 2008 (FAOSTAT, 2010). Prior to development of the diamond sector bovine meat was the mainstay of the economy. The industry has been key to Botswana's economic wellbeing in rural areas, export diversification and poverty alleviation, with 90 percent of the national herd being owned by smallholder communal farmers typically owing between 20 and 50 head. Farmers rarely sell female animals, only oxen, traditionally those over 3 years of age.

Challenges. Until recently the beef sector faced a serious crisis, with declining production, decreasing exports and losses experienced by both cattle farmers and the parastatal, BMC. It had been argued that the industry was heavily protected, limiting the scope for trade, competition and the price incentives needed to bring about the necessary adjustments.

Innovation triggers. Change was initiated through the preparation of a carefully researched policy paper (Jefferis, 2005) prepared on behalf of the Botswana Cattle Producers Association

(BCPA), an association representing and promoting cattle producers' economic interests. The paper proposed policy alternatives for revitalising the cattle industry by improving cattle prices, providing incentives for intensifying cattle production and increasing the national cattle off-take. This resulted in broad debate and allowed policymakers to consider the policy options that could improve the efficiency of the sector.

Interventions and stakeholder roles. Key stakeholders in the livestock sector are: the Ministry of Agriculture (MoA), responsible for policy regulation and through its extension and veterinary services, livestock management, health and disease control, the BMC and 60,000 cattle producers represented, since 2006, by the BCPA, and prior to this a number of regional associations. Stakeholder deliberations on the BCPA policy paper resulted in Government and the BMC accepting export-parity pricing and support to convert from the marketing of older cattle to long-weaner and feedlot production systems. At the same time Government negotiated successfully for tariff free entry of livestock products to EU markets. These moves greatly expanded the demand for cattle, although supply remained a problem. Consequently, the BMC agreed a new strategy, which is now being implemented. The strategy includes: a restructuring of operations to reduce BMC's cost base, improving throughput, and processing efficiencies aimed at delivering the best prices for BMC products at least cost and to ensure BMC's long-term sustainability. Restructuring involves the direct purchase of cattle from producers, with a focus on younger cattle, which are then fattened for 90 days in contractor-owned feedlots prior to slaughter (BMC, 2009).

Achievements. Stakeholder interactions have resulted in:

- An increase in cattle prices, which has in turn led to increased herd take-off, increased incomes for farmers and an increase in land values. With 90 percent of cattle being sourced from smallholder farmers this is playing an important role in poverty alleviation
- A record throughput of cattle being slaughtered in 2010 with abattoir use now approaching capacity
- The national herd demographic becoming younger, as farmers realise they are able to increase their profits by selling younger animals.

At the same time opportunities are now occurring to build on these successes by the application of new research knowledge – the full extent of which is yet to occur. Innovative products, including formulated cattle feed mixed using efficient livestock feed mixers are being adopted, as is eco-friendly pest control for flies.

Emerging or unresolved challenges. Research has an important and ongoing role in improving cattle management, health and disease control and ensuring the most cost-efficient livestock feeding regimes are used in line with animal welfare, environmental and human health protection.

Lessons learned. Understanding the role the private sector plays in facilitating change at local, regional, and national government levels is important when considering changes to the enabling environment for value chains. It is essential that the private sector is able to speak with an informed and unified voice and is able to engage with Government.

In this case, the Government and BMC addressed a startling contraction of the bovine cattle sector through public–private dialogue, organising the BCPA and soliciting its help in designing a revitalisation strategy. The dialogue is ongoing and has the potential to catalyse further change within the sector. It demonstrates how change is occurring after private-sector participants in the bovine red meat value chain organised to effectively engage government for mutually beneficial changes.

Malawi, building public-private partnerships in the cotton sector

Cotton is a strategic crop in Malawi with a value chain that includes nearly 200,000 cotton growers, ginning, spinning, textile and garment manufacture and oil extraction industries with both domestic and export markets. The cotton sector has faced a number of challenges among which are: low productivity, weak institutional structures, low investment in both production and value addition, and the lack of a cohesive national strategy to guide the sector This has given rise to conflicting interests between stakeholders to the detriment of all actors in the industry.

A number of initiatives based on stakeholder interactions culminated in the formation of a Cotton Development Trust (CDT) comprising all cotton value chain actors. Through the formation of four thematic groups concerned with improving research, extension and farmer productivity, marketing and pricing, policy and regulation, and financing concerns, CDT has achieved remarkable progress in a short time. This includes: acceptance and recognition of CDT by all stakeholders including Government, contributing to the review of the Cotton Act that will provide the regulatory framework for the cotton sector, initiation of a 5-year strategic plan to guide cotton development, support for establishing the National Cotton Farmers' Association of Malawi (COFAM) to represent all cotton farmers, advocacy for improvement of certified seed supplies and reduction in the use of recycled seed, establishment of cotton test and demonstration plots linked to research undertaken by Government's Makoka Research Station, establishment of a consultative platform for negotiation of seed cotton farm-gate prices and participation in a wider regional cotton development initiative including Malawi, Mozambique, Zambia and Zimbabwe.

Brokering the networks and alliances in private–public partnerships is a critical role in ensuring knowledge is used to enable innovation. This brokerage role is an indispensable and an unavoidable cost. In this case study an NGO, the African Institute of Corporate Citizenship (AICC) played this role with support from DFID and the Norwegian Agency for Development Cooperation (NORAD).

Initial context. Cotton is a key component of Malawi's agricultural sector, ranking fourth as a foreign exchange earner for the country after tobacco, tea, and sugar. The crop was identified by the Government as having the potential to improve the livelihoods of some 200,000 rural households through the production of more than 100,000 tonnes of seed cotton provided productivity increases and prices stabilise or increase. It is the most important cash crop for

smallholder farmers in the Shire Valley, along Lake Malawi shore areas and dry districts. Linkages and added value of cotton products include cotton textiles and garments, oil extraction from cotton seed, production of animal feed using cotton seedcake and the manufacture of such finished goods as clothes, blankets, twine and surgical products. An additional 700 000 people outside agriculture are involved.

Initial challenges. Problems faced by the sector have included well below potential yields, poorly resourced extension, use of recycled cotton seed, poor organisation of cotton farmers, low prices – with disagreements between farmers and ginners on prices often causing conflict with Government who set minimum prices. These have resulted in misunderstandings and distrust between stakeholders, with the sector performing increasingly poorly and major international stakeholders disinvesting.

Innovation triggers. Recognising a need to strengthen public–private partnerships across a number of sectors including coffee, cotton, sugar, and tea, AICC Malawi initiated a process of consultation to establish common ground and build links between public and private sectors with initial support from *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ) This included initiatives to build trust and partnerships between the private sector, donors, government and civil society to promote agri-business models that would contribute to achieving the Millennium Development Goals in Malawi. To support the initiatives in the cotton industry, RIU in Malawi provided additional support, facilitating increased dialogue between stakeholders, culminating in a workshop during 2008 to identify the challenges and opportunities facing the cotton sector. As a result stakeholders formed the CDT comprised of all the value-chain actors with AICC appointed as a secretariat to support CDT activities with funding from RIU-Malawi, NORAD and the stakeholders themselves.

CDT aims to create a competitive and sustainable integrated cotton sector contributing to national economic growth that benefits all stakeholders through a vibrant cotton industry supplying increased volumes of high-quality cotton and related value-added products to domestic and international markets through the collaborative efforts of all players in the value chain.

Stakeholder interactions and interventions. CDT provided a forum of all the key players along the cotton value chain, including farmers, farmer organisations, input suppliers, ginners, spinners, textile manufacturers, garment manufacturers, oil manufacturers, financial institutions and Government departments. CDT has a Board of Trustees comprising a Chairperson, Chairpersons from four thematic groups, the Permanent Secretary for Agriculture in the Ministry of Agriculture and Food Security (MoA&FS), the Executive Director of the Farmers' Union of Malawi (FUM) and three others from the public and private sectors. The four thematic groups comprise:

Research, extension and production. Responsible for promoting research to recommend specific varieties for specific areas, improve farmer access to certified seed and other improved management practices, ensure an effective seed multiplication system and enhance technology dissemination.

Marketing and pricing. Responsible for analysing all aspects of cotton marketing, exploring new marketing arrangements, providing information to partners and creating a platform for

price negotiation between cotton sector stakeholders and Government through development of an agreed pricing model

Policy and regulation. Responsible for issues that affect cotton policy and its impact on stakeholders along the value chain. This group endeavours to play an active role in providing input on policy issues including a review of the Cotton Act, establishment of a Cotton Council, establishing a farmer registration system, investigating contract farming and cotton marketing, and exploring the introduction of a cotton levy to fund cotton development activities.

Credit and financing. Seeks to establish a forum for dealing with financing activities and opportunities along the cotton value chain, including production, processing and other value addition.

Achievements. CDT has now been accepted and recognised by all stakeholders including Government on all issues affecting the cotton industry. Specific achievements include:

- Initiation of a 5-year Strategic Plan to guide cotton development, contributing to a review of the Cotton Act, which will provide the regulatory framework for the cotton sector
- Support in establishing COFAM to represent all cotton farmers
- Providing a consultative platform for negotiation of cotton seed farm-gate prices
- The establishment of an advocacy group to oversee production, distribution and marketing of certified cotton seed to replace recycled seed
- Providing cotton testing and demonstration plots in all cotton-growing areas to encourage farmer testing of new technologies linked to research undertaken by Government's Makoka Research Station
- Participation in a wider regional cotton development initiative including Malawi, Mozambique, Zambia and Zimbabwe.

After a number of years when cotton prices declined to very low levels, cotton prices are now at an all-time high and the sector is in a strong position to capitalise on the achievements made by the CDT so that all stakeholders benefit. This is likely to have a major benefit on Malawi's smallholder cotton producers in terms of increased profitability.

Unresolved and new challenges. Although much has been achieved a number of challenges remain including: funding for finalising the 5-year strategy, continuation of research and demonstration plots linked to agri-dealer networks, ensuring that new technologies are developed and promoted, support for COFAM to assist in farmer empowerment and registration of all cotton growers, promotion of investment in downstream value addition and importantly the establishment of a cotton levy to fund these activities.

Lessons learned. Brokering networks and alliances in private–public partnerships is a critical role in ensuring knowledge is put into use and innovation in agriculture is enabled. This brokerage role is an indispensable and unavoidable cost. In this case AICC played this role with support from DFID–RIU and NORAD. However in many case donors and investors are unwilling to fund this crucial role. Unfortunately the capacities and competencies required for this role are scarce in both the public and private sectors.

Malawi, overcoming market challenges – the case of groundnuts

Groundnuts in Malawi are an important crop whose productivity declined after market liberalisation due to low prices and the requirements of high-value export markets, which were subject to maximum allowable levels of aflatoxins. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), National Association of Smallholder Farmers (NASFAM) and Government services and FairTrade with support from USAID combined forces to introduce improved groundnut production practices to reduce aflatoxin contamination, develop a system of grades and standards, and establish a traceability system to monitor aflatoxins during production so that high-value European markets could be accessed. At the same time groundnut producers of a NASFAM member Association were able to benefit from FairTrade labelling of their product that has resulted in a premium being paid over and above the market price. This has benefitted the communities from which the groundnuts were purchased by funding community development projects.

New knowledge from research is only one component required to encourage innovation in agriculture. Addressing other constraints, including access to information, appropriate inputs and management practices, credit and markets supported by appropriate policy and institutional environments can create an effective demand for appropriate research products. This includes new and improved crop varieties, better ways of managing pests and diseases, and more effective management practices

Initial context. Groundnuts in Malawi are an important crop often grown in association with maize. Groundnuts provide a nutritious source of food, an ability to fix atmospheric nitrogen and enhance soil fertility, and, when sold, a cash income. Although important, groundnut production declined during the 1990s because of a failure to participate in the major European markets due to an inability to meet the required grades and standards. This decline was attributed to the liberalisation of marketing in Malawi that removed the monopoly of the Agricultural Development and Marketing Corporation (ADMARC), the major outlet for all produce including groundnuts from farmers at that time. As a result, famers increasingly sold their crop to traders and vendors, systems of grading disappeared and prices declined.

Initial challenge. Groundnuts have been increasingly subject to stringent maximum allowable levels of aflatoxin contamination. Aflatoxins are toxic metabolites, which are known to have carcinogenic effects. They are produced by two strains of fungus, which occur naturally in the soil and infect groundnut pods during pod development and through poor postharvest handling. This contamination has prevented producers from many African countries accessing the high-value markets in the EU.

Innovation triggers. ICRISAT and NASFAM (see Box 4) supported by USAID, Government extension services and Twin Trading have worked closely together as partners since 2003 in assisting farmers to access high-value FairTrade export markets in the EU. It was realised that reducing aflatoxin levels during production and being able to identify aflatoxin contamination of a groundnut consignment at source reduces not only the risk of shipment rejection but also results in maintenance of market share on the international market.

Stakeholder interactions and interventions. The stakeholder partnership combined forces to increase the productivity of groundnuts by providing improved varieties and improving smallholder management practices to increase yields and reduce aflatoxin contamination. This required the development of a system of grades and standards enabling participation in regional and international markets and assistance in standards certification as well as the development of a traceability system so that the areas in which aflatoxins were a problem could be easily identified. Only then could a high-value market in Europe for smallholder-produced groundnuts be accessed. Improving productivity and developing standards certification involved the establishment of on-farm demonstrations to train farmers in improved agronomic practices. Production standards were developed to ensure that farmers follow improved management practices to reduce the incidence of the aflatoxin-causing fungus. This involved ICRISAT training NASFAM and Government extension staff to understand the critical points in the management of aflatoxin during production, harvest and postharvest handling (Siambi *et al.*, 2008). Although farmers often prefer the variety Chalambana, because of its light skin colour, low oil content and large kernel size, which makes shelling easier, it is susceptible to the fungus that causes aflatoxin contamination. Improved varieties are higher yielding and have some resistance to contamination. NASAFM and ICRISAT have worked closely to ensure certified seed of new varieties CG7, Chalambana 2000 and JL24 is accessible by farmers. Unfortunately weather conditions can exacerbate the aflatoxin problem and postharvest handling can be critical in managing aflatoxin levels. ICRISAT was instrumental in developing pyramid structures on which harvested groundnuts are placed, leaves upwards, so that pods dry and rainwater runs off without damaging the pods. These pyramids are now widely used by farmers.

Food safety requirements of the EU have a minimum acceptance level (MAL) of aflatoxin contamination of 4 parts per billion (ppb) that requires a systematic approach to identify and eliminate the sources of contamination. This required the establishment of laboratory facilities to establish a system for quality control for groundnuts purchased by NASFAM. During the early stages 200-g samples were taken from every 50-kg bag of groundnuts purchased. These were labelled to identify the grower and the centre from where it was purchased. The coding, recording and grinding of samples was undertaken by ICRISAT-Malawi and then sent to ICRISAT-India, for aflatoxin contamination measurement. Test results were used for product differentiation and targeting different markets that permitted different MALs. When the traceability system was proved, analysis as undertaken initially by ICRISAT- Malawi, until NASFAM was able to establish its own laboratory with staff trained to measure aflatoxin.

NASFAM Associations are grouped by Market Access Centres, which provide support to members. Clubs sell their produce at designated Market Centres. This allows for traceability as samples are collected from groundnuts purchased by NASFAM and analysed for aflatoxin

Box 4: NASFAM structure

The National Smallholder Farmers Association of Malawi (NASFAM) originated as a USAID-funded project to support and organise tobacco production. Since 1995, NASFAM has promoted diversification away from dependency on maize and tobacco, supporting production of alternative crops including: chillies, groundnuts, rice, soybeans, sunflowers and other crops as and when opportunities occur. NASFAM functions are split between commercial and development activities. Commercial activities include the marketing of inputs to, and produce from farmers. Development activities, which are often donor-funded, include community development and capacity-building services for staff and NASFAM members.

The smallest operational NASFAM unit is the Club comprising 10–15 individual smallholder farmers. Clubs combine to form Action Groups, which are the focus point for extension and dissemination of information and bulking of produce for marketing. Action Groups in turn combine to form Associations of which there are currently 40 across Malawi. These are legally registered entities, member-owned and managed by Farmer Boards. Associations are grouped by geographical location under 14 different Association Management Centres (AMCs), which provide management and operational support to the Associations for production, marketing and community development. Each AMC is supported by NASFAM Regional and Head Offices. This includes support and guidance to members on the organisation and management of small-scale businesses, access to inputs, advice, technical support and training on crop management and agronomic practices, harvesting and postharvest crop management. In addition NASFAM provides marketing support, facilitating the bulking of member's crops to secure access to the most profitable markets for reliable income.

Much of this is undertaken through NASFAM's farmer-to-farmer training programmes, where progressive members are trained to train fellow members on successful and best bet practices including:

- *Seed selection, use of fertiliser and chemicals*
- *Land preparation, planting and crop husbandry, promoting environmentally and sustainable natural resource management (NRM) practices*
- *Provision of crop production estimates for marketing plans*
- *Harvest and postharvest techniques for drying and grading*

Through its network of Associations, NASFAM facilitates the procurement, bulking and transport of members' produce to the point of sale. It works to identify and secure domestic, regional and international markets for its members' produce.

Source: NASFAM, 2011

content. After introduction of the farmer training programmes, results showed 39 percent of the groundnuts were aflatoxin free, 29 percent had levels in the range 1–2 ppb, 20 percent 2–4 ppb and 12 percent over 4 ppb, showing that farmers had started to improve their crop management and postharvesting management practices thus reducing aflatoxin levels. It was also evident that progress varied between areas. This process of testing continued for a number of seasons and showed continuing improvement in reduction of aflatoxin levels with a high proportion meeting export standards. Although aflatoxin levels have shown a gradual decline, weather conditions during maturity and harvest can have significant influence on year-to-year variation. This requires ongoing monitoring so that production standards continue to meet export requirement standards, especially in the face of competition from traders and vendors who do not require the same standards to be met.

Presently when groundnut purchases are delivered to NASFAM's central store, samples are taken for aflatoxin testing at NASFAM's laboratory. International standards require that independently taken samples are analysed by internationally accredited laboratories. At present the Malawi Bureau of Standards (MBS) is not yet accredited, so samples are taken by SGS, an international company that specialises in inspection, testing and certification services. Samples are then sent to laboratories in either Kenya or South Africa.

Having successfully established a system for monitoring quality, NASFAM has worked with FairTrade to use their certification label. To qualify for use of this label, FairTrade analyse the value chain from production to market, and provided producers are receiving a fair price will pay a premium over and above market price. This requires an annual independent audit of governance and accounts to ensure continued use of the label. The Mchinji Area Smallholder Farmers' Association was the first NASFAM Association to have been certified by FairTrade. As a result of satisfying the export market criteria, NASFAM has been able to partner with Twin Trading a UK-based company that each March indicates its annual groundnut requirements. Required supplies are purchased and transported by container to Beira, in Mozambique for shipment to UK. In UK, Twin Trading blanches the groundnuts, a process for roasting and skin removal. A company called Liberation jointly owned by Twin Trading and smallholder farmers in Africa, India and South America undertakes the UK marketing to Sainsburys, Tesco and other supermarkets. Groundnuts from NASAFAM farmers are now widely available in supermarket outlets throughout Europe, and Malawi farmers are major beneficiaries.

Achievements. The partnership has resulted in:

- Increased productivity of groundnuts through providing improved varieties and management practices leading to increased yields and reduced aflatoxin contamination
- Introduction of a system of grades and standards that allow participation in regional and international markets
- Introduction of a traceability system so that the areas where aflatoxins remain a problem can be easily identified
- Development a high-value market for smallholder-produced groundnuts in Europe, from which groundnut producers of Clubs within the Mchinjii Smallholder Farmers' Association have been able to benefit from FairTrade labelling of their product. This has resulted in a premium being paid over and above market prices, which has funded community development projects, thus benefitting the communities from which the groundnuts were purchased.

Key success factors. New knowledge from research is only one component required to encourage innovation in agriculture. Addressing other constraints, including access to information, appropriate inputs and management practices, credit, and markets supported by appropriate policy and institutional environments can create an effective demand for appropriate research products. This includes new and improved crop varieties, better ways of managing pests and diseases, and more effective management practices.

Malawi, Increasing the availability of legume seed

Grain legumes are an important component of Malawi's maize-based farming system and are a cheap source of vegetable protein and vitamins, in addition to their contribution of soil fertility improvement through nitrogen fixation. Despite these benefits grain legume production is characterised by low yields with farmers experiencing serious problems in accessing legume seed as seed companies have focused primarily on maize seed to the detriment of other crops.

The Malawi Government's programme of providing subsidised seed and fertiliser for smallholder famers initially focused on maize but now includes legumes as it was recognised that their inclusion was desirable both from human nutritional and soil fertility perspectives. However, a serious shortage of seed was a major constraint. A DFID-funded programme, Research-Into-Use (RIU)-Malawi was instrumental in promoting an innovation systems approach that facilitated the bringing together of legume seed stakeholders in an IP to identify bottlenecks and opportunities to increase seed availability by helping to broker linkages for the participation of farmers in multiplying breeder and basic seed for certified seed production.

Initial analysis involved looking at the whole seed value chain from new variety approval and release, production of breeders', foundation and certified seed to sale to farmers. The critical constraint was identified as being the lack of sufficient breeders' seed. Although breeders were attempting to meet the demand, it was taking time and resources from ongoing crop breeding research. The proposed solution was for small quantities of pre-breeders seed to be released by the breeders to private sector growers with regular inspection by Department of Agricultural Research Services (DARS) Seed Services ensuring seed quality was maintained and certifying the seed as required. RIU-Malawi provided a revolving innovation grant to initiate activities, which allowed the IP to contract an approved private sector applicant to purchase pre-breeders seed to multiply and produce breeder's seed. This was undertaken in close consultation with the breeder. This seed was then purchased by IP for onward sale to successful farmer applicants who were contracted to produce basic seed. The IP empowered members of an Association of Smallholder Farmers Seed Multiplication Action Group (ASSMAG) and Grain Legumes Association (GALA) through training to become effective partners. The IP organised and paid for training of farmers by the DARS Seed Services unit.

Key achievements included a policy decision by the Government to allow farmers to participate in multiplication of legume breeder seed. As a result considerable quantities of breeders and foundation seed are now available for farmers to produce certified seed.

Initial context. Grain legumes are an important component of Malawi's maize-based farming system and are a cheap source of vegetable protein and vitamins, in addition to their

contribution of soil fertility improvement through nitrogen fixation. Despite these benefits grain legume production is characterised by low yields with farmers experiencing serious problems in accessing legume seed.

The challenge. The main seed companies in the country have focused primarily on maize seed production to the detriment of other crops. The Government's programme of providing subsidised seed and fertiliser for smallholder famers initially focused on maize but now includes legumes as it was recognised that their inclusion was desirable both from human nutritional and soil fertility perspectives. However a serious shortage of seed has been a major constraint.

Innovation trigger. RIU-Malawi funded by DFID was instrumental in promoting an innovation systems approach that facilitated the bringing together of legume seed stakeholders in an IP to identify bottlenecks and opportunities to increase seed availability (RIU, 2011). The IP included breeders and seed services responsible for seed inspections and certification, MoA&FS crop production and extension staff, seed companies and farmers.

A National Innovations Coalition (NIC) comprised of Champions from a range of IPs acts as a national platform for leveraging policy advocacy with Government. In the case of the Legume IP the representative for the MoA&FS is the National Coordinator of grain legumes research in Malawi. He was pivotal in ensuring Government policy support for the private sector involvement in producing breeder's seed and in helping to broker linkages for the participation of farmers in multiplying breeder and basic seed for certified seed production. At the same time a key individual on the IP is a member of a Government TF to identify a strategy for the legume sector under the Government's Input Subsidy Programme.

Stakeholder interactions and interventions. Key stakeholders included (CIAT, DARS, the Department of Agricultural Extension Services (DAES), Seed Trade Association of Malawi (STAM), representing seed companies, Association for Smallholder Seed Multiplication (ASSMAG) and Grain Legumes Association (GALA) representing famer organisations, input suppliers and seed companies. Key IP partners included a Champion, a bean breeder with CIAT, DARS-Chitedze legume coordinator, DARS Seed Services, Demeter Farms, from the private sector and the Seed Trade STAM.

The partnership operated through joint meetings facilitated to review legume seed systems, identify opportunities for overcoming constraints, plan, initiate and monitor actions that would improve seed availability and use. The IP enhanced communication and interaction between stakeholders increasing the interest of private sector companies. The IP meets regularly allowing partners to review progress and share experiences, document progress, successes, challenges and lessons learned. Where necessary the IP established special TFs to resolve technical bottlenecks.

An initial analysis involved looking at the whole seed value chain from new variety approval and release, through production of breeders', foundation and certified seed for sale to farmers. The critical constraint was identified as being the lack of sufficient breeders' seed. Although breeders were attempting to meet the demand, it was taking time and resources from ongoing crop breeding research. Unfortunately legume seed is required in larger quantities than maize as the crop's seed requirements are much greater. In addition production of some legume seed, particularly beans, is best undertaken in the dry season under irrigation. Irrigation facilities at Government research institutes are extremely limited and valuable water is therefore only used in breeding research programmes. The proposed solution was for small quantities of

pre-breeders seed to be released by Government breeders to private-sector growers with regular inspection by DARS Seed Services to ensure seed quality was maintained and to certify the seed as required.

RIU-Malawi provided a revolving innovation fund designed to continue after RIU-Malawi support to initiate activities was phased out. The IP operated its own bank account to fund its operations and contracted approved private-sector seed producers to purchase pre-breeders seed to multiply and produce breeder's seed. This was undertaken in close consultation with the breeder. This seed was then purchased by IP for onward sale to successful farmer applicants who were contracted to produce basic and certified seed. Three varieties of each legume, beans, groundnuts and soybean were identified with 200 kg of pre-breeders seed of each variety being provided for breeder seed production. From this 2.5–3 tonnes of each variety of breeder's seed was produced. This breeder's seed was then available for approved farmer contractors to purchase to produce basic seed from which certified seed can then be produced. In the case of beans Farmers World's Demeter Farms produced breeder's seed on contract to the IP. ASSMAG farmers were then contracted to produce both basic and certified seed. In addition another seed company, Seed Co purchases basic seed from contract growers and contracts further growers to produce certified seed. Seed Co then purchases the certified seed, processes and packs it ready for sale. At each stage DARS Seed Services inspects and certifies the seed. Although all seed production to date has been purchased for the Government subsidy programme, legume seed still remains in short supply. However plans are in hand to increase production.

Achievements. Major achievements of the IP include:

- Decision by Government to allow farmers to participate in multiplication of legume breeder seed is a first in Malawi. In the past farmers were only allowed to grow certified seed
- Considerable quantities of breeders and foundation seed are now available for farmers to produce certified seed
- The IP has been successful in empowering members of ASSMAG and GALA through training to become effective partners on the legumes platform. The IP with support from RIU-Malawi organised and paid for training of farmers by DARS Seed Services unit. ASSMAG and GALA produced 28 tonnes of certified legume seed (beans, groundnuts and soybeans) in 2010/11 benefitting over 7000 farmers in 2011/12.

New or unresolved challenges. Although all seed production to date has been purchased for the Government subsidy programme, legume seed still remains in short supply. Plans are in hand to increase production to meet demand. However with seed being supplied by the Government's subsidy programme at low or zero cost, there are concerns about future sustainability. The need to ensure that high- quality seed of varieties acceptable to farmers continues to be available at affordable prices remains a priority.

Lessons learned. Funding for the facilitation of stakeholders has again played a key role in bringing stakeholders together. At the same time ensuring new varieties are used has required 'champions' who understand the often-complex institutional and regulatory structures. Such 'champions' are needed to encourage and support the building of networks of actors who are able to analyse and alleviate constraints or add value within a systems chain. Ultimately

this requires strong outcome-focused individuals and networks of policy with entrepreneurial actors from both public and private sectors. This has been demonstrated in this case study.

Malawi, SSA CP ZMM Pilot Learning Sites, Balaka and Zomba districts

Problems of food insecurity and low incomes resulting from low soil fertility, unreliable rainfall, high input costs and poor market access resulted in the establishment of three IPs, one in Balaka District and two in Zomba District. These form part of FARA's SSA CP PLS in southern Africa, which includes nine IPs in Malawi, Mozambique and Zimbabwe. This case study concerns the three in Malawi. Each IP brought together a range of stakeholders including farmers, researchers, Government and NGO extension, traditional leaders and local policymakers as well as the private sector involved in input supplies and output marketing at two levels, (district and community) to consider initiatives that would address local problems. In Balaka, the lowest rainfall area, priority was given by the IP to addressing low rainfall by introducing conservation agriculture (CA). In Zomba, one IP addressed low soil fertility through the introduction of maize–legume rotations and the other focused on vegetable production for local markets.

Each initiative was reflected in the District Councils' priorities and plans for development in the area, fitting the Government's agricultural sector wide ASWAp. Each IP established learning sites in five communities focusing on the introduction of new technologies related to the problem being addressed. Each learning site acted as a focus for stakeholders to learn, plan and evaluate. As a result improved coordination has grown, speeding up the process of making research relevant to farmers' needs. Government's input subsidy scheme also played an important role in increasing farmer awareness on the benefits of using improved varieties and fertiliser. The new technologies were promoted by a wide range of actors and are being adopted in each community and district. Agri-dealers are now supplying inputs that farmers need, food security has improved and crops are being marketed locally.

Benefits include improved food security and local farmer incomes, with better coordination of development activities. However challenges remain. These include ensuring the on-going commitment of partners, given their own priorities and time

commitments. The high price of inputs and low market prices are still of concern. Hence, IP focus is shifting to producing crops for which there are ready markets

IP activities are proving to be a useful model for the implementation of ASWAp at district level while simultaneously IP activities are making an important contribution to the District Councils' development plans in which food security, income diversification and improved NRM are high priorities.

Initial context. Malawi, with a population close to 13 million people, has a life expectancy at birth of 38 years with an estimated 29 percent of the population being undernourished and a high incidence of stunting in children (FAOSTAT, 2011) unreliable rainfall and declining soil fertility resulting in low and declining productivity. At the same time rising population has resulted in decreasing farm size with fields cropped continuously. Most farmers are reliant on rainfed agriculture with maize the overwhelmingly dominant crop, although many farmers also grow a cash crop. Recognising the critical importance of agriculture as the cornerstone of sustained growth and poverty reduction, the Malawi Government was one of the first African countries to design and implement an ASWAp that was undertaken through a CAADP compact agreement. The ASWAp provided for decentralisation of priority setting, planning and implementation to individual District Councils.

Challenges. Until recently farmers had limited access to improved seed and fertiliser and marketing surpluses was a problem. Challenges included: improving access to quality seed, building the capacity of farmers to produce as a business opportunity and linking farmers with markets

Innovation triggers. As part of its national programme, Government, through its Farm Input Subsidy Programme, has assisted targeted households with subsidised inputs to boost food security. To support this programme FARA's SSA CP ZMM PLS initiated activities in ways consistent with the aims of Malawi's ASWAp; establishing three IPs in southern Malawi, one in Balaka District and two in Zomba District. Each IP acted in support of the respective District Councils' own priorities for development in their respective areas. These form part of FARA's SSA CP PLS in southern Africa, which includes nine IPs, three in Malawi, three in Mozambique and three in Zimbabwe. This case study concerns the three in Malawi. Overall coordination across has been provided by CIAT for CA, CIMMYT for integrated soil fertility management and Bioversity International for vegetable production.

Stakeholder interactions and interventions. Each IP brought together a range of stakeholders including farmers, researchers, District Government and NGOs, traditional leaders, local policymakers as well as the private sector involved in input supplies and output marketing. Each IP operated at both district and community levels, establishing learning sites in five communities within their respective areas focusing on:

- Improving crop yields using CA techniques in Balaka with coordination provided by CIAT
- Improving maize and legume yields by using improved seed and fertiliser and introducing legumes in rotation with maize in Zomba with coordination provided by the University of Malawi's Bunda College (Kabuli and Kazombo, 2009 and Kabambe *et al.*, 2010)

- Encouraging the production and marketing of vegetables to local markets, and in Zomba, with coordination provided by Bioversity International
- A need to ensure that new technologies had the approval of DARS Technical Clearing Committee.

Achievements: All the learning sites acted as focus for stakeholders to learn, plan and evaluate, from which improved coordination has grown. It has speeded up the process of making research relevant to farmers needs. Agri-dealers are now supplying inputs that farmers need, food security has improved, and surplus crops are being marketed locally. New technologies are being promoted by a wide range of actors and adoption is occurring throughout the Districts with the Government input subsidy scheme playing a major role in increasing farmer awareness of the benefits of using improved varieties and fertiliser. However, IP focus has increasingly shifted to improving links with markets to ensure that local demand can be met.

- In Balaka, IP focus shifted to tomatoes with production techniques being improved and markets established for this potentially high-value crop.
- In the case of soil fertility in Zomba, an important breakthrough was forging a link with a local processor who produces fortified maize and soybean food for sale to relief programmes, school feeding and hospitals. The processor supplies soybean seed on credit to contracted farmers, who repay in kind when they sell their soybean crop to the processor
- Also in Zomba, supplying the local schools with the vegetables they require was another important breakthrough.

Farmers in IPs are forming groups or associations and registering them with the Government. Financial institutions have responded to this by making arrangements to provide loans to farmers by paying the agri-dealers to provide them with inputs. Packs containing vegetable seeds, fertilisers and chemicals are provided to farmers who at harvest, sell their produce and use part of the money to pay back the loan and the rest to provide for their families and prepare for the next season. Participatory market research by farmers has not only improved returns, but has also empowered farmers to look for other markets and expand the market base for their produce.

Benefits in each IP area include improved livelihoods of local farmers and better coordination of development activities.

Unresolved or new challenges. These include ensuring on-going commitment of partners to IP meetings, given their own priorities and time commitments. The availability of improved and certified seed, particularly of legumes is proving to be a constraint and attention will need to be given to this. The high price of inputs and low market prices for all commodities remain of concern.

Lessons learned. Although each IP concentrates on different commodities, the approaches are similar. Stakeholders have been brought together under the leadership of District Officers to establish activities that integrate into District Development Plans; they are making an important contribution to the District Council's priorities of improving food security, diversifying income

and improving NRM. As such, the IP structure and activities are proving to be a useful model for the implementation of Government's ASWAp in the respective districts.

The IP approach has proved very useful for empowering participating stakeholders in rural communities. However the expectations and aspirations of IP members vary, meaning that the IP is ever-evolving or changing with a potential to become increasingly relevant. The benefits enjoyed by farmers are numerous, including access to inputs, loans, market and power through collective action. Each learning site has proved to a be focus for IP activities for farmers from both host villages and surrounding communities as well as visiting NGOs, who arrange exchange visits for farmers from other areas.

Zambia's conservation agriculture

Pilot initiatives to introduce more sustainable farming practices in Africa are many, although documentation of results and lessons learned is scarce. There is, however, growing understanding among stakeholders that sustainable agriculture needs to be based on simple core principles that are embodied in CA. This Zambia case study concerns the role of CA in increasing agricultural productivity and supporting diversification to other crops, particularly legumes.

A Conservation Farming Unit (CFU) was established in 1995 as an independent unit within the Zambia National Farmers Union (ZNFU) to develop and promote the adoption of CA. This was in response to the realisation that even in years of good rainfall the majority of smallholder farmers were food-insecure. At the same time it was argued that conventional cultivation practices were leading to declining productivity, increasing food insecurity, increasing poverty, and serious environmental degradation, not only in Zambia but in the region as a whole. There was clearly an urgent need to identify and promote more productive and more sustainable farming practices.

CFU strongly believed that these problems could be addressed by adopting CA practices. Management practices were developed for hand hoe, animal-drawn and tractor faming systems, involving growing crop rotations that included legumes with options for the use of herbicides for weed control and trees to harvest soil nutrients and improve human nutrition. In 1999 the Zambian Ministry of Agriculture and Cooperatives (MoA&C) endorsed the promotion of CA as national extension policy and by 2003 studies were confirming that CA was financially attractive, although its effectiveness varied across crops and over time due to weather fluctuations. Today an estimated 175,000 farmers are practising CA.

ZNFU realised the necessity for commercial viability by linking farmers with markets, reducing transport costs and improving extension to ensure that CA was a viable proposition. At the same time, the Golden Valley Agricultural Trust (GART), a joint venture between Government, the ZNFU and University of Zambia was undertaking research to validate and improve CA practices. A National Conservation Agriculture Associationof Zambia (CAAZ) was recently formed to link stakeholders and support MoA&C initiatives to further scale up CA. Two complimentary programmes, a Conservation Agriculture Scaling up Programme (CASPP) and a Farmer Suggested Initiative and Response Programme (FSIRP) are being established with a TF established to consider policy issues including subsidies, possible use of electronic vouchers for input acquisition, and greater participation of the private sector. CA stakeholder groups have emerged at district, national and regional levels that are promoting faster scaling up of CA practices.

Key lessons include the need to build strong partnerships, provide and sustain training and communication, maintain research commitment and ensure the private sector becomes fully involved in supporting input and outputs markets to stimulate development.

Initial context. Southern Africa is home to some of the most food-insecure communities in the world. Agricultural productivity, not only in Zambia, but also in much of the sub-region, is low with average staple food crop yields lagging behind global levels. It was argued that conventional cultivation practices had contributed to declining productivity, increasing food insecurity, increasing poverty and serious soil degradation and desertification. There was clearly an urgent need to identify and promote more productive and more sustainable farming practices not only for maize but to promote diversification to other crops particularly legumes.

The challenges. Until the 1950s, African farmers maintained soil fertility primarily through shifting cultivation, with natural fallows of 10–30 years rejuvenating soils between cultivation cycles. However, demographic pressure resulted in shortened fallow periods and expanded areas of permanent cultivation. In spite of effort to maintain soil fertility, nutrient balances of African soils have declined leading to growing concerns about agronomic and environmental sustainability. In a region where up to 80 percent of the population derives their livelihoods from agriculture, declining soil fertility seriously constrains efforts to raise farm productivity, increase farm incomes and reduce poverty.

Innovation triggers. Three decades of heavy subsidies on fertiliser and farm equipment ended in the early 1990s. Continuous high-input maize mono-cropping had left soils degraded, with high levels of soil erosion, acidity and compaction (ACT, 2011). It was increasingly realised that even in years of good rainfall the majority of smallholder farmers were food-insecure. During the 1990s a series of shocks including a series of drought years, decline in cattle numbers due to disease, and exchange rate devaluation contributed to soaring fuel and fertiliser prices. This forced farmers and researchers to find alternative means of improving soil fertility and crop productivity.

Stakeholder interactions and interventions. Commercial farmers in Zambia were instrumental in developing low-tillage, low external input systems based the use of similar systems in Australia, South Africa, the United States and Zimbabwe. ZNFU became the prime mover in developing appropriate minimum tillage, low-input techniques not only for mechanised,

large-scale farmers but also for smallholder farmers who prepare their land by hoe. Zimbabwe experiences with permanent planting basins were particularly valuable. A CFU was established within ZNFU to spearhead the development and promotion of minimum tillage low-input CA technologies to Zambia's smallholder farming community. From 1996 until 2006, CFU tested a range of CA technologies at GART research stations and through a series of on-farm trials. With modest funding from a series of donors including EU, NORAD, SIDA and Finland's Government as well as Lonrho Cotton Company (subsequently purchased by Dunavant) the CFU moved to develop guidelines for Zambia. Emphasis was placed on testing such additive low-input technologies as crop basins, crop rotations, an ox-drawn ripper, and agroforestry including a leguminous tree – *Faidherbia albida*.

In 1999 the Zambian MoC&A endorsed the promotion of CA as national extension policy. CFU has continued to be a champion for CA providing training to Government, NGOs and the private sector (CFU, 2009). CFU has been strongly supported by ZNFU, who realised the necessity for commercial viability by linking farmers with markets, reducing transport costs and improving extension to ensure CA was a viable proposition. At the same time GART, a joint venture between Government, ZNFU and the University of Zambia, undertook research to validate and improve CA practices. CFU has worked with a range of NGO extension partners including Africare, CARE, the Catholic Diocese of Monze and World Vision producing field manuals and radio broadcasts in different local languages' to facilitate promotion activities (GART, 2009). CFU's two key field partners were Dunavant Cotton Company and the Cooperative League of the USA (CLUSA). Dunavant engaged CFU to run training programmes aimed at 10,000-plus cotton farmers through farmer associations and lead farmer trials and demonstrations. Similarly CLUSA promoted CA in training and demonstrations for 8000-plus farmers in Southern and Central Provinces as well as requiring all farmers to adopt CA as a condition for receiving group loans and marketing support

In 2007 NORAD made a 5-year commitment to support scaling up of hand hoe and ripper systems, part of which enabled CFU to introduce a lead farmer-training module. More recently, a National Conservation Agriculture Association of Zambia (CAAZ) was formed with support from a DFID funded initiative, RIU–Zambia to help link stakeholders and support Government initiatives to further scale up CA. Two complimentary Government programmes, CASPP and FSIRP, supported by FAO have been established, with a task force considering policy issues including subsidies, possible use of electronic vouchers, to encourage greater participation of the private sector and establishing technical guidelines for CA, building on the work of CFU.

CA platforms have emerged at, district, national and regional levels that are enabling the faster scaling up of CA practices.

Achievements: Estimates of adoption indicate that by 2001, between 20 and 60 thousand farmers were using CA. By 2003 studies confirmed that CA was financially attractive, although effectiveness varied across crops and over time due to weather fluctuations, but that up to 150,000 farmers were using CA (Haggblade and Hazell, 2010). By 2006, CFU estimated that 175,000 farmers were practicing CA on a portion of their land. Most studies of CA document significantly higher yields than conventional techniques – up to 100 percent more for maize and 50 percent more for cotton.

The annual national harvest has been growing steadily and in 2010 the largest maize crop in recorded history was harvested. This was attributed to a range of factors including the Governments' fertiliser subsidy programme, good rainfall and increased maize prices together with adoption of CA practices (Burke *et al*., 2010).

Unresolved or new challenges. Most farmers who adopt CA technologies do not appear to apply them on their entire farm and in some cases they revert to old technologies. This is attributed to the fact that although CA reduces costs and increases yields, it is management-intensive, for which not all farmers are suited. Some farmers enter promotional campaigns to receive inputs either free or on credit and when these are no longer available may revert.

Cotton farmers appear to be the largest group of adopters with about 15 percent of those in the moderate and low rainfall areas using hand basins (Haggblade and Tambo, 2003). Since cotton demands precise attention to planting date, regular weeding, and careful pest monitoring and control, cotton farmers tend to constitute a self-selected group of diligent and hard-working smallholder farmers.

Lessons learned. Some of the key factors identified by CAAZ stakeholders in scaling up CA include the need to: build strong partnerships, provide and sustain training and communication, maintain research commitment, ensure the private sector is fully involved in allowing the market to play its rightful role, assure long-term funding and address policy constraints.

The Zambian case study has indicated the complexity of scaling up CA with many different public, private and NGO organisations involved (Baudeon *et al.,* 2007). However the emergence of a national stakeholder platform, the CAAZ has enabled the sharing of experiences, which have enabled district stakeholder groups to emerge in which extension personnel from Government, NGOs and ZNFU (CFU) are able to interact. At the same time the increasing involvement of the private sector as input suppliers, contractors or buyers of produce is helping to ensure that CA is a profitable undertaking. A significant number of CA activities are building on previous or ongoing research initiatives. Relatively small additional investments, often with private sector partners, appear to provide an effective way of putting this research into use.

Cameroon, production and marketing of bananas

This case study concerns the redevelopment of the Cameroon banana industry after its near collapse in 1987 due to disease and adverse rainfall conditions over a number of years. The resulting loss of livelihoods, export earnings and social upheaval forced Government to intervene. This involved many different stakeholders including public and private sectors, NGOs, and farmer organisations working closely together. Measures introduced included: increased research funding resulting in disease-resistant banana varieties, new infrastructure, improved farmer access to inputs and credit, improved postharvest handling resulting in preferential access to European markets. Consequently banana production recovered to its earlier levels and continues to grow at over 10 percent per annum providing livelihoods for over 10,000 people, both as paid employees and small-scale producers.

Context. Bananas (*Musa* spp) are the most popular and best-selling fruit in the world and globally the fourth most widely consumed crop by humans, after rice, wheat, and maize, earning around US$5 billion each year. In Cameroon the banana industry provides direct employment to thousands of people in rural areas and is seen by many as important for the stability of the country. Poor varieties, inadequate infrastructure, price fluctuations, inadequate finance and storage facilities affect both production and marketing.

The challenges. Banana exports declined steadily from the early 1960s from around 140,000 tonnes in 1961 to little more than 20,000 tonnes in 1987. Bananas from Cameroon could not compete in the European market due to increasing incidence of Panama disease, a *Fusarium* wilt, and Sigatoka, a fungal leaf spot disease, as well as weather-related problems. Exports declined to a record low by 1987 (Sama-Lang, 2004; Asfaw *et al*., 2009). The Government was faced with rehabilitating a key industry that had potential to generate valuable foreign exchange and improve the livelihoods of over 10,000 people.

Innovation triggers. Increasing unemployment, huge losses in import earnings and social unrest necessitated Government action.

Interventions and the role of different stakeholders. Since 1987 the Government has introduced measures to improve the policy environment, improve infrastructure particularly roads and safe storage facilities, provide funding for research, extension and farmer credit

through a farmer organisation, *l'Organisation Camerounaise de la banana* (OCB). At the same time, the EU supported Government in providing funding for technical and farmer support for the industry. In addition, foreign companies took a leading role in the development of banana export markets. Del Monte International (DMI) entered a joint venture with the Government-owned Cameroon Development Corporation (CDC) and in 1990 the OCB was bought by *Compagnie Frutière*, a French company controlled by Dole Food Company Inc., which had been responsible for selling OCB produce in Europe. Both DMI and Dole made large investments in irrigation, fruit-handling facilities and sanitation equipment.

Other interventions included:

- Introduction of policy measures by the Ministry of Food and Agriculture (MoFA) to ensure compliance with international export standards
- Improved infrastructure including roads, storage facilities and an organised transport system
- Support by MoFA, *Centre Africain de recherches sur bananiers et plantains* (CARBAP) and *Insitut de recherche agricole pour le développement* (IRAD) in research and the development of farmers' organisations to encourage increased productivity for export markets. This included the development of some 20 improved banana varieties selected through participatory evaluation. CARBAP and IRAD have also been working to reduce black spot and other diseases effecting bananas
- *In vitro* multiplication from auxiliary buds of banana suckers and development of environmentally friendly agronomic practices
- Credit for farmers to acquire production inputs
- Support by Banana Link, a non-profit company who provide an information service on trends in the international banana trade and on the activities of the companies involved. Banana Link campaigned and lobbied in support of smallolder banana farmers and plantation workers by collaborating with other organisations working on similar issues in the rest of the world.

Achievements. By 2002, banana exports had exceeded earlier production levels reaching almost 260,000 tonnes, having grown by 10 percent per annum over a 15-year period, due in large part to the introduction of improved farming methods. Today banana exports continue to rise with over 80 percent of total production going to the European Community (EC) with the remainder going to Eastern Europe, North Africa and neighbouring African countries. In addition to exports, Cameroonian farmers now produce a further 700,000 tonnes of bananas and 1.3 million tonnes of plantains for domestic consumption (Sama-Lang, 2004 and MoFA, 2008). While plantains are largely grown by smallholder farmers in the southern and western parts of the country, banana exports are mainly produced in the south-western region primarily by *Compagnie Frutière* and DMI.

Cameroon-produced desert bananas attract a premium price as organic and FairTrade produce, particularly in the European market due to non-use of chemical fertilisers and absence of infestation by certain insects banned by the EC. Over 10,000 people are now directly or

indirectly involved in the industry and rural household incomes have increased by over 10 percent.

New challenges. Research remains to be fully incorporated into the innovation system, giving concerns as to how productivity increases could be maintained if production or marketing challenges were to emerge. In addition land fragmentation and small farm sizes limit the areas that smallholder farmers are willing to plant to bananas.

Lessons learned. Important lessons have included the involvement of both public and private sectors as a driving force for success in rehabilitation of the banana industry. Government provided the regulatory framework and the additional infrastructure, increased funding for research and extension with the private sector supporting production and marketing. Clearly, product access to the profitable EC markets, supported by Government enforcement of import regulation, improved farmer access to new technology and the ability to use knowledge generated by research, resulted in productivity increases and compliance with export regulation requirements.

Cameroon's garlic industry

This case study concerns the development of a high-value niche crop, garlic – aimed at the export market to decrease reliance on traditional exports, primarily bananas, and expand foreign exchange earnings. The development required Government-led collaboration between multiple stakeholders in the public and private sectors, NGOs and farmers' organisations.

Cameroon is now the largest global producer of garlic, with over 8,000 producers providing over 45 percent of the worldwide crop. Incomes of both producers and marketing agents have increased substantially and there is evidence of poverty reduction among households that are involved in producing this crop.

Initial context. In Cameroon, farmers have relied primarily on subsistence agriculture, growing a variety of food crops primarily for domestic consumption, with occasional surpluses for sale. These included banana, cassava, maize, millet, plantain and sweet potato. In order to decrease the country's reliance on traditional exports such as bananas, Government encouraged production of other high-value crops, such as garlic and ginger, primarily for export.

Garlic is a traditional crop, often cultivated by women in the North West Province. Some production expansion occurred when coffee prices declined and farmers were seeking alternative sources of income.

Initial challenges. The initial challenges faced in developing the garlic industry included:

- Lack of early-maturing and disease-resistant varieties, as insect and disease attacks on local varieties cause major problems
- Lack of finance for farmers to procure production inputs
- Lack of appropriate storage and processing facilities that limit garlic's shelf life

- Lack of an export market for increased production
- Poor infrastructure, particularly access roads in potential growing areas.

Innovation triggers. The need to expand foreign exchange earnings and national revenue prompted Government to explore diversification of export commodities. This resulted in new policy initiatives designed to promote high-value export commodities including garlic and ginger. This led to collaboration between the public sector, private sector and NGOs to support farmers and farmers' organisations to initiate garlic production.

Interventions and the role of different stakeholders. Government, private sector and NGOs have supported garlic production. This has included the Northwest Farmers' Organisation (NOWEFOR), who were supported by two NGOs, *Service d'appui aux initiatives locales de développement* (SAILD) and *SOS Faim* based in Luxembourg. While SAILD provided advice, inputs on credit and marketing support, *SOS Faim* provided additional credit facilities.

In addition, the Cameroon Farmers' Corporation (CFC) has now become a major stakeholder in the garlic industry, exporting fresh and processed garlic products worldwide. CFC produces garlic and is also responsible for collecting, processing, packing, storing and exporting many thousand tons of fresh garlic on behalf of over 8,000 smallholder farmers. Other farmers produce and sell garlic to a range of processors and exporters, who have developed their own agri-businesses enterprises over the last five years. Garlic products now include dehydrated powder, flakes, paste, fresh and frozen peeled cloves, granules and decorated braids (Raynolds, 2004).

Interventions have included:

- Policies to reduce reliance on traditional exports by encouraging the production of high-valued crops, including garlic and ginger for export
- Development by research of early-maturing and disease-resistant varieties
- Provision of critical infrastructure, particularly roads, provided by Government to support production and marketing
- Development of CFC as a major stakeholder in the garlic industry
- Introduction of support services for credit and input acquisition for farmers through CFC and NOWEFOR.

Achievements. Cameroon is now the largest producer of garlic worldwide, producing over 45 percent of the global crop that includes normal white, pure white and high mountain organic purple varieties. Garlic exports compete well in the European market.

CFC and NOWEFOR have brought farmers together by sharing experiences encouraging information exchange, providing training and coordinating marketing to ensure good prices. Improvements in production and marketing include seedlings treatment, progressive replacement of inorganic by organic fertilisers and re-organisation of marketing to attract a high premium for garlic as organic and FairTrade produce.

The development of the garlic industry has brought about socio-economic transformation at both national and household levels. Garlic exports have contributed significantly to an improvement in the country's foreign exchange earnings, and farmers have indicated that

household incomes have risen by an average of 15 percent as a result of garlic production. This has made a significant contribution to poverty reduction among garlic-producing households (World Bank, 2006).

New or unresolved challenges. There remains an ongoing need for research to be more closely integrated into garlic value chains so that production and postharvest processing constraints are quickly resolved. For instance, farmers still face pest and disease problems so resistant varieties or management systems that reduce their incidence are required to ensure future productivity can be sustained. At the same time there remains an on-going need to ensure access to inputs and improve soil management practices.

Lessons learned for scaling up. Access to an export market has been a driving force for the development of the garlic industry, with access enhanced by export through FairTrade agreements enjoyed by organic garlic production. Ensuring long-term sustainability requires close coordination and cooperation of stakeholders in the value chain, particularly with regard to research so that production problems can be addressed as they emerge.

Ghana's pineapple industry

This case study concerns the rehabilitation of the pineapple industry after loss of valuable export markets to Europe as new country producers provided sweeter varieties favoured by consumers. This resulted in loss of foreign earnings and many farmers stopped production. This situation prompted Government and donor intervention as part of a national economic recovery programme, involving multiple stakeholders in the public and private sectors supported by NGOs and international agencies. Pineapple productivity has now recovered and is making an important contribution to significant poverty reduction in pineapple-growing areas, with farmers reporting a 10 percent increase in household income levels.

Initial context: Although pineapples were grown during both colonial and post-colonial periods, by the early 1970s the crop had largely disappeared. It initially recovered during the 1980s, with three types of export companies dominating the industry, larger producer–processors with a network of smallholder producers, processing companies with their own plantations, and smaller production companies with a smallholder production base.

This initial recovery of the pineapple industry from local to export production resulted from Government's Economic Recovery Programme (ERP) aimed at increasing foreign currency earnings. This required businesses to export commodities in order to earn foreign exchange to finance their operations. The recovery was due to favourable climatic conditions for pineapple

production, market demand in Europe and low labour costs. A new pineapple project was launched in 1992 with pineapple research being initiated under the National Agricultural Research Project (NARP). NARP aims to address agronomic, biological and postharvest handling constraints.

Initial challenges. Increased competition and changing consumer tastes in the international pineapple market made it increasingly difficult for Ghanaian producers to compete. The decline was accelerated as EU consumer preferences changed from the Ghana-produced smooth Cayenne pineapple to a new Costa Rican variety, MD2. The main attractions of this variety included the bright yellow appearance of its fruit; with deep yellow pulp; high sugar and ascorbic acid contents and a long fresh- fruit shelf life. As a result, MD2 quickly gained some 70 percent of the international market for fresh pineapples within a relatively short period of time (Kleemann, 2011). Consequently the Ghanaian pineapple industry was faced with low demand and falling prices resulting in declining production exacerbated by unorganised producers with poor processing and storage facilities and inadequate capacity or resources to change.

Innovation triggers. The change in the market demand made it increasingly difficult for the Ghanaian pineapple industry to compete. As a result, smallholder and medium-scale farmers merged to form larger-scale professional commercial farmers, but many other smallholder farmers left the industry. To redress this situation the Government implemented several support programmes to improve pineapple production, processing and marketing. This resulted in the direct involvement of international agencies and NGOs in the rehabilitation of the industry through injection of funds and research support.

Interventions and stakeholder roles. Although Government played a pivotal support role in the pineapple industry expansion in the late 1980s, the industry received little further attention until the early 2000s, when the sector received support from a World Bank-funded loan in 2004. Since then, a number of joint Government–donor initiatives targeting pineapple exports have been implemented. The largest of these was the US-led Millennium Challenge Programme (MCP) for the modernisation of agriculture, which had a strong focus on supporting horticulture producers, 70 percent of which concerned pineapples.

The MCP involved both the Ministry of Trade and Industry (MoTI) and the Ministry of Food and Agriculture (MoFA) in promoting pineapple production. Both ministries promoted and supported capacity-strengthening activities in smallholder producer out-grower schemes alongside commercial pineapple production.

The MD2 variety was introduced into the Ghanaian pineapple industry in 2003 by pineapple exporters, Sea-Freight Pineapple Exporter of Ghana (SPEG), a group of pineapple producers supported by the Ghana Atomic Energy Commission (GAEC) with support from USAID, the Ghana Export Promotion Council (GEPC). The same stakeholders established BioPlantlets Ghana Ltd as a joint public–private venture to produce MD2 slips using tissue-culture techniques and distribute them to farmers at reasonable prices. At the same time a private company, Bomart Farms Limited also assisted in the breeding and cultivation of MD2 pineapple plantlets.

Other key interventions provided by Government and various stakeholders in the industry included:

- Government-funded road construction to help producers move their farm produce
- Development and distribution of new pineapple varieties
- Provision of training (capacity-building) and financial support to smallholder farmers
- Assistance to smallholder producers with the supply of production inputs
- Purchase of produce from farmers and processing for local consumption and export.

Achievements. By 2002, Ghana had made its first commercial exports of the MD2 pineapple variety. However, by 2006 42,000 tonnes of the commodity were exported earning the country 20 million US dollars. Consequently the country regained its position as the world's third largest exporter of pineapples to European markets, with the MD2 variety, having overtaken the once-dominant smooth Cayenne variety, accounting for about 85 percent of all pineapple exports to that market.

Pineapples now account for more than 50 percent of Ghana's total horticultural exports and the crop is a source of income and employment for 15,000 people. Increased production has led to significant poverty reduction in pineapple-growing areas with farmers reporting a 10 percent increase in income (World Bank, 2006), largely due to increased production and higher prices for the commodity.

Many smallholder farmers in southern Ghana have joined the pineapple business in the last decade, growing this crop for both export and local markets. Many small-scale producers sell for both fresh local consumption and for export. A large-scale processor is the Blue Skies fruit-processing company located on the outskirts of Accra. Income from pineapple sales has made a significant contribution to family income and living standards, while food security from cassava and maize has been maintained. Pineapple production has also benefitted women and young people. Women producing pineapples have become more economically independent and some young people have abandoned low-paid jobs in the towns to take up pineapple farming as a profitable venture.

Research. Although there is little research undertaken in the pineapple industry at farm level, major processors undertake research on quality assurance of the processed product in order to meet the standards required by the European market.

New or unresolved challenges. Ongoing challenges include rising input costs, price volatility and a lack of irrigation facilities. At the same time increasing land consolidation has meant that benefits are being increasingly concentrated in the hands of larger producers, as smallholder producers are increasingly unable to compete. As the smooth Cayenne variety is progressively squeezed out of the market by the newly introduced and favoured MD2 variety, this poses a serious threat to smallholder growers, who account for some 50 percent of production volumes (Larsen *et al*., 2006).

Lessons learned for scaling up. The strong commitment of all stakeholders – donors, national partners, NGOs, Government, exporters, importers, individual farmers and research institutes – has played an important role in the success achieved in the pineapple industry. Linkage with export markets has clearly been a driving factor. However the emergence of large-scale farmers and processors has made them the major beneficiaries at the expense of smallholder farmers. Meeting this challenge will require additional support to raise their production levels.

Ghana's growing cassava sector

This case study demonstrates the development of a traditional subsistence crop – cassava – as a commercial crop that is processed to provide industrial products including starch, flour and adhesives. Popular commercial foods based on traditional processes have also been successfully marketed. These developments required public sector-led multiple stakeholders involving the private sector and farmer organisations, which has resulted in greatly expanded areas of improved cassava varieties, processing factories and improved livelihoods.

Initial context. Ghana, in common with other West African countries, depends heavily on agriculture for national and household food security and employment. Cassava is grown throughout the country, as a sole or mixed crop, either primary or a subsidiary. The greatest concentration is in the South and Central Regions that are responsible for nearly 80 percent of total production. For many years Ghana focused on rapid industrialisation, favouring grain production on large public farms, with little research for smallholder farmers and root crops. However, cassava production has grown rapidly over the past two decades, benefiting from new varieties and processing techniques developed in Nigeria.

Popular cassava products include *fufu, gari, agbelima, agbelikaklo* and *yakeyake.* In all these products, the roots undergo a fermentation process when they are immersed in water for several days. In the case of *fufu* the peeled or unpeeled roots are 'watered' for some days, then dried in the sun and pounded into flour. The dried fragments possess a distinctive taste due to the fermentation that takes place during watering. The preparation of *gari* or *atieké,* involves fresh roots being peeled, grated and then left to ferment before the pulp is finally cooked and eaten. *Gari* is the most popular product because of its long shelf life. Available records show that formerly Ghana had three active and one potential manufacturers, who produced cassava starch, flour and flour-based paperboard adhesive.

Initial challenges. The key challenges were:

- The need to enhance income and food security among households and to improve livelihoods of the rural poor by building a market-based system to ensure profitability at all levels of the value chain
- To develop a sustainable system for multiplication and distribution of improved planting materials for cassava
- Strengthening on-farm adaptive research
- Increasing the availability of new techniques and empowering resource-poor farmers, particularly women, to ensure that they have access to productivity-enhancing inputs and techniques.

Challenges to overcoming these problems included a lack of improved varieties and farmer knowledge to grow them, lack of capital and processing facilities and the need to develop markets.

Innovation triggers. A severe drought in 1982–83 highlighted the importance of cassava in ensuring national food security. Crop failure, rapidly increasing food prices and migration of Ghanaians attempting to escape famine all highlighted the importance of cassava. Since cassava was the only crop that did not fail, it led policymakers to question reliance on maize for food security. Unfortunately an outbreak of cassava mealybug resulted in heavy on-farm losses and a consequent doubling of *gari* prices. Declining productivity and the realisation that cassava could provide the basis for value addition through processing for industrial products as well as enhancing traditional foods have been the major innovation drivers.

Stakeholders and interventions. In 1988, Ghana launched a National Root and Tubers Improvement Project (NRTIP) as a component of the Ghana Smallholder Rehabilitation and Development Programme. This resulted in the import of Nigerian varieties developed by IITA for local evaluation by Ghanaian researchers with support from IITA. As a result, new varieties were released that were capable of more than doubling the yield of existing local varieties (MoFA, 2005) and Ghana's policymakers have given attention to industrial processing and export markets.

The stakeholders in the cassava industry include public and private sectors, NGOs, farmers and farmers' organisations. They have all interacted at different phases in the development of the industry, although Government has been the driving force. In the early phases in 1999, the MoFA initiated multiplication and distribution of planting material of improved varieties, aimed at food security and income enhancement especially for the poorest. Increasing production required development of a market-based system to ensure profitability at all stages in the value chain. This required: a sustainable system for multiplication and distribution of improved planting materials; strengthening on-farm adaptive research and empowering smallholder farmers particularly women through access to improvement technologies. Farmers' field schools (FFS) were successfully used as entry points for collaborative research on farmers' fields and as an extension tool for rapid technology dissemination and adoption. Value chain analysis carried out by MoFA with support from the International Fund for Agricultural Development (IFAD) helped to identify actors and their roles. A phased project approach, the first from 1999

to 2005 placed initial emphasis on cassava production, although it soon became clear that a balance between crop production and the development of downstream processing, being undertaken as a second phase (2007–2014) was required to ensure that farmers benefitted from the increased yields. The multiplication and distribution of improved varieties planting materials involved the development of improved varieties and their multiplication at specific MoFA primary multiplication sites. Government, IFAD, other partner institutions, and the beneficiaries themselves jointly financed this. From the primary sites, cassava cuttings were supplied to contract farmers, located in each district, who acted as secondary multipliers thus ensuring that the new varieties were readily available to as many other farmers as possible. The secondary multipliers were trained in agronomic and sanitary practices associated with production and handling of cassava cuttings. Inspectors from the MoFA Plant Protection and Regulatory Services (PPRS) certified that varieties were genuine and free from disease.

In addition Government improved road access to production areas for transport of farm produce to point-of-sale or processing. Small-scale processing facilities owned by private small-scale processors are widely distributed and large processing facilities, also privately owned, buy cassava from smallholder farmers to produce industrial starch and alcohol.

Achievements. The rapid decline in cassava production has been reversed, new disease-resistant, high-yielding varieties have been developed and are now widely grown, improving household and national food security and importantly providing a basis for industrial processing of new products. This was supported by Government-provided infrastructure, including new feeder roads, irrigation and processing facilities. As a result, cassava production has been increasing substantially, providing an important source of cash income for rural households (MoFA, 2010). At the same Ghana has moved from being the sixth largest cassava producer in Africa to the fourth (FAOSTAT, 2010). A fall in the price of *gari* has also meant that urban consumers have gained from the new varieties and processing technologies.

New or unresolved challenges. As in Nigeria, future growth will depend on the continued development of industrial and livestock markets. Growth to date has largely focused on markets for human food, while future gains will require on-going expansion into convenience foods, livestock feeds and industrial products. Future processing, packaging and development of industrial applications are necessary to sustain commercial expansion of cassava production and milling. Private-sector innovation in processing and marketing will be crucial in sustaining further cassava-led growth and private traders are likely to play a vital role in linking farmers with markets.

Lessons learned for scaling up. Strong community involvement in planning and implementation of agricultural innovation programmes is essential for sustainability and impact. Public actors played two major roles in making cassava development possible, firstly through research investment in cassava breeding and pest control programmes. As public goods, these contrast with the development of hybrid maize varieties that are often private goods, requiring farmers to purchase new seed each year. Cassava being vegetatively propagated means that farmers are able to take root cuttings from existing plants to expand production. Consequently, vegetatively propagated crops like cassava rarely attract private-sector investment. Secondly, policy played a critical role. Reduced support for cereal crops radically altered the farmer decision-making

environment and incentives for production. This combined with readily available new varieties helped to trigger a boom in cassava production.

At the same time commercialisation of *gari* and other cassava-based foods was supported by the introduction, modification and adaptation of mechanical graters through commercial adaptation by private artisans.

Niger's vegetable production

This case study concerns an initiative supported by FARA's SSA CP PLS in KKM in the Aguié District of the Maradi Region, Niger. Although vegetables had been grown in the district for some time for both household consumption and local sales, low productivity and poor marketing had limited their potential benefit. To address the problems experienced, an IP comprising key stakeholders was formed to identify and implement opportunities for improving income from vegetables, in particular green pepper for which a large local market exists in bordering Nigeria. Farmer capacity-building, introducing improved new varieties and management practices – including neem for nematode control, and linking farmers with market traders have resulted in increased production, sales and household incomes, despite a number of new challenges appearing. These include water shortages for irrigation and periodic flooding, which are threatening loan repayments by farmers. However, successful innovation based on simultaneous introduction of technical, institutional, infrastructural and market initiatives has been achieved.

Context. Only 12 percent of Niger's land area, located along the southern border with Nigeria, is potentially useful for rainfed cultivation with limited availability of water for dry-season production. The average farm size is about three hectares and low rainfall, drought, pests and diseases all contribute to low productivity. Poverty, food insecurity and malnutrition are widespread. To redress this situation the Government has encouraged crop diversification including off-season vegetables production of such crops as garlic, onions, peppers and potatoes. This has been supported by donor organisations. As part of this wider initiative FARA's SSA CP KKM PLS in the Sahelian zone supported an IAR4D approach in Aguié District of the Maradi Region. This has been managed through *Conseil ouest et centre Africain pour la recherche et le developpement agricoles* / West and Central African Council for Research and Development (CORAF/WECARD) and coordinated by *l'Institut national de la recherche agronomique du Niger* (INRAN).

The challenge. Although vegetables had been grown in Aguié in low-lying wetland *fadama* areas for some time, for household consumption and local sales, low productivity and poor marketing had limited their potential benefits. Green pepper is the principal cash crop for many farmers of a number of villages, where the principal constraints were identified as diseases and pests, in particular nematodes, which cause seedling death due to root damage.

Innovation triggers. It was recognised that vegetables due to their high commercial value provided opportunities to improve not only nutrition but also incomes, thus allowing other

food to be purchased. With a large potential market existing for green peppers in neighbouring Nigeria, resolving production and marketing problems was given priority.

Interventions and the role of different stakeholders. An IP, established and functioning since 2008 comprises a steering and management committee, with representation from: stakeholders, including elected members of farmer groups from five participating villages; input dealers, vegetables traders and seed producers from Maradi; policymakers and traditional leaders; researchers from (INRAN); Ministry of Agriclture and Rural Development extension workers; *Projet de promotion Promotion de l'initiative locale pour le développement à Aguié* (PPILDA), an IFAD-supported initiative in Maradi; *Asusu*, an NGO micro-finance institution providing warrantees for crop storage and micro-credit for inputs purchase; and an NGO, *Taimakon Manoma*, providing farmer capacity-building in organisation development, production technologies and marketing.

Activities included the formation of famer groups through which training, credit, input supply and marketing initiatives have taken place. New production practices for green pepper production were introduced including: new varieties, increasing plant density to eight plants per square metre to maximise yield, and the use of neem leaves for nematode control during the rainy season, when demand is greatest and prices are highest. At the same time farmers were supported by the provision of irrigation facilities to enhance production.

Women were actively encouraged to participate, not only in marketing where they have traditionally played an important role, but also in production.

Achievements. Farmer organisations' capacity has been strengthened through improved leadership skills, improved communication and bargaining power. As a result farmers' organisations from each village have now been registered with local authorities.

Options for improving production of green pepper (including use of improved seed with a higher plant population density and efficient fertiliser use) have been tested and the most appropriate and acceptable adopted by farmers. Disease and pest management practices have been evaluated with farmers during off-season periods and improved production practices have been promoted in other areas. Production contracts between farmers' organisations and vegetables traders have been agreed and options for postharvest vegetable processing are being investigated.

Participating farmers have already reported productivity increases of 20 percent and household incomes increasing by 30 percent and an improvement in their families' nutrition.

Key lessons learned. Ongoing sustainability will require ongoing capacity strengthening for all stakeholders including farmers, research and extension partners, and importantly the farmer's organisations to effectively assume ownership and leadership of the IP.

New challenges. Irrigation wells are drying up because dams are being built in the *fadama* catchment areas in neighbouring Nigeria. This is limiting the period for which irrigation is available. At the same time, increased flooding is new a challenge for vegetable production. Both problems are contributing to poor recovery of production credit given to farmers.

Lessons learned. Successful innovation has been based on the simultaneous introduction of a number of technical, institutional, infrastructural and market initiatives.

Nigeria's cassava production and processing sector

In Nigeria cassava is the most widely cultivated crop, providing food and income for some 30 million farmers, processors and traders. Problems of intermittent drought, pests, wars, inappropriate policies and the sudden emergence of major plant diseases have impacted on cassava production. The Presidential Initiative on Cassava Production and Export (PICPE instigated in 2003 to address the critical threat of an outbreak of cassava mosaic disease (CMD) and to revitalise Nigeria's agricultural economy resulted in the launching across eleven southern states of a project to promote cassava processing and commercialisation through a public–private partnership. Two initiatives implemented by IITA, formed an Integrated Cassava Project (ICP), which focused on both mitigating the impact of the CMD and increasing cassava productivity, processing and marketing.

Achievements include the development and distribution of CMD-resistant varieties, substantially increased yields for a large number of farmers, the establishment of large-, medium- and small-scale processing units through support to local fabricators, together with revenue of over US$50 million generated from sales of cassava products including mash, *gari*, *fufu* flour, high-quality flour for bread making, chips, *cassavita*, ethanol and starch.

Initial context. Cassava production has grown rapidly in Africa in recent decades to around 50 percent of global production by the mid-2000s, with Nigeria surpassing Brazil as the world's largest producer. In Nigeria cassava is the most widely cultivated crop, providing food and income for some 30 million farmers, processors and traders. In SSA, the crop provides food for over 200 million people, about one-third of the region's population, and is the second most important calorie source, after maize (Nweke, 1997). Cassava's drought tolerance and long harvest period make it an ideal crop for food security with high potential to produce animal feeds and for industrial processing. However problems of intermittent drought, pests, wars and the sudden emergence of major plant diseases have all impacted on production.

Initial challenges. Cassava development from a staple food to a cash crop was threatened by both cassava mealybug and more recently by a virus causing CMD (Fauquet and Fargett,1990). By the late 1980s CMD had devastated crops in Uganda and by 1999 had caused up to 100 percent crop losses in Eastern and Central Africa. In Nigeria, CMD also posed a serious threat,

especially in the cassava-growing areas in the south of the country. This was compounded by Nigeria's reliance on oil exports, which had triggered an abrupt fall in production in the agriculture sector, resulting in large scale rural–urban migration and rapidly rising urban wages supported by cheap rice and wheat imports to meet growing urban demand. Unfortunately the agricultural sector remained largely subsistence and failed to keep up with rapid population growth. With high dependence on food imports and oil dominating the economy, the price of cassava remained depressed and production fell. However, by the mid-1980s, petroleum-led economic growth had slowed and the Government introduced a structural adjustment programme that devalued the *Naira* and lifted subsidies on fertiliser and cereals. This resulted in dramatically improved incentives for cassava growers. Real producer prices increased as a consequence of devaluation, the abolition of commodity boards, and import restrictions on selected foodstuffs and animal feeds. As a result, consumer demand changed from such foods as bread, eggs, meat and rice towards such locally produced staples as cassava, maize, sorghum and yams. Farmers responded by producing more of these crops. Despite this response, many areas still suffer from seasonal food deficits. This prompted Government to seek policies to enhance agricultural productivity, thus encouraging collaboration with international agencies and NGOs to develop the cassava sector.

Innovation triggers. PICPE launched in 2003 brought cassava and its potential into the national limelight. PICPE's goal was to stimulate cassava production to become a viable foreign exchange earner. The challenge was that by 2007 the country should earn US$5 billion from value-added cassava exports. Nigeria's Ministry of Trade and Commerce commissioned the United Nations Industrial Development Organization (UNIDO) to assist in the development of a Cassava Master Plan. This Plan identified and analysed the cassava value chain, proposing: business development, international economic cooperation and scientific support initiatives, and benchmarking the Nigerian cassava sector against competing cassava nations, particularly Thailand and Brazil.

The National Economic, Empowerment and Development Strategy (NEEDS) (National Planning Commission, 2004) recognised the importance of agriculture, despite the dominant role of oil as the country's main export. Accordingly, Government committed three percent of the national budget to agriculture, aiming at six percent growth for the sector in order to restore agriculture to its former status as a leading sector in the economy. The main challenges were to increase economic opportunities through sustainable and competitive cassava production, processing, marketing, and agri-enterprise development in selected communities by:

- Increasing cassava productivity by developing improved germplasm, soil amendments, integrated pest management (IPM), and other proven best practices
- Mitigating the impact of CMD through participatory evaluation, multiplication, and distribution of CMD-resistant germplasm to farmers
- Developing and expanding postharvest processing, and marketing outlets for cassava products to increase incomes and improve livelihoods in rural areas.

Interventions and stakeholder roles. In 2003 PICPE tasked a commission to find ways of increasing annual cassava production, processing and export from 32 million to 150 million tonnes increasing the value added in cassava production from US$ 1 billion to US$ 5 billion

(Nigeria First, 2005). PICPE brought together stakeholders from Federal and State governments, the Niger Delta Development Commission (NDDC) and Nigeria National Petroleum Corporation (NNPC), Shell Petroleum Development Company (SPDC) and Nigerian Starch Mills Limited (NSM), to provide funds to promote cassava production, processing and commercialisation through a public–private partnership. To encourage domestic industrial processing the Nigerian Government mandated a 10 percent mixture of cassava and wheat flour to be used in bread making, starting in June 2006

Two initiatives implemented by IITA, formed an Integrated Cassava Project (ICP) that focused on both mitigating the impact of the CMD and increasing cassava productivity and cassava processing and marketing (Tarawali *et al.,* 2009). It aimed to expand economic opportunities by increasing productivity, enhancing value-addition processing and increasing commercialisation through private-sector led growth and development. ICP supported off-farm agricultural enterprises that enhanced processing and value-added transformation, and generated employment and investment opportunities, especially in the rural areas.

Another programme was the USAID-funded Global Food Security Response Program's, Maximising Agricultural Revenue and Key Enterprises in Targeted Sites (MARKETS). It comprised several partnerships in the cassava sector involving Nigerian agri-businesses in creating such high-value final products as starch. MARKETS also addressed value-chain constraints to increased farm-gate prices by supporting agri-business development to improve competitiveness, increase domestic market share and reduce starch imports. Key national institutions involved included:

- National Root Crops Research Institute (NRCRI[11]), which in collaboration with IITA provided the base for the rapid spread of improved cassava varieties and other root crops
- Cassava Multiplication Programme Coordinating Unit (CMP–CU)
- National Seed Service (NSS)
- Multi-State Agricultural Development Project (MSADP) involving State Agricultural Development Programmes (ADPs) and a number of local NGOs
- Private companies including Agip Oil Company Ltd, Shell BP Petroleum Development Company of Nigeria Ltd and Texaco Agro-Industries Nigeria Ltd (Texagric).

New high-yielding varieties, with multiple resistances to diseases and pests were developed and extensively multiplied and distributed through the establishment of strategic reserves and the development of community-based cassava production schemes for planting material. The ADPs, Cassava Growers Association of Nigeria, an NGO – Women-in-Agriculture, the organised private sector, schools, and religious organisations were the main avenues for these activities. Emphasis was on developing clusters around demonstration trials and processing centres so that raw materials were readily available for processing plants. Commercially oriented bodies for the sale of cassava stems were identified and promoted.

1. NRCRI has the national mandate for genetic and agronomic improvement of cassava, cocoyam, ginger, Irish potato and yam, as well as farming systems research in the Southeastern AEZ

To improve the productivity of cassava to potential yields of 30–40 tonnes per hectare, activities included the promotion of fertiliser use and the introduction of nitrogen-fixing legumes into cassava-based systems. Effort was also made to encourage the use of labour-saving devices, including power tillers, cassava planters, and harvesters. The team worked closely with herbicide and fertiliser companies to provide services at the farm-gate level. The continuous use of certified weed control groups ensured farmers had the benefit of unadulterated chemicals and at the same time provided youth employment. Farmers, extension agents, NGOs, and the private sector were trained in new technologies and adequate extension materials and leaflets were produced.

Through ICP a wide range of value-added products were introduced to the market. These included ethanol, odourless *fufu* flour, cassava flour for bread making, starch, and livestock feed. Emphasis was given to upgrading or developing and testing new processing and drying facilities. Local fabricators were trained and linked to potential investors and credit sources. A Market Information Service was introduced with information on processing disseminated through posters, fliers, radio, TV, newspapers, and exhibitions. This focus on enterprise development and market promotion helped in poverty reduction and enhancing profitability.

Achievements. Cassava production has grown rapidly in Africa over recent decades, with Nigeria recently surpassing Brazil as the world's leading cassava producer. Production tripled in less than a decade as improved cassava varieties, successful pest control and strong producer incentives increased production potential. Nigeria has led the increase in cassava production by introducing improved varieties, successful pest control, strong producer incentives and processing technologies coupled with favourable Government policies. Across the entire breadth of Africa's cassava belt, many millions of farmers have benefitted from the large-scale investment of public resources in cassava breeding and pest control programmes. Breeding breakthroughs by IITA breeders and successive waves of new variety releases to national breeding programmes have resulted in highly productive new varieties being grown across the continent. An estimated 29 percent of the cassava area is now planted to new varieties. Nigerian production has increased, particularly in the last decade, partly through the adoption of higher yielding varieties, but also through an increase in the area cropped. Current estimates of cassava production are around 34 million tonnes per annum; with over 90 percent of this being consumed and about 50 percent marketed (Markelova, *et al.,* 2009). Yield increases have resulted in up to 80 percent increases in productivity with both smallholder farmers and urban consumers benefitting from higher incomes and improved food security.

IITA's ICP project alone has developed many new improved CMD-resistant cassava varieties with potential to yields over 30 tonnes per hectare. Nearly 300,000 farmers are now planting improved varieties and achieving yields increases from 11–25 tonnes per hectare with a 25 percent decline in the incidence of CMD. Nearly 500 processing enterprises and over 10,000 new jobs have been created, while revenue of over US$ 50 million has been generated from sales of such cassava products as mash, *gari*, odourless *fufu* flour, high-quality cassava flour for bread making, chips, *cassavita*, starch and ethanol.

New or unresolved challenges. In the future, processing technologies, packaging and the further development of industrial applications will be crucial to the sustained economic expansion of cassava production and marketing. While past growth has focused on markets for

human foods, future expansion will require further ventures into convenience foods, livestock feeds and industrial products.

This will require ongoing support for: building the capacity of local fabricators, improving access to capital for vulnerable groups, improving access to inputs, reducing high production costs (particularly of labour due to limited mechanisation), ensuring the sustained profitability of processing centres, and infrastructure improvement. Unfortunately the production capacity of cassava farmers has not always been sufficient to meet the demand from cassava processors, who consequently face seasonal supply constraints and operate below capacity.

Lessons learned. The public sector played two important roles, firstly by investing in cassava breeding and pest control programmes and secondly by introducing policy changes to reduce subsidies favouring cereals. These in combination triggered rapid booms in cassava production.

The private sector played a major supporting role not only by providing project finance but also by ensuring that early prototype processing technologies have been developed into often smaller, simpler and commercially viable models. An important lesson is that a market-led, private sector-driven developmental approach was the driving force of development in the industry. This was achieved through supporting processors and by linking smallholder farmers to the market. While this has led to emergence of large-scale processors in Nigeria, a number of challenges remain to be addressed. For any agricultural innovation to thrive and be sustainable all components of the system must be incorporated: technological, market, institutional and infrastructural.

Nigeria, rice production in Katsina state

This case study concerns an initiative supported by FARA's SSA CP PLS in KKM in the Dandume Local Government Area (LGA) of Katsina State, Nigeria. Rice is an increasingly important crop in Nigeria, grown for both sale and for home consumption. Dandume with its large lowland (f*adama*) areas has traditionally been a rice-growing area. However low productivity and poor marketing, as in other rice-growing areas have limited the potential benefits. Bringing together stakeholders within an IP at LGA level provided the forum for joint identification of challenges and opportunities that could be addressed by partners. Introduction and testing of new rice varieties, management, and storage practices combined with improved marketing led to higher productivity and household incomes. Initial success on the pilot scheme based on five villages is already being scaled out to all villages in the LGA. The success demonstrates the importance of local stakeholders being able to work together in solving simultaneously production, storage and marketing problems while linking and building the capacity of production and market actors.

Context. Rice is an important crop in Nigeria produced for both home consumption and sale and often considered a luxury food item for special occasions (Booz, 2009). There are many

varieties grown, some traditional, others introduced within the last 20 years. A general decline in agricultural production from the late 1970s to early 1980s, as a result of reliance on revenues from petroleum, also affected rice. Declines in oil revenue resulted in policy changes to address national food security by promoting domestic agricultural production. This included rice. This case study concerns an initiative at LGA level that was supported by FARA's SSA CP KKM PLS in the Northern Guinea agro-ecological zone (AEZ). It reports initiatives in Dandume LGA, Katsina State. Dandume with its large lowland *(fadama)* areas has traditionally been a rice-growing area and in common with other Nigerian rice-growing areas, low productivity and poor marketing limit the potential benefits.

The challenges. The International Fertilizer Development Center (IFDC) was tasked by FARA with coordinating and facilitating the bringing together of a range of partners to support IAR4D through the formation of an IP that addressed a number of challenges. These challenges were identified and prioritised by local farmers and the IP aimed to increase rice production to meet increasing consumer demand and to improve farmer income through the development of yield-increasing innovative farming practices that could be scaled out as rapidly as possible.

Innovation trigger. Low rice productivity and low incomes necessitated stakeholder action to identify and introduce measures to change the situation. Five villages in Dandume LGA were identified as part of a pilot scheme where stakeholders could work together to identify opportunities for change.

Stakeholder interactions and interventions. As part of this initiative, an IP based in Dadume supported by FARA's SSA CP in KKM PLS and CORAF/WECARD has been operating, based on agreed roles, responsibilities and activities for each partner. Partners include: elected male and female farmers representing farmer groups from each of the five villages; representatives from Dandume LGA Council; researchers from IFDC, who have been coordinating the IP; the International Centre for Development-Oriented Research in Agriculture (ICRA), National Agricultural Extension, Research and Liaison Services (NAERLS) at Ahmadu Bello University (ABU), the Institute of Agricultural Research (IAR) also at ABU, the Agricultural Engineering Department of ABU, the Cooperative Extension Centre (CEC) at the University of Makurdi in Benue State and the National Cereals Research Institute (NCRI) at Badeggi; Katsina State Government including the Agricultural Commissioner and extension staff from the Katsina Agricultural and Rural Development Authority (KTARDA); the private sector including Premier Seed Ltd, Maslaha Seed, Golden Fertilizer Ltd, NOTORE Chemicals, GoldAgric and OLAM, a rice processor, packager and distributor.

Specific responsibilities included: NAERLS facilitating participatory learning and action research activities supported by KTARDA and researchers; IAR and NCRI undertaking rice input and output market studies and contributing to LGA policy analysis. CEC coordinated some of the early community analysis and mobilisation for participatory research. ABU's Engineering Department supported farm mechanisation and local rice processing. The private sector was linked to the IP to ensure ready availability of inputs and to support marketing activities. After initial facilitation the LGA Council Chair assumed leadership of the IP, helping to build local ownership and ensure that LGA resources were available for scaling out new technologies and practices to other villages within Dadume LGA.

Activities have included: analysis of the rice value chain to identify challenges and opportunities to support rice intensification; assessment of the current agricultural policy situation regarding rice production in Dandume to evaluate constraints for advocacy within the LGA; identification and evaluation with farmers of options for improving rice production. This included new varieties, planting methods, fertiliser and weed management, and soil and water conservation methods; assessment of intensification options using drill markers and optimal fertiliser rates; and improved access to inputs through the private sector without fear of adulteration. Technical interventions included the introduction and farmer testing of:

- Improved seeds namely, high yielding, disease resistant, N-efficient and early-maturing (110 days) new rice for Africa (NERICA) varieties, developed by the African Rice Center (AfricaRice, previously the West Africa Rice Development Association, WARDA)
- Increased planting densities to improve yields
- New techniques for fertiliser application and measurements to ensure maximum soil absorption and utilisation
- Introduction of insecticides to help control termite infestations
- Use of ventilated storage and flat platforms for storage.

Lead farmers from each group initially tested the new rice varieties and management practices. Many of these farmers later become advocates for change, thereby assisting extension personnel through farmer-to-farmer extension practices.

Achievements. Stakeholder interactions have ensured farmer access to high-yielding new, rice varieties and markets resulting in substantially increased productivity. Both producers and processors have formed themselves into farmer associations and cooperative groups easing access to finance and other inputs. As a result, both small- and large-scale processors have emerged and product quality has improved.

Scaling out has occurred from the initial five pilot villages to all 11 villages in Dandume with the support of the LGA Council. Ownership and leadership of the IP now lies with Dandume LGA, which is now providing resources for additional inputs and mechanisation. The use of new technologies has spread widely beyond Dandume.

Rice-producing households report that productivity has increased by 10 percent and household income has increased by 20 percent (Nigeria Bureau of Statistics, 2010).

Challenges. Problems incurred by the regularity, duration and intensity of rainfall associated with climate change continue to pose challenges.

Key success factors. The IP has addressed an opportunity, prioritised by Federal, State and Local Governments, where farmers traditionally produced rice. The IP successfully brought together the key actors in a process where each was able to learn successfully from the other, thereby increasing rice productivity and raising farmer incomes in a manner that created local ownership. This is already being widely scaled out.

Lessons learned. Innovation in Nigeria's rice industry clearly indicated that the incorporation of different components of agricultural innovation in the package and the existence of synergy between the different components of the value chain were critical factors for success.

A comparative analysis of the case studies

Contrasting cases

The case studies offer a series of contrasts including different commodities, operational levels at national or district level, and success drivers, institutional, technical or policy innovations. At the same time comparisons have been possible between planned or opportunity-driven innovation and the stage reached, be this at initiation, or assessment, or achieved sustainability. Other contrasts include the challenges and opportunities addressed; i.e., how stakeholders have interacted to stimulate innovation. This has allowed success factors and key lessons to be identified.

The case studies were broadly classified into five development groups, (Table 2 in the second section). These included successful innovation based on:

1. Traditional crops – cassava in Ghana and Nigeria, legumes (including seed, climbing beans and groundnuts) in Malawi and Rwanda, and vegetables in Niger.
2. Export cops – bananas in Cameroon, cotton in Malawi, horticulture in Kenya, pineapples in Ghana.
3. Niche crops – *Sidama* coffee in Ethiopia and garlic in Cameroon, both also export crops.
4. Livestock – beef in Botswana and dairying in Kenya and Uganda.
5. NRM in Malawi and Zambia for both staple and export crops.

Scale, type and phase of the innovation process

Of the 21 cases, 12 were instigated at national and 9 at district or local government level, 13 were planned and led by the public sector, while 9 were opportunistic, with the private sector or NGOs taking the lead. 11 cases have reached a stage where sustainability has or is being reached, while the remaining 10 are in the latter stages of learning and assessing from the process.

Challenges and opportunities

Each case study experienced a wide range of challenges with which it was faced before the innovation process was triggered. These have been grouped under six broad categories: policy; infrastructure; institutions; markets; support services; and farming systems. Policy challenges included both lack of, or poor policy and regulation. Poor infrastructural development includes

poor road access, lack of power and inadequate marketing facilities. Under institutions, challenges included weak institutional structures, often compounded by little contact or conflicts between stakeholders. In addition the absence of, or poor farmer organisation meant that producer organisations were often unable to take the initiative. Poorly developed markets, again poor infrastructure, high cost of inputs and low producer prices compounded these problems. Under support services, challenges included poor access to inputs due to lack of finance and market facilities, a lack of or poor access to knowledge and poor extension sometimes associated with inappropriate research. Consequently challenges to improving farming systems included use of unsuitable varieties, pests, diseases and poor management practices, resulting in low or declining yields and hence low incomes for farmers. These challenges are summarised in Figure 3, and detailed for each case study in Table 4

Figure 3: Challenges identified

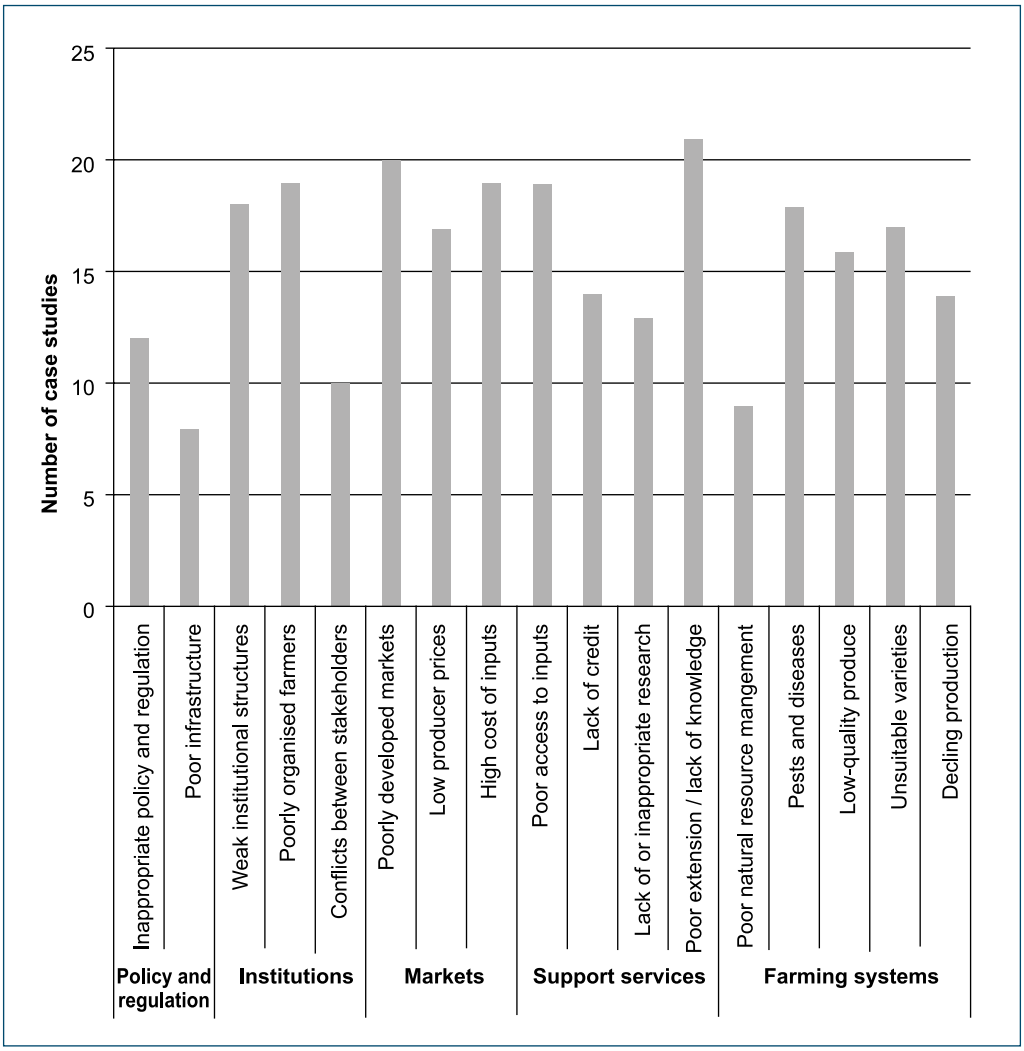

Table 4: Challenges identified in each case study

				Institutions			Markets			Support services				Farming systems				
Region/country	Commodity	Inappropriate policy and regulation	Inadequate infrastructure	Weak institutional structures	Poorly organised farmers	Conflicts between stakeholders	Poorly developed markets	Low producer prices	High cost of inputs	Poor access to inputs	Lack of credit	Lack of or Inappropriate research	Poor extension/ lack of knowledge	Poor NRM	Pests and diseases	Low quality produce	Unsuitable varieties	Declining production
Eastern Africa																		
Ethiopia	Coffee			1	1		1	1	1	1		1	1	1		1		
Kenya	Dairy	1	1	1	1	1	1	1	1	1	1		1					1
	Horticulture	1	1		1		1					1	1	1	1		1	
	Sweet potatoes				1					1		1	1		1		1	
Rwanda	Climbing beans				1		1		1	1		1	1		1		1	
Uganda	Dairy	1	1	1	1	1	1	1	1	1	1		1		1			1
Southern Africa																		
Botswana	Beef cattle	1		1	1		1	1	1				1		1	1		1
Malawi	Cotton	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Groundnuts	1		1			1	1	1	1		1	1	1	1	1	1	1
	Legume seed	1		1		1	1		1	1			1		1	1	1	1
	CA (maize and tomatoes)			1	1		1	1	1	1	1		1	1		1	1	1
	ISFM (maize and legumes)			1	1		1	1	1	1	1		1	1	1	1	1	1
	Vegetables			1	1		1	1	1	1	1		1	1	1	1	1	1
Zambia	CA (maize and legumes)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Region/country	Commodity	Inappropriate policy and regulation	Inadequate infrastructure	Institutions			Markets			Support services				Farming systems				
				Weak institutional structures	Poorly organised farmers	Conflicts between stakeholders	Poorly developed markets	Low producer prices	High cost of inputs	Poor access to inputs	Lack of credit	Lack of or Inappropriate research	Poor extension/ lack of knowledge	Poor NRM	Pests and diseases	Low quality produce	Unsuitable varieties	Declining production
West Africa																		
Cameroon	Bananas	1		1	1		1	1	1	1	1	1	1		1	1	1	1
	Galic			1	1		1	1	1	1	1	1	1	1	1	1	1	
Ghana	Pineapples	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1
	Cassava	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1
Niger	Vegetables			1	1	1	1	1	1	1	1	1	1		1	1	1	1
Nigeria	Cassava	1		1	1	1	1	1	1	1	1	1	1		1	1	1	
	Rice		1	1	1	1	1	1	1	1	1		1		1	1	1	
	Total	**12**	**8**	**18**	**19**	**10**	**20**	**17**	**19**	**19**	**14**	**13**	**21**	**9**	**18**	**16**	**17**	**14**
	Percentage of case studies	57%	38%	86%	90%	48%	95%	81%	90%	90%	67%	62%	100%	43%	86%	76%	81%	67%

Of the six categories, market challenges were often the most serious with over 90% of cases being affected whether by poorly developed markets – 95%, low prices – 81%, or high input costs – 91%. All cases were challenged in one way or another by poor support services notably lack of knowledge/poor extension – 100%of cases, lack of access to inputs – 90%, lack of credit – 67% and lack of or inappropriate research – 62%. Institutional challenges included weak institutional structures – 86% and poorly organised farmers – 90%, with conflicts between stakeholders accounting for 48%. With regards to farming systems, pests and diseases were stated as being the greatest challenges – 86% of cases, lack of suitable varieties – 81%, low-quality produce – 76%, declining production – 67%, and poor NRM – 43%. Clearly these challenges are interrelated with one often being the consequence of another.

Inappropriate policy was regarded as a challenge in 57% of cases and although poor infrastructure was regarded as a challenge in only 38% of cases, poor marketing facilities – 95% of cases were often tied to poor infrastructure.

Stakeholders and their roles during the innovation process

Stakeholders came from the entire spectrum of the public, private, and NGO actors across the economy, undertaking roles that evolved over time, details of which are shown in Annex 1. Interaction, collaboration and coordination were essential components of all cases, often achieved through a process that assisted in bringing together the actors, changing attitudes and building partnerships based on shared concerns and a need to identify opportunities for improvements. In some cases farmers themselves took an active role in the early stages, but in most the public sector took the lead in providing policy guidance, research and other support. In some cases NGOs or private commercial companies took the initiative with donor funding playing an important role in most cases.

Coordinating roles

At the start of the innovation process responsibility for coordination was often shared, especially where primary production and processing activities had not been linked previously. Often it was research or another public-sector body that took the lead, with NGOs playing a support role for farmers especially during early stages. In only two cases were farmers sufficiently organised to take the lead at the start of the innovation process, this often being triggered by a commodity or sector study presented for stakeholder discussions and leading to recommendations to government for policy changes. Special projects, often donor-funded played an important role in coordinating stakeholders, with research often taking an early lead (Figure 4 and Table 5)

As the innovation process continued coordination often shifted to farmer organisations taking greater interest and sometimes assuming leadership as their capacity for this role increased. Backstopping for weaker partners formed an important service provided by research, NGOs and occasionally the private sector. It was also apparent that local or district government representatives played an increasingly important role, as the research lead reduced and local capacity and capability increased.

Table 5: Coordinating roles at the start and end of the innovation process

Region/country	Commodity	Coordinating body – start								Coordinating body – end						
		Farmer organisation	Parastatal/ public	Special project	Research	Local Government	Private sector	NGO	Private sector	Farmer organisation	Parastatal/ public	Special project	Research	Local Government	Private sector	NGO
Eastern Africa																
Ethiopia	Coffee							1		1						
Kenya	Dairy		1					1		1	1					
	Horticulture		1				1				1				1	
	Sweet potatoes				1			1					1			
Rwanda	Climbing beans				1									1		
Uganda	Dairy		1					1		1	1					
Southern Africa																
Botswana	Beef cattle	1	1							1	1					
Malawi	Cotton							1							1	1
	Groundnuts	1			1					1						
	Legume seed							1								1
	CA (maize and tomatoes)				1									1		
	ISFM (maize and legumes)				1									1		
	Vegetables				1									1		
Zambia	CA (maize and legumes)							1		1						
West Africa																
Cameroon	Bananas		1							1	1					
	Ginger		1					1		1	1					
Ghana	Pineapples						1			1					1	
	Cassava		1							1	1					
Niger	Vegetables				1								1	1		
Nigeria	Cassava			1							1			1		
	Rice				1									1		
	Total	**2**	**7**	**1**	**8**	**0**	**2**	**8**	**0**	**10**	**8**	**0**	**2**	**7**	**3**	**2**
	Percentage of case studies	10%	33%	5%	38%	0%	10%	38%	0%	48%	38%	0%	10%	33%	14%	10%

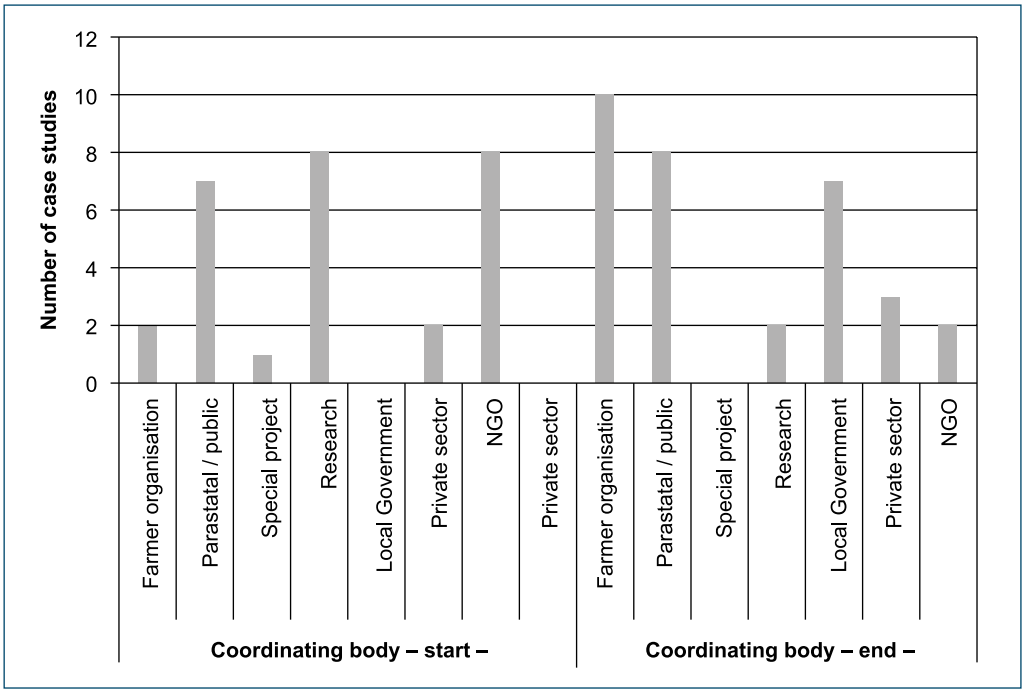

Figure 4: Coordinating bodies at the start and end of the innovation process

Public sector roles

Active government involvement and a commitment to agricultural growth proved central to all the case studies whether they were planned or opportunity driven, with public sector actors playing important roles, even when they did not take the lead or were not involved in the early stages. Public-sector support proved essential for: policy and regulation; infrastructure improvement research; extension and capacity development; and in some cases intervening to improve marketing and provide incentives for the private sector (Table 6 and Figure 5).

The provision of key public goods, particularly government-financed agricultural research was directly responsible for triggering growth in most of the case studies reviewed. In all cases the availability of public roads and transport facilities contributed indirectly to their success or failure.

In the planned initiatives, the public sector played a key role from the beginning, while in the opportunity-driven innovations, the public sector tended to play a role after the process had been initiated. Agricultural research on vegetatively propagated and staple food crops was often funded by the public sector. Other publicly funded research crops included cassava, bananas, rice and legumes. For instance, cassava, which is prized for its ability to thrive in harsh conditions, produces in poor soils even in times of drought. The crop provides a crucial source of income for hundreds of thousands of smallholder famers. As such the importance of having disease-resistant varieties is vital and – being one of the world's most important food crops – it is essential that cassava is protected from pests and diseases in particular whitefly, green

mite and the viruses that cause cassava mosaic and brown streak diseases. Successful control of pests and diseases formed an integral part of publically funded research programmes. Similarly, control of contagious livestock diseases was a public sector responsibility. Although private- sector research played a role in horticulture and pineapple improvement there were few examples of private seed companies taking a coordinating role.

In some cases although government may have been funding research and training activities, these were sometimes poorly integrated with the initiatives of other actors and not necessarily in support of the innovation process or sector development.

Turning to policy, open trade policies were important for growth of export commodities and niche crops. These included, bananas and garlic in Cameroon, beef in Botswana, *Sidama* coffee in Ethiopia, horticulture in Kenya, pineapples in Ghana and cotton in Malawi.

Table 6: Public sector roles in each case study

Region/ country	Commodity	Policy and regulation	Infrastructure	Research	Extension and training	Markets	Incentives for private sector	Sector coordination
Eastern Africa								
Ethiopia	Coffee	1		1	1			
Kenya	Dairy	1		1	1			
	Horticulture	1						
	Sweet potatoes	1		1	1			1
Rwanda	Climbing beans	1		1	1	1		1
Uganda	Dairy	1		1	1			
Southern Africa								
Botswana	Beef cattle	1	1	1	1	1		1
Malawi	Cotton	1		1	1			
	Groundnuts	1		1	1			
	Legume seed	1	1	1	1		1	
	CA			1	1			1
	ISFM			1	1			1
	Vegetables			1	1			1
Zambia	CA	1		1	1			
West Africa								
Cameroon	Bananas	1		1	1			1
	Garlic		1	1	1			1
Ghana	Pineapples	1	1	1	1		1	1
	Cassava		1	1	1			1
Niger	Vegetables		1	1	1			1
Nigeria	Cassava	1	1	1	1			1
	Rice	1	1	1	1	1		1
Total		**15**	**8**	**20**	**20**	**3**	**2**	**13**
Percentage of case studies		71%	38%	95%	95%	14%	10%	62%

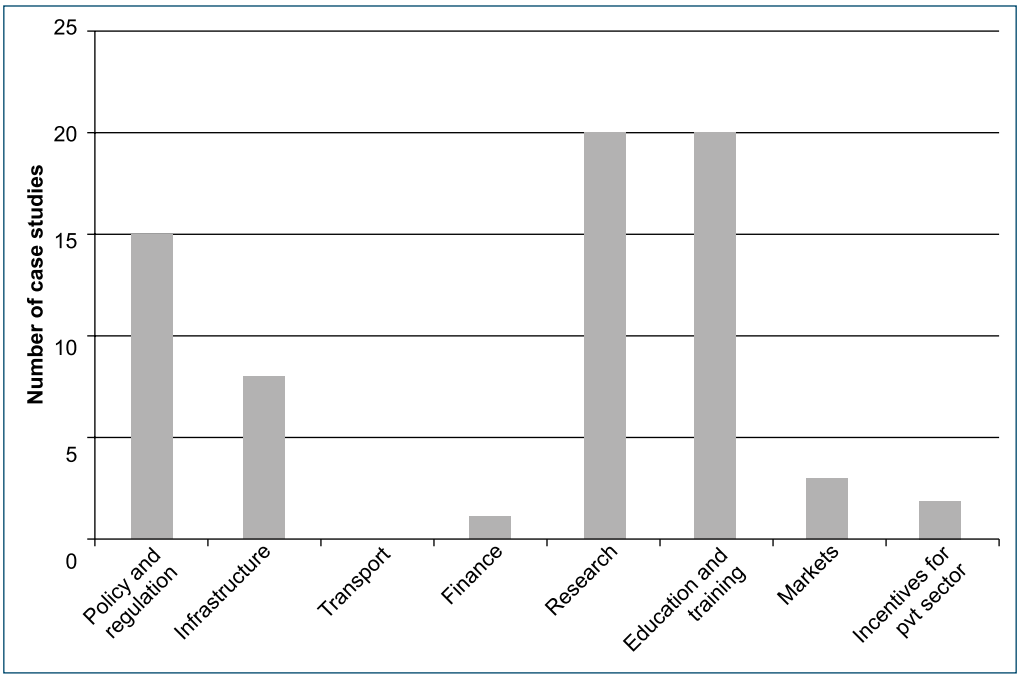

Figure 5: Public sector roles

Private sector roles

The private sector played a key role in all of the case studies (Figure 6 and Table 7) This sector included input supply companies and agri-dealers, processing and export companies, and sometimes private-sector associations. In many cases input supply companies not only ensured inputs were available, but also provided technical advice to farmers through training programmes, field days and support to agri-dealer networks through product training and occasional provision of short-term credit.

In Kenya private traders provided the driving force for market development, input supplies and market organisation for horticultural products. Cassava processing in Ghana and Nigeria involved a broad range of privately owned small-, medium- and large-scale processors in grating, milling, pressing, fermenting and toasting processes with periodic input from public sector research. In Kenya and Uganda informal markets for raw milk have dominated the dairy industry ever since milk marketing was liberalised. Processing companies, whether owned by a farmer association or cooperative, a parastatal, or a private company proved essential in providing a market, sometimes providing production advice, sometimes linked to research services and sometimes farmer credit. In Malawi, growing soybean in rotation with maize greatly increased when a small milling company supplied improved seed and contracted with farmers to purchase their harvest. Trade and industry associations, whether for input supplies or processing, proved essential for both strengthening the market and liaising with government on policy concerns. It was often when the public-sector actors were directly involved with commodity associations that the most favourable environment for enabling innovation was created.

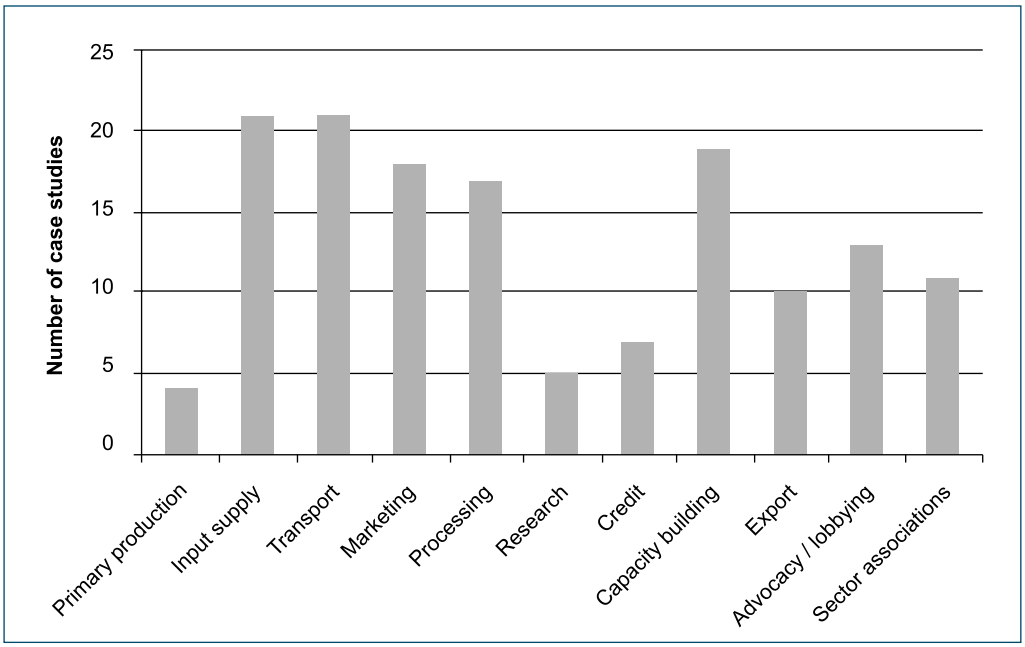

Figure 6: Private sector roles

Private firms' support for research and extension occurred when they saw direct benefit to their business. In Zambia, support for research and extension in CA provides a good example. In this case Durant, a private cotton company, supported ZNFU's establishment of a Conservation Farming Unit to promote suitable practices for maize and cotton and funded a research farm to undertake further research on CA.

However, in the case of less-valuable crops, for which the private sector cannot benefit from their investments, public research and extension remain essential.

Although farmers and their representative bodies are the largest component of the private sector, because they were major beneficiaries of the innovation process, they have been excluded from this categorisation,

Farmer roles

In some cases, for example, in Botswana's cattle industry, farmers successfully helped to shape the policy environment through production of a well researched sector study that provided the basis for consultation and discussion. However such a process requires effective organisation, funding and political access. Unfortunately in most cases smallholder farmers were not been able to directly influence policymaking. In the case of the cotton sector in Malawi other stakeholders are supporting the organisation and establishment of a National Cotton Farmers Association. In other cases NGOs supported the establishment, coordination and facilitation of farmer groups and representative bodies.

The case studies demonstrated that farmers respond when new technology is available and at the same time there is a financially attractive market. This is typified when the two are

Table 7: Private sector roles in each case study

Region country	Commodity	Primary production	Input supply	Transport	Marketing	Processing	Research	Credit	Capacity building	Export	Advocacy/lobbying	Sector associations
Eastern Africa												
Ethiopia	Coffee		1	1	1	1			1	1		
Kenya	Dairy		1	1	1	1	1	1	1	1	1	1
	Horticulture	1	1	1	1	1	1	1	1	1	1	1
	Sweet potatoes		1	1		1						
Rwanda	Climbing beans		1	1	1							
Uganda	Dairy		1	1	1	1			1	1	1	
Southern Africa												
Botswana	Beef cattle		1	1	1	1		1	1	1	1	1
Malawi	Cotton		1	1	1	1		1	1	1	1	1
	Groundnuts		1	1	1	1			1	1		
	Legume seed	1	1	1	1	1			1		1	
	CA		1	1	1				1			
	ISFM		1	1	1	1			1			
	Vegetables		1	1					1			
Zambia	CA		1	1	1	1	1	1	1		1	1
West Africa												
Cameroon	Bananas	1	1	1	1	1	1	1	1	1	1	1
	Garlic		1	1		1			1	1	1	1
Ghana	Pineapples	1	1	1	1	1	1	1	1	1	1	1
	Cassava		1	1	1	1			1		1	1
Niger	Vegetables		1	1	1				1			
Nigeria	Cassava		1	1	1	1			1		1	1
	Rice		1	1	1	1			1		1	1
Total		**4**	**21**	**21**	**18**	**17**	**5**	**7**	**19**	**10**	**13**	**11**
Percentage of case studies		19%	100%	100%	86%	81%	24%	33%	90%	48%	62%	52%

synchronised as in Kenya's dairy industry. As soon as the market was liberalised, smallholder milk producers' sales to urban raw milk markets increased significantly. Likewise farmers responded when both input and output markets were readily available at prices that ensured reasonable profits, examples being beef cattle in Botswana, *Sidama* coffee in Ethiopia, cassava in Ghana and Nigeria and horticulture in Kenya.

Varietal change was often easier to effect than other agronomic changes. For instance, CA requires significant change in existing management practices, including new crop rotations and long-term land management. This requires greater focus on extension support than new varieties, which can raise productivity without significantly changing management practices.

With regards to research, there is increasing evidence of farmers' innovative capabilities, with on-farm participatory research playing a key role in linking not only farmers and researchers but also providing a focal point for involvement of other stakeholders in the identification of constraints, seeking alternative solutions, and the design and evaluation of research results. This is typified in the case studies on the FARA-supported SSA CP PLS in Malawi, Nigeria, Niger and Rwanda IPs.

NGO roles

NGOs have played different roles, sometimes serving as coordinating bodies in promoting better interaction between public and private organisations, and sometimes in assisting farmer organisations to create self-help groups. However, their major role was in supporting the development of networks of farmers and in scaling up the use of technologies and marketing practices to other farmers outside the immediate target area of the innovation process.

Financial organisation roles

Financing organisations did not feature strongly in most of the case studies, since they regard credit for smallholder producers as high-risk, compounded by a history of poor credit repayments. However, a number of rural financing institutions were increasingly enthusiastic about lending to small groups of farmers. By far the most important sources of credit were processing companies to contract growers and input supply companies to agri-dealers.

International stakeholders

International research organisations, international NGOs and international companies (often supported by donors) played a key role in catalysing coordination between stakeholders. This included: funding sector and value-chain studies to identify constraints and opportunities; funding stakeholder meetings and workshops; together with providing the initial foundation for either remedial action or new innovations.

Types and consequences of interaction

The case studies provide examples of many stakeholder interactions public–private and private–private and as well as those occurring at regional and international levels. The issues addressed in these broad categories of stakeholder interactions are summarised in Figure 7 and detailed in Annex 3.

The most important issues addressed in public–private interactions were the building of partnerships, capacity building and planning, monitoring, and assessing activities. Private–private interaction was essential in building farmer organisations and in arranging sales and contract details. Regional and international interactions helped to develop networking arrangements, trade and health issues including FairTrade and organic product registration.

The consequences of these interactions resulted in policy and institutional, economic, support service, and production outcomes (Figure 8). Within policy and institutional outcomes, improved interaction between stakeholders, improved cooperation and trust and the formation

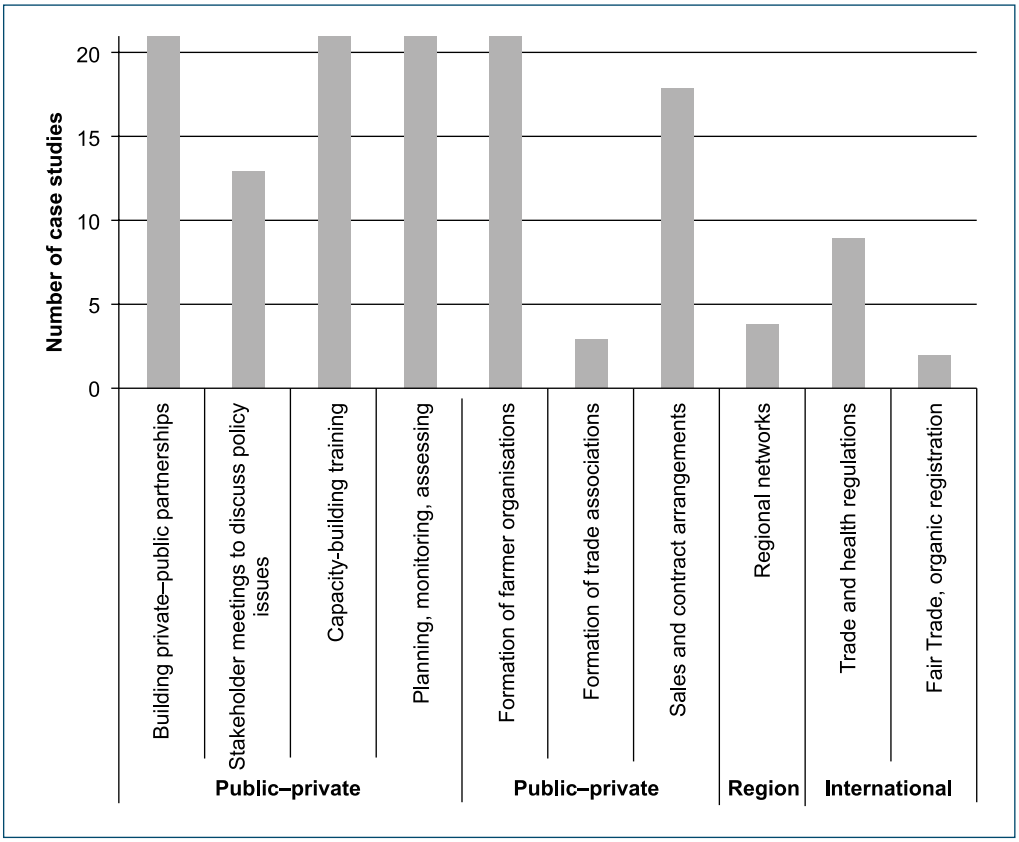

Figure 7: Issues addressed during stakeholder interactions

of farmer organisations were found to have played key roles in the innovation process. Within economic outcomes, improved markets and higher producer prices were important. Under support service outcomes, improved access to information was key. Key production outcomes included the use of improved varieties and management practices that generated increased productivity and higher incomes.

Context comparison before and after success

A comparison of the context before and after innovation success shows important changes in the six categories where challenges were addressed namely: the policy environment; infrastructure; institutions; access to efficient markets; effective support services and importantly the productivity of the farming system. The challenges identified were shown in (Figure 3). Each category for each case study was ranked before and after success using a scale of one to five, one being very poor and five excellent and the two situations were compared using a radar diagram (Figure 9). This illustrates the mean of the context rankings for all the case studies, before and after. Although scorings were somewhat subjective, they demonstrate

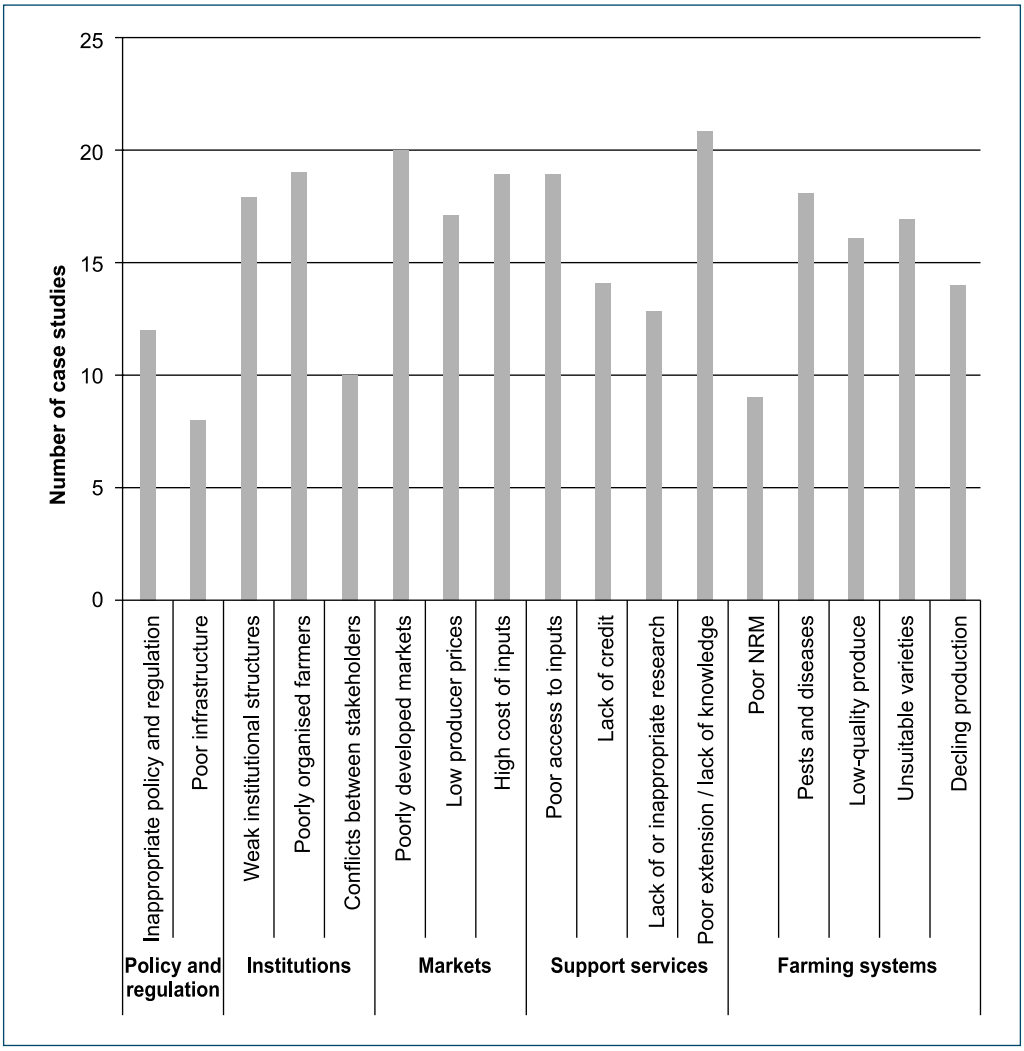

Figure 8: Consequences of stakeholder interactions

the importance of addressing all six contextual areas to ensure successful innovation. The mean for all the case studies before innovation shows a score of two indicating a poor policy and institutional environment. Poorly developed markets and weak support services with the consequence that farming systems also ranked low. Clearly under such a scenario, innovation is unlikely to be enabled. This compares with a very different situation after innovation when the ranking of each contextual area appreciably improved with a mean score close to four, out of a theoretical maximum of five.

Although the before and after ranking varied considerably between the case studies, improvements did occur consistently across all categories.

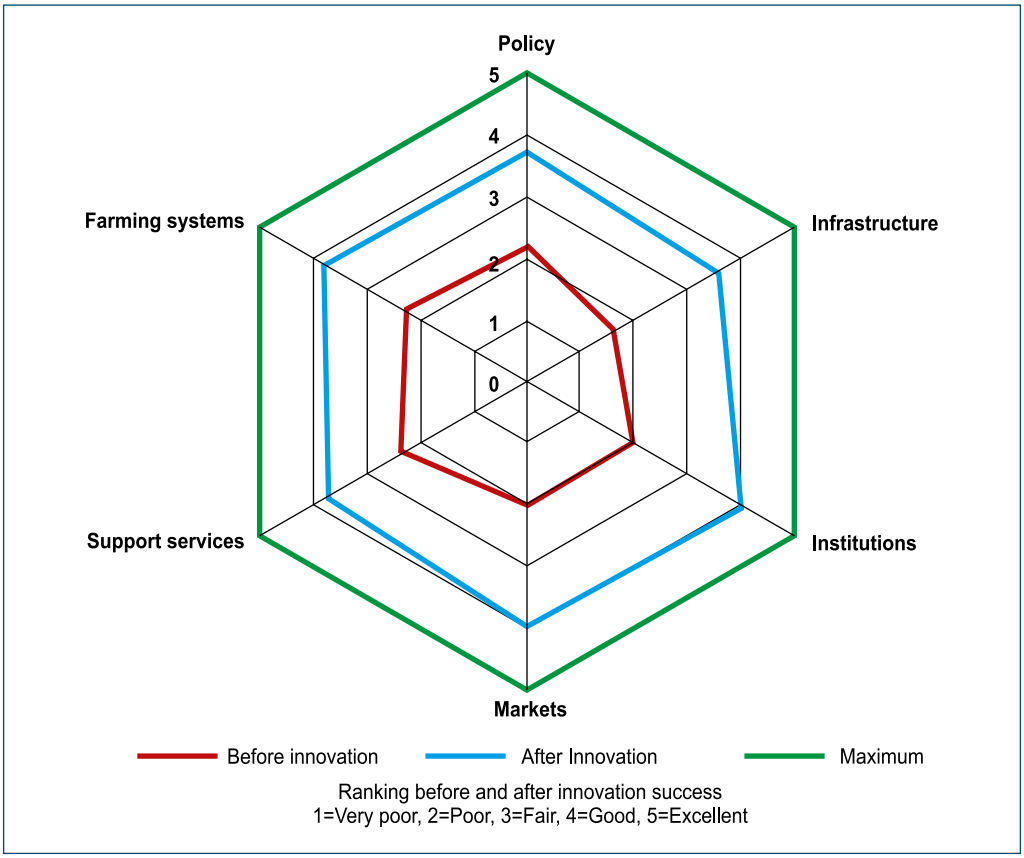

Figure 9: Key enabling factors contributing before and after innovation

Table 8: Context ranking before and after innovation for each case study

Region/Country	Commodity	Before Innovation						After innovation					
		Policy	Infrastructure	Institutions	Markets	Support services	Farming systems	Policy	Infrastructure	Institutions	Markets	Support services	Farming systems
Eastern Africa													
Ethiopia	Coffee	1	1	2	1	2	2	4	4	4	4	4	4
Kenya	Dairy	2	1	2	2	3	3	4	4	4	4	4	4
	Horticulture	2	1	2	2	2	3	4	3	4	4	4	3
	Sweet potatoes	2	2	2	1	2	3	2	2	3	3	3	3
Rwanda	Climbing beans	2	2	2	4	2	2	3	3	4	4	4	4
Uganda	Dairy	2	1	2	1	2	2	4	4	4	4	3	3

Region/Country	Commodity	Before Innovation						After innovation					
		Policy	Infrastructure	Institutions	Markets	Support services	Farming systems	Policy	Infrastructure	Institutions	Markets	Support services	Farming systems
Southern Africa													
Botswana	Beef cattle	2	3	2	2	3	2	4	4	4	5	3	4
Malawi	Cotton	2	2	2	2	2	2	4	2	4	4	3	3
	Groundnuts	2	2	3	1	2	2	4	4	4	4	4	4
	Legume seed	2	2	2	2	2	2	4	4	4	4	4	4
	CA	2	2	2	2	2	2	3	3	4	4	4	4
	ISFM	2	2	2	2	2	2	3	3	4	4	4	4
	Vegetables	2	2	2	2	2	2	3	3	4	4	4	4
Zambia	CA	2	2	2	2	2	2	4	3	4	4	4	4
West Africa													
Cameroon	Bananas	3	1	2	2	3	3	4	3	4	5	4	4
	Garlic	3	1	2	2	3	2	4	3	4	5	3	4
Ghana	Pineapples	3	2	2	3	2	2	4	4	5	5	4	4
	Cassava	3	2	2	3	2	3	3	3	3	4	4	3
Niger	Vegetables	3	2	1	3	3	2	5	5	4	3	4	5
Nigeria	Cassava	3	2	2	3	3	3	4	4	4	3	3	3
	Rice	2	2	2	2	3	2	4	5	5	5	4	5
	Overall mean	**2.2**	**1.7**	**2.0**	**2.1**	**2.3**	**2.3**	**3.7**	**3.5**	**4.0**	**4.0**	**3.8**	**3.8**

Ranking before and after innovation success: 1=Very poor, 2=Poor, 3=Fair, 4=Good, 5=Excellent

Table 9: Facilitating and inhibiting factors and key interventions that enabled innovation

Area	Factors effecting innovation		Key interventions made
	Facilitating	Inhibiting	
Policy	Enabling public policies and regulations	Restrictive policies	Deregulation of markets, ensuring competition with appropriate standards Export parity pricing
Institutions	Existence and interaction of stakeholder groups	Stakeholders act in isolation	Building and supporting partnerships including capacity building Encouraging cooperation, building trust and common vision, joint planning and implementation with agreed roles
Infrastructure	Public sector provision of basic infrastructure	Inadequate roads, communication and power	Ensuring that infrastructure development meets the need for market development
Market	Effective input supply systems	Non-availability or high cost of inputs relative to output prices	Involving the private sector and ensuring market driven approaches
	Market opportunities	Undeveloped or no market demand	Seeking opportunities to add value along market chains
	Market competition	Monopolistic inefficiencies and corrupt practices	Public and private sector maintenance of competition and standards
Support services	Effective extension capability and capacity	Lack of knowledge and information	Improving access to information, knowledge and training
	Effective research capability and capacity	Lack of appropriate research	Ensuring farmer involvement in setting research agendas and participation in implementation and evaluation Facilitating collaborative learning Building local ownership with backstopping
	Supportive funding mechanisms	Lack of innovative funding mechanisms	Ensuring credit meets the needs of the agricultural sector
	Donor support for local priorities	Inadequate funding	Increased support of agricultural development initiatives

Key factors contributing to success

The case studies demonstrated that successful multiple stakeholder approaches were dependent on a wide range of facilitating or inhibiting factors and interventions that enabled innovation and improved the productivity of farming systems. These factors were characterised in the same broad category areas identifying case study context, namely: policy, institutions, infrastructure, market and support services (Table 9).

Clearly, enabling public policies and regulations are paramount. Deregulation of markets whilst ensuring competition and compliance with minimum standards whether for internal or export markets often laid a solid foundation for enabling innovation. However, the existence or creation of a network of research, training and development stakeholder groups drawn from both public and private sectors was a pre-requisite. Such groups need to have the capacity and be able and willing to interact and work together in an environment that encourages

cooperation, builds trust, and establishes a common vision for the future. Creation of this vision needs to have been built on an assessment of the challenges and realistic opportunities for improvement along a value chain. Most important was the establishment and participation of effective and representative farmer organisations that communicate with members. In many cases this required support and capacity development. A facilitation process that encourages dialogue, identifies and prioritises opportunities, encourages joint planning with agreement on partner roles and implementation responsibilities played an important role.

Improved infrastructure, particularly roads, communication and power clearly provide the basis for ensuring inputs can be made available at affordable prices and outputs delivered to market. This was often a precursor in seeking opportunity to add value along market chains.

Facilitation was frequently necessary to promote collaborative learning and assessment processes. This requires not only the necessary skills, but also the enthusiasm and determination to ensure that key actors continued to participate and play their roles. This can be a difficult task, requiring the support of policy and decision makers. Although research can be an important component, it is often not the central one, and in the early stages interventions to build capacity, access and use existing knowledge and foster learning are required. Clearly ready and timely access to inputs including finance is crucial. This needs to be based on effective and competitive marketing, whether for domestic or export markets, with social and environmental concerns being addressed.

Ultimately local participants build sustainability on ownership with effective back-up research and development organisation in both the private and public sectors. Of the 21 case studies all had succeeded to a greater or lesser extent, although there were elements that needed to be addressed or reinforced to ensure long-term sustainability. Of the 21 case studies, 11 had reached the sustainability phase, while 10 were still addressing ownership by local participants.

Looking to the future

Challenges

As Africa faces the challenge of creating favourable conditions for enabling the innovation required to stimulate poverty reduction and agricultural growth, the context for this is changing. Increasing population, rapid urbanisation, land resource degradation, climate change and the present disarray in world commodity markets pose serious challenges. Global integration of many agricultural supply chains are placing increasing control in the hands of large-scale retailers, processors and exporters, whose compliance conditions are often difficult for smallholder farmers to meet.

Until recently agricultural growth had resulted from an expansion of the area under crops or grazing rather than higher yields. However, demographic pressures have largely exhausted available land and in many areas, average farm sizes are falling, with typically areas of 2–5 ha dominating. Unfortunately land degradation has often been accompanied by increasing land scarcity and deforestation, shorter fallow periods, mono-cropping and low fertiliser applications that have all contributed to declining soil fertility and soil erosion (Sanchez *et al*., 1997). In addition climate change is likely to compound many of these problems. This combination of increasing land scarcity, land degradation and climate change means that future innovation must of necessity include improved NRM practices including CA, as illustrated by the case studies in Malawi and Zambia. Rapid urbanisation will place additional responsibility on rural areas to produce surpluses at affordable prices. IAR4D has the potential to play a leading role in the scenarios being played out as a key framework that allows the integration of NRM issues with other vital issues in agricultural development.

Given the heterogeneity within African agriculture participatory research involving scientists and farmers will become increasingly important, not only to identify practices for specific conditions, but also to ensure that farmers are increasingly able to drive the research agenda. Improved agronomic practices are likely to form a major component of these efforts, and this requires a sound understanding of existing farming systems and farmers' constraints and priorities. Technology development requires not only early interaction between farmers and researchers but also an increased focus on building and maintaining effective extension systems.

Advances in the biological sciences, including molecular biology and genetic engineering, offer considerable potential to develop new crop varieties that can prosper in Africa's drought/flood and pest-prone environments. However they require increasingly specialised staff and

laboratories as well as effective biosafety regulations and protocols to protect human health and the environment (Haggblade and Hazell, 2010). This provides opportunities for African research organisations to build partnerships in creating the resources for this work. Regional research networks in Eastern, West and Southern Africa (ASARECA, CORAF and SADC–Food Agriculture and Natural Resources (FANR) together with FARA and the CGIAR centres are already playing this role in support of national research systems resulting in increased coordination and specialisation.

Commodity prices for Africa's traditional export commodities such as coffee, cotton, cocoa and tea generally declined from the mid-1970s to mid-2000s (World Bank, 2007). Over this period the composition of world agricultural trade shifted from bulk commodities to processed agricultural and horticultural goods, requiring strict attention to health and food safety issues, product quality and sanitary standards. In many instances these stringent requirements have acted as non-tariff barriers and Africa's share of world agricultural trade fell sharply. At the same time world commodity prices have moved sharply higher from the mid-2000s and fertiliser and energy prices are likely to remain high. This requires improvement in the efficiency of fertiliser use and the development of alternative management practices to maintain soil fertility assumes increasing urgency.

Relaxation of restrictions on foreign investment, foreign exchange markets and international trade has resulted in rapid consolidations in food retailing and exports. This is likely to trigger a parallel consolidation in wholesaling, processing and distribution, with changing market requirements for African farmers. Larger retailers, processors and exporters require larger quantities of product, consistent quality, standard packaging, food safety compliance and guaranteed timing of deliveries, all things that most small-scale farmers find difficult to achieve without some form of group action, investment and support. This requires an increasing facilitating role to stimulate innovation, establish standards, provide market information, negotiate and enforce contracts and mediate disputes.

Lessons

Interventions to encourage innovation depend on the initial context and how this changes over time. They should not focus first on developing research capacity, but should be developed from the start in a way that encourages interactions between public, private and civil society organisations. Stakeholders who initiate an innovation process can be either public or private. The innovation can be policy- or market-driven, either planned or opportunity-led, both of which are characterised by three distinct phases: 1. Stakeholder engagement; 2. Shared planning, implementation, learning and assessment; and 3. Ensuring a sustainable and dynamic innovation system. By the third stage the innovation is unlikely to be either public- or private-led, but to involve a high level of collaboration between all actors. This is essential if the sector is to be able to respond to new challenges and new opportunities in economically, socially and environmentally inclusive ways. The requirements to reach this stage include:

Building and supporting partnerships

- Engagement and collaboration between stakeholders is an essential component that needs to build on existing links where participants are already working together, rather than

creating completely new ones. Such engagement is a necessary and consultative process that can be time-consuming. It requires the creation of trust between stakeholders, a willingness to work together, raising awareness of the challenges faced and the creation of a common vision for the future. Joint activities help to build ownership and accountability between partners.

- Facilitating or brokering these networks and alliances is a critical role in enabling innovation and incurs an indispensable cost that is often overlooked. Unfortunately the competencies required for this role are scarce and in many case investors are unwilling to fund this crucial role. The market rarely pays for this and support by public funds is often required as a catalyst.
- The case studies demonstrated different forms of facilitation. Some were initiated by farmer organisations, others by private companies or NGOs, with most being initiated by ministries of agriculture or research institutions. This does however indicate that it is not the type of organisation that is important, but rather the need for facilitation and capacity building to create effective alliances.
- Facilitation or brokering needs 'champions', either individuals or institutions, who understand the often-complex institutional and regulatory structures, in which alliances need to be encouraged. This requires individuals with the experience and skills to coordinate networks of actors from public and private sectors.
- IPs represent a strong approach to empowering participating stakeholders, building capacities and identifying opportunities able to analyse and alleviate constraints or add value within a systems chain. However the IP itself needs to be dynamic and evolve so that it becomes stronger and increasingly relevant.

Creating strong farmer organisations

- Strong farmer organisations at all levels have a critical role to play in increasing smallholder productivity and livelihoods, improving competitiveness and increasing bargaining power for markets, services and enhancing the policy environment. It is essential that farmer organisations are able to speak with an informed and unified voice and are able to engage with other stakeholders. At the same time they must be representative and able to communicate with members and other farmers.

Involving the private sector and ensuring market-driven approaches

- Market constraints are successfully dealt with through better understanding and information about demand and supply, market price and its determinants, and in particular market linkages. As such the private agribusiness sector needs to be involved not only in the supply of inputs and purchasing outputs but also in developing market opportunity and capacity-building initiatives.
- Understanding the positive role the private agribusiness sector can play in facilitating change at local and national levels is important when considering changes to the enabling environment. The private sector also needs to be well organised and able to speak with an informed and unified voice in engaging with the public sector.

Improving access to information, knowledge and training

- New knowledge from research is only one component required to encourage innovation in agriculture. Improving access to information can create an effective demand for research products. For instance, use of local radio programmes can compliment training, knowledge sharing and other learning events. The involvement of suppliers, technical experts, farmers, government and NGOs in radio programmes helps to build networks.

Scaling up

- Sustainability requires capacity strengthening throughout the process to ensure local people and organisations assume ownership and leadership. This should be continuous and not undertaken as a one-off activity. It requires long-term funding commitments.
- SSA CP PLS, particularly those in Malawi demonstrated the links with, and the benefits from, contributing to the country's ASWAp. They provide a functioning model of district- and community-level IPs that fit with local priorities within District Development Plans, which reflect national priorities. As such the IP structure and activities are proving to be a useful model for the implementation of the Malawi Government's agricultural sector programme in the respective districts.

Sustainability

- Sustainability requires ongoing capacity strengthening for all stakeholders including: farmers, research and extension partners, and importantly farmers' organisations to effectively assume ownership and leadership of IPs. This should be continuous and not undertaken as a one-off activity. It requires long-term funding commitments.

Implications for integrated agricultural research for development

The case studies show that increased agricultural productivity is driven by the ready availabilities of new technologies together with improved incentives for farmers and agribusiness supported by enabling government policies. At the same time it is likely that the private sector will play an increasingly important role in technology development, marketing and processing systems crucial for agricultural growth and poverty reduction. To support and enable this, the public sector will need to ensure that predictable and transparent policies required for private sector investment exist. The public sector will need to fund infrastructure in particular the roads, power and water to ensure that markets can work effectively. Governments will need to fund research particularly for such low-value food security crops as cassava and sweet potatoes as well as measures to counteract the continuously evolving plant and animal pests and diseases that threaten agriculture. Governments also need to support agricultural advisory services to provide required support to the process of innovation generation.

It is increasingly recognised that IAR4D and the use of innovation systems approaches have a major role to play in improving the links between stakeholders and in introducing new ways of working. Experience shows that where stakeholder interaction is weak or missing, facilitation or brokering is required to strengthen it. This facilitation role is very different from traditional roles of research and extension, which have focused on technology development

and information transfer. Facilitation can help to build working relationships, involving partners in private–public alliances that will stimulate innovation.

The implications for accelerating agricultural development in SSA are that:

- Support for agricultural research requires increased focus on the interface with the rest of the sector and in particular developing links from the beginning in a way that encourages interactions between public, private and civil society organisations. This necessitates support for service providers who are able to facilitate engagement between partners to create the trust, cooperation and common vision required for innovation.
- Support should be provided to encourage institutional cooperation, joint planning, implementation, analysis and learning processes rather than more traditional technology-orientated research undertaken in isolation from other stakeholders. This requires that research expertise includes a wide knowledge of markets, agri-business and rural finance that can compliment specialist technical expertise.
- IAR4D and innovation systems approaches are complementary to the AU and NEPAD's CAADP country process. An IP combines all the elements of the four CAADP pillars that can enable faster innovation and agricultural development. FARA should consider offering to provide a facilitating role in promoting the advances made by the use of IAR4D within CAADP Pillar 4, thereby helping country CAADP processes to institutionalise the use of innovation systems approaches.

Annexes

Regions, authors and case studies

Eastern Africa

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Ethiopia's *Sidama* coffee

Kenya's dairy sector

Kenya's sweet potatoes

Kenya's horticulture with special focus on vegetables

Rwanda's climbing beans

Uganda's dairy industry

Southern Africa

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Botswana's beef sector

Malawi, building public-private partnerships in the cotton sector

Malawi, overcoming market challenges – the case of groundnuts

Malawi, increasing the availability of legume seed

Malawi, SSA CP ZMM Pilot Learning Sites, Balaka and Zomba districts

Zambia's conservation agriculture

West Africa

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Cameroon, production and marketing of bananas

Cameroon's garlic industry

Ghana's pineapple industry

Ghana's growing cassava sector

Niger's vegetable production

Nigeria's cassava production and processing sector

Nigeria, rice production in Katsina state

Annex 1: Stakeholder roles

Eastern Africa

Ethiopia's *Sidama* coffee

	Coordinating body	Government,	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	*Sidama* Coffee Farmers' Cooperative Union (SCFCU) ECGPEA	MoA	Farmers, Traders, Transporters ECX	ECGPEA	EARO at Jimmah Research Station; and Haramaya University	Primary societies	Cooperatives, own resources
Main function	Representing farmers in coffee marketing and organising training, inputs, advice, credit for coffee	Policy and regulation Extension services	Input supply, Transport, Purchase from farmers Marketing and export of coffee, among other crops	Advocacy with policy makers	Coffee husbandry and health	Conglomerate of 42 multipurpose farmers' coop societies in the *Sidama* region	
Phase 1 early	Farmers' interest in improving livelihoods	Interest	Private traders including foreign ones	Interest	Research on quality and disease resistance	No organisation	Seed funding by cooperatives
Phase 2 intermediate	Formation of the SCFCU	Change of policy on exports	Role on export activities reduced	Interest	Research on quality and disease resistance	Primary societies in all *Sidama* districts	Cooperatives own funding
Phase 3 sustainability	Desire to remain the major players in exporting their commodity; maintaining and expanding membership in preferred markets	Maintain new policy on exports while monitoring performance	In partnership with Government in ECX, although SCFCU but still independent of this	Advocacy	Research on quality and disease resistance	Primary societies in all *Sidama* districts	Cooperatives own funding

Kenya's dairy sector

	Coordinating body	Government	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	Kenya Dairy Board (KDB)	MLFD	Farmers, Milk processors, Transporters, Traders	LoL,HPI, TechnoServe, ICRA, ABS (all donor-supported)	KARI, ILRI, Universities	Individual farmers and their primary cooperatives and other groups, especially in high-potential areas of Central and Rift Valley Provinces	Netherlands Government DFID, BMGF, USAID
Main function	Regulation of the industry	Policy, Technical and Advisory Services	Various activities along the value chain	Facilitation of stakeholders interaction	Breeding, Nutrition and Livestock health	Production and development of the industry	Financial and technical assistance
Phase 1 early	Regulation and control	Concern over small land parcels	Concern with low producer prices and high consumer prices	Support for dairy breeds and breeding programmes	Ongoing research	Interest in increased production	Financial and technical assistance (Breeding and feeding)
Phase 2 intermediate	Regulation and policy direction	Policy change; Improved production and marketing policies supported	Participation at all levels along the value chain, formal and informal	Support for dairy breeds and dairy hub	Coordinated efforts especially with SDP	Interest and participation in increased production through breeding, feeding, and improved marketing	Financial and technical assistance (Marketing)
Phase 3 sustainability	Regulation and policy direction	Quality control services, and exploration of export markets, Development of local support institutions	Funding support for ongoing research; private processors have almost taken over the formal market	Support for dairy breeds and dairy hub and Centre of Excellence	Ongoing support	Participation in marketing enhanced	Financial and technical assistance (EADDP)

Kenya's sweet potatoes

Coordinating body	Government	Private sector	NGOs	Research	Farmer representatives	Donors
CIP, KARI	MoA, district levels of MoA	Produce traders	DONATA, REFSO, SASHA, CREADIS, ARDAP, Farm Concern International VITAA, PRAPACE	CIAT, KARI	Many smallholder farmer organisations in villages	FARA and many others
Overall coordination of research	Dissemination and extension; FFS	Produce marketing	Donor-funded breeding, production and utilisation initiatives	Conducting and coordinating research and varietal trials	R&D participation	Research breeding, development and utilisation support
Overall coordination of research	Interest	Interest	Interest and social research	Knowledge provision	Interest	Mobilising donor support
Multiplication of disease-free planting material	Extension	Sales, with information on commodity	Sharing experiences	M&E of research activities	Establishment of learning centres and FFS	Mobilising support and monitoring performance
On-going research and coordination of efforts	Extension	Sales, with information on commodity	Utilisation dynamics	Demand-driven research	Active participation in commodity utilisation programmes	Scaling up benefits

Kenya's horticulture with special focus on vegetables

	Coordinating body	Government,	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	Horticultural Crops Development Authority (HCDA) and the Ministry of Agriculture (MoA)	MoA KEBS, KEPHIS, KIRDI, PCPB, EPC National Horticulture Task Force	Agri-dealers Seed, fertiliser, agrochemical and farm equipment supply companies	Various: FPEAK, KFC, KHC, AAK	KARI, universities JKAUT (on technology)	Various farmer groups at village levels	JICA, JETRO, USAID DANIDA IFAD, USAID, SIDA, ADB GIZ
Main function	Growth and development of the industry	Extension, Policy-regulation standards, Attention to challenges	Agri-input supplies	Production and export advocacy and lobby groups	Research on production regimes, including IPM	Farmer coordination and mobilisation	Funding of development efforts
Phase 1 early (before 2004)	Regulation, Advisory and Marketing services	Extension on production issues Seed sector support	Agri--input supplies, Seed-sector growth and development	Certification under various schemes such as Ethical/ Fair Trade, Nature's Choice or as organic products	Up-scaling innovations, Sharing experiences	Non-targeted production	Supporting non-targeted production
Phase 2 intermediate (2004 to date)	Regulation, Advisory and marketing services including cooling infrastructure at various stations	Extension, Advisory, Quality control on products. Training on GAP certification	Training and distributing only GAP recommended inputs	Promoting GLOBAL GAP compliance, linking farmers to high value markets	Demand-driven research	Production for high value markets, Development of Kenya GAP	Supporting export and production initiatives in particular
Phase 3 sustainability *(phase just emerging)*	Regulation and support of credit needs through *Kilimo Biashara*	Support for production, marketing and quality control including sage use of pesticides and other chemicals. Support for credit needs	GAP recommended supplies especially enforcing safe use of pesticides	Market monitoring and response	Demand-driven research	Production and value addition for high-value markets	Up-scaling innovations, Sharing experiences supporting SHoMAP, SHDP, SHEPUP, KHCP

Rwanda's climbing beans

	Coordinating body	Government,	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	ISAR and CIAT	MoA, RADA	Input suppliers, Agricultural finance organisations, Buying agents, Transporters	RESAPAC, PABRA, ECABREN, RDO, ADRA, WV, CRS, CARE, CARITAS, DERN	ISAR, CIAT, NUR, UP	Various Innovation Platforms	SDC, CIDA, Rockefeller Foundation, BMGF AGRA USAID ASARECA FARA
Main function	Research and development of improved bean varieties	Policy, Seed multiplication, Extension Services	Input and service provision	Advocacy, research, extension and development of the commodity	Research on varieties, production, protection, marketing and extension	Participatory development of the commodity	Making funds available for bean research and development
Phase 1 early	Research and development of high-yielding varieties	Interest	Interest	Collaboration with farmers and Government organisations to form strategy	Basic research	Interest	Funding research and extension activities
Phase 2 intermediate	Research and development of high-yielding, disease-resistant varieties	Seed multiplication, Extension Services	Identification of business opportunities	Participatory planning, priority setting, technology testing, their validation and dissemination	Improvement of initial varieties	Adoption and monitoring of performance	Funding various activities in ongoing research
Phase 3 sustainability	Release of pre-basic seed. Have spread technology to neighbouring countries	Ensuring farmer satisfaction	New or expanded operations established; Participatory analyses	Technology validation and dissemination, Spreading technology to neighbouring countries	Ongoing research on acceptable varieties	Adoption, multiplication and production of improved bean varieties	Funding research, extension and varietal development

Uganda's dairy industry

	Coordinating body	Government	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	Dairy Development Authority (DDA)	MAAI&F MFPLED	Input suppliers, Finance organisations, Traders, Transporters Uganda Veterinary Association	HPI, LoL, EADDP all donor-supported	NARO, Universities	Uganda National Daity Farmers' Association (UNDFA), Uganda National Daity Traders' Association (UNDTA)	DANIDA, UNDP/ FAO, ADB, WFP BMGF, USDA
Main function	Regulating and developing the dairy industry	Extension Services, Veterinary Services	Various respective activities along the value chain, for the growing commercialisation of the sector	Supporting breeding stock distribution and milk marketing	Improved dairy breeds, Better feed and nutrition regimes	Primary production aspects in the industry	Funding production, processing and marketing development initiatives
Phase 1 early	Leadership and partnership development with other stakeholders	Interest, change of policy as recommended in Dairy Master Plan	Interest	Interest	Ongoing research	Interest	Funding production initiatives
Phase 2 intermediate	Leadership and partnership development with other stakeholders	Active support and participation in training farmers	Developing links with markets, Taking up vetinerary and other privatised services	Breeding, Nutrition, Support; for social capital and pro-poor livestock policy	Ongoing research	Active participation	Funding marketing development and pro-poor initiatives
Phase 3 sustainability	Ongoing leadership to the industry	Ongoing extension support to local farmers	Provision of veterinary and other privatised services	Breeding, Nutrition, Social capital support	Ongoing research	Leadership in production and trade momentum	Funding

Southern Africa

Botswana's beef sector[1]

	Coordinating body	Government	Private sector	Farmer representatives	Donors
Organisation name	Botswana Meat Commission (BMC)	MoA	Feedlot contractors Agrivet-input suppliers Livestock feed suppliers Buying agents Transporters	BCPA	USAID
Main function	Sole mandate for all imports and exports of livestock and livestock products	Policy and regulation Disease control Extension services	Agri-input and service provision	Representative body for 60,000 cattle producers	Financial support for development
Phase 1 early	Concern about declining cattle numbers and increasing losses	Interest	Interest	Study indicating the serious state of the industry	Funding for BCPA research study
Phase 2 intermediate	New strategy to put into effect Government policy changes	Policy changes to allow export parity pricing	Support for policy changes Identification of business opportunities	Policy paper presented to Government	Interest
Phase 3 sustainability	Restructure of the organisation Ensuring cost effective operations Ensuring producer prices remain high	Ensuring disease control and animal health and EU export regulations are complied with	New or expanded operations established to support cattle producers and BMC	Change in production methods Opportunities for improved cattle management and increased offtake from the national herd	Interest

1. No NGO or research organisation participation

Malawi, building public-private partnerships in the cotton sector

	Coordinating body	Government,	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	Cotton Development Trust (CDT) formed as a result of facilitation by AICC and RIU	MoA&FS	Cotton ginners, Input supply companies, Oil processors, Spinners, Clothing manufacturers	AICC RIU	DARS	FUM COFAM NASFAM	DFID GIZ NORAD
Main function	Partner organisation representing all stakeholders	Policy and regulation, Extension services, Minimum price setting	Agro-processing, Agri-input supply, Extension	Facilitating role to form CDT	All aspects of cotton production	Representative body for 80,000 cotton producers	Financial support for establishing a PPP
Phase 1 early	Not in existence, but represented by stakeholders	Interest	Participation by some companies	Facilitation of a public–private partnership	Interest	Farmers poorly organised with little voice	Seed funding for PPPs by RIU
Phase 2 intermediate	CDT created and meeting regularly	Government represented by Permanent Secretary, MoA&FS on CDT	Contribution to costs of CDT	Secretariat for CDT	Design in conjunction with CDT of on-farm demos and trials	Formation of COFAM Representation on CDT along with FUM and NASFAM	Funding of some AICC and CDT activities
Phase 3 sustainability	Desire to form a Cotton Council (CC) CDT participation in a regional network	Revision of the Cotton Act	Levy on CDT members to pay CDT and CC costs	Continuation as Secretariat	Funding by CC	CFOM Associations formed throughout the country	Some funding considered on case-by case basis

Malawi, overcoming market challenges – the case of groundnuts[1]

	Coordinating body	Government	Private sector	Research	Farmer representatives	Donors
Organisation name	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	MoA&FS, DARS and DAES	FairTrade, Twin Marketing/ Liberation MBS and SGS	DARS-Chitedze ICRISAT	NASFAM Mchinjii Farmers Association	USAID
Main function	Training for DAES and NASFAM on production and storage methods that reduce aflatoxins Establishing producer traceability systems Developing laboratory methods for identifying aflatoxins	Extension (DAES) Local Coordination at District, EPA and community levels, Compliance with District Development Plan and ASWAp	Developing markets in UK and EU Ensuring NASFAM complies with FairTrade and EC standards and regulations	New variety development and ensuring certified seed availability for producers, Production and storage management practices	Production and storage training, Marketing complying with aflatoxin and FairTrade labeling standards	Funding
Phase 1 early	Leadership and partnership development with other stakeholders	Interest	Interest	ICRISAT leadership with support to DARS	Interest	Monitoring
Phase 2 intermediate	Extension training and introduction of traceability systems, Aflatoxin monitoring introduction	Active support and participation in training farmers	Monitoring the process, Developing links with markets	Support for extension training	Active participation with ICRISAT	
Phase 3 sustainability	Backstopping NASFAM and DARS	Ongoing support to local farmers	Importation of Malawi groundnuts complying with FairTrade and EC standards Premium payments	Ongoing monitoring of aflatoxin constraints and breeding new varieties	Leadership in ensuring momentum maintained	

1. No NGOs involved

Malawi, increasing the availability of legume seed

	Coordinating body	Government	Private sector	NGOs	Research	Farmer seed representatives	Donors
Organisation name	Seed legume IP, representing all stakeholders	MoA&FS DARS- Seed Services	Seed companies STAM Large-scale seed producers	RIU	DARS CIAT	ASSMAG GALA	DFID–RIU
Main function	Representative body of all stakeholders	Seed policy and regulatory body	Contract seed production Seed processing, distribution and sale	Facilitation of stakeholders interaction	Breeders and foundation legume seed production	Representative body of small-scale seed producers	Funding for facilitation
Phase 1 early	Desire to establish reasons for seed shortages	Concern at lack of certified seed	Concern at lack of breeders and foundation seed	Facilitation of meetings	Lack of resources to produce breeders seed	Representation on IP	
Phase 2 intermediate	Proposals for private sector to participate in breeders seed production and Contract brokered through the IP for production of breeders seed Establishment of a revolving fund for ongoing contracts	Agreement that private sector could produce breeders and foundation seed, Quality control of seed production, Seed purchased for subsidy programme	Contracts with DARS-Seed Services to produce breeders and foundation seed. Seed Co contracts for certified seed with ASSMAG and GLA members Most seed presently sold to Goverment's subsidy programme	Seed funding provided for initial contracts, Secretariat for IP	Close liaison with the private sector to ensure seed quality	Representation on IP	Funding to establish a revolving fund
Phase 3 sustainability	Possible establishment of a Trust to take over IP functions and maintain revolving fund	Ongoing quality control services	Funding support for breeders and foundation seed production	Secretariat for IP	Ongoing support for Trust	Funding support for breeders and foundation seed production	-

Malawi, SSA CP ZMM Pilot Learning Sites, Balaka and Zomba districts

	Coordinating body	Government	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	CIAT (CA), Bunda College (ISFM), Bioversity International (Vegetables)	MoA&FS, DARS-Chitedze and Bvumwe, DAO, MoLG, District Commissioner, District Council, Schools and hospitals	Agri-dealers, Traders/vendors, Processors, Supermarkets, Hotels	Concern Universal DAPP Emmanuel International Millennium Village Project, World Vision, Blantyre Synod	DARS–CIAT Bunda College Bioversity International, IITA, WV	Elected members from each participating community Traditional leaders	FARA SSA CP PLS
Main function	Overall coordination, Leadership and training	Extension (DAES) Input subsidies Local Coordination at District, EPA and community levels Compliance with District Development Plan and ASWAp	Input supplies, Marketing	Donor-funded support activities to vulnerable households	Providing new knowledge relevant to commodity focus, Training, Comparing IP with counterfactuals	Main beneficiaries of IP activities	Research
Phase 1 early	Introduction, Partnership and capacity building, Technical coordination	Interest	Interest	Interest	Knowledge provision	Interest	Mobilising donor support
Phase 2 intermediate	Technical and research input to IP	Incorporation of IP activities into DAO work programmes and District Development Plan, Market for vegetables	Increased sales of seed, fertiliser and other inputs, Supporting IP in marketing commodities	Sharing experiences, Learning from IP	Monitoring and evaluation of research activities	Establishment of learning centres and FFS	Impact assessment
Phase 3 sustainability *(In progress)*	Backstopping DAO, DARS and NGOs	Main support for IP within District Plan and DAO work programmes, Increasingly IP coordination	Ongoing sales of agri-inputs, Effective marketing arrangements for soybean developed	Scaling up IP activities within Balaka District	Demand-led research as requested by IP farmers	Active participation in IP activities, Farmer clubs seeking markets for produce as well as credit for production	Scaling up IP benefits

Zambia's conservation agriculture

	Coordinating body	Government	Private sector	NGOs	Research	Farmer representatives	Donors
Organisation name	Conservation Farming Unit (CFU) of ZNFU CAAZ a recent stakeholder forum initially supported by RIU	MoA&C	Dunavant Agri-dealers Seed, fertiliser, agro-chemical and farm equipment supply companies	CLUSA Many smaller NGOs supporting the initiative	GART CFU SOFECSA CIMMYT CIAT IITA	ZNFU Farmer associations Cooperatives	EU DFID Finish Government NORAD SIDA World Bank
Main function	Technical unit of ZNFU, Champion for CF and CA, promotion, training and research including diversification from maize	Policy and regulation, Extension for scaling up CA, National food Security, Fertiliser and seed subsidies Special programmes involving FAO (CASPP and FSIRP)	Agri-input supplies	Poverty and hunger alleviation of vulnerable groups	Validation/ improvement of technologies	Farmer coordination and mobilisation	Scaling up of yield increasing and productivity technologies
Phase 1 early 1996–2000	Demonstrations around the country	Interest	Interest	Interest	Studies undertaken on adoption of CA	Interest	Initial seed funding from EU and World Bank
Phase 2 intermediate 2000–2005	Training and extension facilities expanded to support 180,000 farmers	CA accepted as extension policy, CA practiced by political leaders	Training provided to smallholder growers delivering to large companies,	Promotion of CA linked to distribution of seed and fertiliser packages, Staff received training from CFU	Validation of existing technologies by GART, ICRISAT support	CFU incorporated into ZNFU as a stand-alone unit	Major support from NORAD, DFID supporting CA in Zimbabwe
Phase 3 sustainability	Expansion of CA to other countries with partner NGOs (Kenya, Malawi, Uganda and Zimbabwe)	Continued support for CF	Ongoing training activities	NGOs from other countries linking with CFU	CIAT and CIMMYT NRM research	Use of ICTs for improving market linkages, transport logistics and e-extension	NORAD support for scaling out

West Africa

Cameroon, production and marketing of bananas

	Coordinating body	Government	Private sector	NGO	Research	Farmer representatives	Donors
Organisation name	Government-owned CDC	MARD	Del Monte International *Compagnie Frutière* Dole Food Company Inc.	*Banana Link*	CARBAP IRAD	OCB	EU
Main function	Sole mandate for supporting production and export of bananas	Policy and regulation, Research into varieties and disease control, Extension services	Agri-input and service provision and development of export market	Support for research, educational services and dissemination of information on banana trade	Development new banana varieties *In vitro* multiplication of banana suckers	Representative body of some 10,000 smallholder producers	Funding for financial and technical support
Phase 1 early	Concern about declining banana production	Some infrastructure improvements	Facilitation of public–private partnership	Capacity-building of farmers for sustainable production	Production of banana suckers using tissue culture and *in vitro* multiplication techniques	Evidence of decline productivity in the industry	Funding for research, credit and infrastructures
Phase 2 intermediate	New strategy to put into effect, Government policy changes	Policy changes for promotion of production and export through price support and input subsidy	Support for research and policy changes, Identification of business opportunities	Campaign and lobby for socially and ecologically sustainable banana production and trade	Reduction of the use of pesticides in banana production. Development of environmentally friendly agronomic practices. Development of strategies to fight various diseases of the plant and fruits.	Credit provision for members	Ongoing financial support
Phase 3 sustainability	Ensuring producer prices remain stable, Ensuring cost-effective operations	Enforcement of export regulations, Extension for improved production methods	Expanded production and marketing activities	Lobbying for fair development of the international banana trade and sustainable production methods	Attainment of market niches in the areas of organic, FairTrade and exotic bananas.	Encouraging ongoing change in production methods and marketing support	Interest and support for sustainable production of organic desert bananas

Cameroon's garlic industry

	Coordinating body	Government	Private sector	NGO	Research	Farmer representatives	Donors
Organisation name	CFC	Ministry of Agriculture	Agri-input suppliers Buying agent	SAILD *SOS Faim*	IRAD	NOWEFOR	SAILD *SOS Faim*
Main function	Sole mandate for all exports of garlic products Representative body of garlic producers	Policy and regulation Research on disease control Extension services	Supply of improved seeds and technical support	Collaboration with farmers group and Government agencies for easy access to production inputs	Development of disease-resistant and early-maturing garlic	Farmer representative body supporting welfare improvement representing 1,200 individual farmers	Making credit available for garlic production
Phase 1 early	Concern about meeting the market demand	Support for CFC as the major stakeholder in the industry	Production, processing and export of fresh and processed garlic products worldwide	Provision of assistance to farmers in term of access to markets	Development of production methods for organic garlic	Study indicating huge market for garlic industry	Funding for support of producers and marketers
Phase 2 intermediate	New strategy to put into effect efficient production and marketing	Policy changes for export parity pricing	Support for policy changes Identification of business opportunities	Improvement in productivity	Encouraging use of organic fertilisers and sustainable soil management	Policy paper presented to Government by NOWEFOR	Interest
Phase 3 sustainability	Restructure of the organisation, Ensuring cost- effective operations, Ensuring producer prices remain stable	Ensuring quality products	Expanded operations established with support for producers and NOWEFOR	Sustained technical and financial support to farmers	Enhancement of farmers' technical-know how through capacity building on mobilisation and the judicious management of resources	Opportunity for farmers to come together to share experiences and their extension to other farmers	Interest

Ghana's pineapple industry

	Coordinating body	Government	Private sector	Research	Farmer representatives	Donors
Organisation name	MoFA	MoFA MoTI GEPC	Blue Skies Industries MCP BioPlantlets Ghana Ltd Bomart Farms	NARP GAEC	SPEG Outgrowers linked to members of SPEG	World Bank EU USAID
Main function	Mandate for policy regulation in the pineapple industry	Infrastructural support Support for research and extension services	Collaboration with public institutions and donor agencies to support farmers and processors	Addressing agronomic, biological and postharvest handling constraints	Pineapple production and export	Making funds available for development of production and processing
Phase 1 early	New strategy of productivity enhancement using improved varieties	Support for farmer capacity strengthening in out-grower schemes	Support programmes to improve pineapple production, processing and marketing	Launching of NARP	Study indicating a large export market for pineapple products	Funding for support of producers
Phase 2 intermediate	Support for private–public partnerships including the establishment of BioPlantlets Ghana Ltd and SPEG	Policy changes to provide technical support and inputs subsidies	Market promotion and revitalisation of access to global markets	Research on quality assurance of the processed product in order to meet the standards required by the European market	Smallholder and medium-scale farmers merged to form larger-scale professional commercial farmers	Rehabilitation of the industry through injection of funds and research support
Phase 3 sustainability	Promotion of processing for local and export trade	Support programmes to improve pineapple production, processing and marketing	Expanded production established and support for producers targeting development of pineapple exports	Attainment of good share of global market for pineapple	Change in production scale, Opportunities for higher productivity	Interest

Ghana's growing cassava sector

	Government / Coordinating body	Private sector	Research	Farmer representatives	Donors
Organisation name	MoFA	A number of medium-large procesors	IITA, NRTIP	Farmers and processors associations	IFAD Government
Main function	Mandate for policy supporting farmers and processors,	Technical support Financial support	Research on development of improved varieties of cassava		Funding agricultural development
Phase 1 early	Concern about low production and food security resulting from drought Establishment of NRTIP Extension services	Initiation of links between farmers, processors and funding agencies	Development of improved varieties and their multiplication at specific MoFA primary multiplication sites	Study indicating low production but huge domestic market and industrial demand	Funding to support producers and processors
Phase 2 intermediate	Release of new varieties capable of more than doubling the yield of existing local varieties Policy support to provide technical support and inputs subsidy	Ongoing linkages between farmers, processors and funding agencies	Multiplication and distribution of planting materials of improved varieties	Policy paper presented to Government by MoFA	Ongoing funding
Phase 3 sustainability	Attention to industrial processing and export markets.	Expanded production, Established and support for producers	FFS successfully used as entry points for collaborative research and extension on farmers' fields	Import of Nigerian varieties developed by IITA for local evaluation by Ghanaian researchers with support from IITA Opportunities for higher productivity	Lesson learning

Niger's vegetable production

	Coordinating body	Government	Private sector	NGO	Research	Farmer representatives	Donors
Organisation name	INRAN as task leader for FARA'S SSA CP PLS in Maradi	Aguié Prefecture and Maradi Local Government Ministry of Agriculture and Rural Development	Local inputs suppliers and traders	*Asusu* *Taimakon Manoma*	INRAN	Five farmers' associations representing five villages Traditional Leaders	IFAD-PPILDA FARA / CORAF / WECARD
Main function	Identifying and researching constraints affecting producers	Policy and regulation, Technical support, Extension services	Supplying inputs Buying vegetables for reselling	Technical support and micro-credit provision for input purchase	Research	Over 2000 members represented by associations	Donor –and associated activities
Phase 1 early	Creating awareness and building trust between stakeholders	Overall support for the IP concept and encouragement for stakeholders to work together Policy support to provide technical support and inputs subsidy	Ensuring inputs are availale Identifying suitable markets	Formation of functional famer groups for efficient input delivery, credit use, production and marketing	Training farmers on improved vegetable crop management practices	Undertaking trials with INRAN on disease and pest management practices Linking with traders on opportunities for vegetable marketing	Funding for IP and supporting NGOs
Phase 2 intermediate	Initial leadership and coordination of the IP Facilitating stakeholders capacity building	Main link between farmers, research, training and commercial activities	Linking farmers to local vegetable market and across the border in Nigeria	Strengthening farmer organisation skills through leadership, communication and technical training	Technical and economic research in support of farmers Development of disease and drought-resistant crop varieties	Testing of new varieties and production methods in conjunction with INRAN Linking with PPILDA for irrigation development	Capacity building Farmer support for irrigation infrastructure
Phase 3 sustainability	Backstopping other stakeholders	Backstopping other stakeholders	Ensuring farmers and traders receive a fair price for their respective roles	Scaling out improved production practices	Ongoing research in support of farmer problems	Expanded production established with support for producers	Backstopping other organisations Lesson learning

Nigeria's cassava production and processing sector

	Coordinating body	Government	Private sector	NGO	Research	Farmer representatives	Donors
Organisation name	IITA for ICP as part of PICPE and UNIDO master plan	Federal MoA, MoT&C and UNIDO State MoA and ADPs, CMP–CU and NSS	Large processors under MARKETS Texagric	A number of local NGOs	IITA NRCRI	Over 500 producer and five SME processor associations	USAID NNPC NDDC NSM SPDC AGIP
Main function	Research study indicating low production but large potential for both domestic and export markets Manager of ICP	Policy and regulation, Extension services Supporting farmers and processors (PICPE and NEEDS) Master Plan for the cassava sector Cutting multiplication and quality control	Technical and financial support for producers	Collaboration with public and private sector to support farmers and processors	Research mandate for development of cassava and cassava-based products and technologies	Over 5,000 members represented by their associations	Support for the industry in developing the value-chain
Phase 1 early	Leadership of ICP Building partnerships and trust between stakeholders	Support for policy initiatives for controlling CMD, improving food security and developing profitable enterprises	Collaboration with public sector to support producers and processors	Introduction and promotion of a wide range of value-added products to the market	Introducing improved varieties and agronomic practices Training and linking of local fabricators to potential investors and credit sources Support for SMEs	Testing and multiplication of new varieties	Funding support for producers and processors
Phase 2 intermediate	Enterprise development and market promotion	Policy support to provide technical support and inputs subsidy and improve marketing	Promotion of production through market linkages	Capacity building for farmers and SME processors	Ensuring farmer access to new varieties Linking producers to processors	Increased area and yields of CMD-resistant varieties	Funding support for producers and processors
Phase 3 sustainability	Backstopping of other partners	Ongoing support for policy changes to reduce subsidies favouring cereals addition	Expanded production base established Ongoing support for producers and SME processors	Ongoing support for producers and SME processors	Ongoing development of improved CMD-resistant and high-yielding varieties	Improved food security and sales of products to processors Increasing	Ongoing support for agri-business development

Nigeria, rice production in Katsina state

	Coordinating body	Government	Private sector	Research	Farmer representatives	Donors
Organisation name	IFDC	Katsina MoA KTARDA Dandume LG	Maslaha Seed, Premier Seed Notore chemicals Golden Fertilizer, OLAM (rice processor)	IFDC, ICRA, ABU IAR, NAERLS, NCRI, CEC, AfricaRice	Farmer and processors associations in five villages in the LGA	FARA / CORAF / WECARD
Main function	Task leader for FARA'S SSA CP PLS in the NGS of KKM PLS	Policy and regulation, Technical support, Extension services	Input suppliers, processors and marketing agents	Research and development activities related to value chain analysis, variety improvement, agronomy, NRM and use of participatory approaches	Representative body of farmers on Dandume IP	Funding provided by a number of donors through FARA
Phase 1 early	IP leadership, creating awareness ands building trust between stakeholders Encouraging private sector involvement with IP	Concern about low production and food and nutrition problem in the State and LGA	Supporting farmers in improving input provision and creating awareness of markets for increased production	Improving farmer access to improved rice seed and inputs for better growing techniques Supporting local seed production	Interest in improving rice productivity for improving food security and improving livelihoods	Support for IP activities
Phase 2 intermediate	Coordination of IP activities	Policy support to provide technical support and inputs subsidy	Ensuring increased demand for inputs is met and ensuring markets are available for increased production	Supporting farmer testing and production of new varieties	Testing new rice varieties, management, and storage practices and improved marketing	Support for IP activities
Phase 3 sustainability	Withdrawal form the IP other than for backstopping activities	LG takes leadership of the IP and scales out to all villages in the their area	Ongoing commercial support for Dandume farmers	Backstopping to Dandume LGA and farmer associations on IP Scaling out to other areas	Increasing role on IP encouraging other farmers to adopt innovations and scale out to other areas	Lesson learning

Annex 2: The role of the public sector in supporting innovation

Eastern Africa

Policy and regulatory framework	Infra structure	Research	Extension and Training	Marketing (input and output)	Incentives for private sector investment	Sector coordinating bodies	Specific pro-poor interventions
Ethiopia's *Sidama* coffee							
Special permission for cooperative to bypass auction and sell directly to clients	Support to growth of SCFCU,	Research on quality improvement and disease resistance (CBD, leaf rust, coffee wilt disease), Involvement in FFS	General extension, and FFS	ECX a public–private partnership complements SCFCU efforts in Ethiopia coffee in general	Transparent transactions	SCFCU, ECGPEA	Primary societies involve mostly small-holder and relatively low-income farmers
Kenya's dairy sector							
Liberalisation of the industry	Private sector development of processing facilities	Breeding, Nutrition, Livestock health	Dairy Training Institute	Liberalisation of milk marketing and privatisation of production services	Privatisation of services and the establishment of the KDSCP funded by USAID	MLFD, SDP, KARI, ILRI,	EADDP activities with collaborating institutions and NGOs, which target farmers on less than 1.5 acres through more profitable production and marketing of milk
Kenya's sweet potatoes							
Approval of research agenda from various players, Registration of NGO efforts	IPs	Research on yields, vitamin contents, disease resistance, taste	DAO involvement with various NGOs and commodity development efforts,e,g., DONATA	Open market Farm Concern International promotes the marketing of the OFSP	Open market, and the development of IPs where marketers are members	Recognition of CIP and KARI efforts	The commodity itself is traditionally pro-poor: the high β-carotene content of the OFSP makes it suitable to HIV/AIDS and Vitamin A deficiency sufferers

Policy and regulatory framework	Infra structure	Research	Extension and Training	Marketing (input and output)	Incentives for private sector investment	Sector coordinating bodies	Specific pro-poor interventions
Kenya's horticultural industry with special focus on vegetables							
Promoting smallholder involvement in high-value markets	Cooling facilities under HCDA	On-going research at KARI and the public universities	Training farmers on such GAP certification requirements as safe use of pesticides	Produce is inspected by Government machinery at the point of exports	Contractors supported for minimum tillage and spraying operations	HCDA supports farmers *Kilimo Biashara*, a public–private partnership initiative provides an integrated approach to financing smallholders, also providing training	GAP certification process for farmer groups
Rwanda's climbing beans							
Research and development initiatives	Various Research stations and extension outfits	Yields, disease control	Production methods, seed production IPM	Advocacy for input suppliers and produce traders in IPs	Increased production of different varieties, using modern inputs	Ongoing meetings for the IPs	None in particular although most producers are women

Policy and regulatory framework	Infra structure	Research	Extension and Training	Marketing (input and output)	Incentives for private sector investment	Sector coordinating bodies	Specific pro-poor interventions
Uganda's dairy industry							
DDA supporting regulation and development of the industry		NARO research agenda includes breeding, nutrition and marketing	MoA supports farmer extension services	Liberalised	Liberalised market, and privatised services	African Breeders Services –Total Cattle Management provides bovine genetics and related products and services including contact information and Frequently Asked Questions	Identification of targets for NGOs EADDP activities with collaborators supporting business orientation, Total Cattle Management, environment and cattle feed, and research. Women are particularly targeted through provision of heifers and training

Southern Africa

Policy and regulatory framework	Infrastructure	Research	Extension and Training	Marketing	Incentives for investment	Sector coordinating bodies	Specific pro-poor interventions
Botswana's beef sector							
Consideration of BCPA policy recommendations Restructuring of BMC to reduce costs and operate profitably	Rejection of proposals to privatise BMC Ensuring abattoirs operate near to full capacity	Supporting BCPA study on cattle value chain Encouraging new research on emerging opportunities	Encouraging cattle producers to sell long weaners rather than older oxen Ensuring adherence to cattle disease control regulations	Allowing BMC to be the major buyer of cattle Ensuring compliance with EC export requirements	Ensuring cattle producer prices are export-parity related Encouraging contract feedlots for long weaners	Ongoing meetings between BMC and BCPA Stakeholder representation on the BMC Board	Benefits expected to be received by all cattle producers
Malawi, Building public–private partnerships in the cotton sector							
Consideration of policy concerns indentified by CDT Annual setting of minimum producer prices for cotton Commitment to revision of the Cotton Act	Improving marketing arrangements	Support for cotton production research but lacking resources CDT funding for on-farm research and demos	DAES extension staff in cotton-producing areas, but poor delivery Improving links between research and extension	Subsidies for cotton producers initially introduced, but removed as cotton prices increased	Improved productivity and profitability for all stakeholders	Approval for establishment of CDT with AICC and RIU brokering stakeholder meetings and formation AICC Secretariat for CDT	As a key smallholder crop in the driest areas of the country, productivity improvements are likely to benefit the poor
Malawi, overcoming market challenges – the case for groundnuts							
Ensuring farmer compliance with EC standards and regulations	Support for MBS to ensure adherence to EC standards	ICRISAT support to DARS in breeding, seed production, and aflatoxin monitoring and backstopped NASFAM	ICRISAT support to NASFAM and MOAFS in production, storage training and aflatoxin traceability	Ensuring availability of new varieties	Subsidy scheme for seed and fertiliser now applicable to groundnuts	ICRISAT initially coordinated the innovation but now play a backstopping role	Premium payments target smallholder producers Premiums invested in projects requested by local communities

Policy and regulatory framework	Infrastructure	Research	Extension and Training	Marketing	Incentives for investment	Sector coordinating bodies	Specific pro-poor interventions
Malawi, increasing the availability of legume seed							
Policy decision to allow the private sector to produce breeders seed	Private sector irrigation facilities used to produce bean seed during the dry season	Breeders working in close association with the private sector	DARS Seed Services providing support to private sector to ensure quality is maintained	All certified seed sold to Government's subsidy programme	Promotion of use of improved seed by farmers	RIU–Malawi has facilitated IP establishment Revolving fund established to pay for contract seed producers producing breeders seed	Certified legume seed now included in subsidy packages
Malawi, SSA CP Pilot Learning Sites, Balaka and Zomba districts							
Approval of CA technologies through DARS Technical Clearing Committee IP activities compliment and provide an example for implementation of the ASWAp at district level	No special initiative for infrastructure	DARS–Chitedze involvement with IP	DAO involvement with IP at district and community levels	Government agri-input subsidy programme compliments IP activities	Organisation of farming groups to facilitate marketing	IP activities fit with District Council Development Plan priorities	All IP activities are targeted at poor households
Zambia's conservation farming							
Extension policy to promote CA approved by MoA&C MOA&C scaling up initiatives with NORAD and FAO support initiated (CASPP AND FSIRP)	Encouragement of private sector to support marketing initiatives	GART funded by ZNFU to undertake research on CA	CFU provide training for Government extension and NGOs Pilot schemes on CA established District-level stakeholder panels (IPs) established	Subsidy introduction for seed and fertiliser helps to support CA initiatives with increased areas of legumes planted Minimum price of maize set higher than import parity prices acts as an incentive for production, but is resulting in need for export	Contractors supported for minimum tillage and spraying operations	CAAZ established as a forum for discussions on CA	Subsidies for smallholder farmers introduced by Government, though sustainability questioned

West Africa

Policy and regulatory framework	Infrastructure	Research	Extension and Training	Marketing	Incentives for investment	Sector coordinating bodies	Specific pro-poor interventions
Cameroon, production and marketing of bananas							
Government consideration of CDC policy recommendations Producer prices increased	Provision of suckers of improved varieties Participatory multiplication and disease control efforts	Funding for IRAD and CARBAP research on bananas Opportunities for new research emerging	Provision of farmer and improved planting materials Ensuring disease and weed control regulations are adhered to	Marketers' association act as major buyers Exports increase	Increased banana prices	MoF&A and IRAD	Benefits received by all producers
Cameroon's garlic industry							
A committee in charge of regulating the supply of, and demand for garlic was put in place Municipal Council assisted in reinforcing local markets	Provision of market facilities to associations Financial support for producers	Improvement in quality and quantity through research Opportunities for new research emerging	Farmer capacity building through training, seminars and, workshops	NOWEFOR is the major buyer and marketing agents Improvement in production and quality Increasing export markets	Increase in commodity prices	Regular discussions between MoF&A and NOWEFOR	Benefits received by all stakeholders (producers and marketers)
Ghana's pineapple industry							
Provision of the new variety MD2 to farmer at a highly subsidised rate	Provision of infrastructural facilities	Provision of improved varieties Opportunities for new research emerging	Capacity building through training, seminars, workshop	Private organisations as major buying and marketing agents Increase in exports	Increase in productivity Identification of large export markets High commodity prices	Ongoing meetings between MoFA, EU and USAID	Benefits received by all stakeholders (producers and marketers)

Ghana's growing cassava sector							
Provision of the improved planting materials to farmers	Provision of infrastructural facilities, e.g., roads	Provision of improved variety Opportunities for new research emerging	Capacity building through training, seminars, workshops Extension services	Private organisations as major processors into industrial starch Increase in production	Increase in productivity High demand for industrial starch	Ongoing meetings between MoFA, and farmers' associations	Benefits received by all stakeholders (producers and traders)
Niger's vegetable production							
Provision of advisory and technical services to farmers	Provision of infrastructural facilities such as irrigation facilities and roads	Provision of improved seed varieties Opportunities for new research emerging	Capacity building through training, seminars and workshops Extension services	Producers direct link with local markets Increase in production	Increase in productivity All-year-round production	Ongoing meetings between SSA ACP, MoFA, Credit and farmers' associations	Benefits received by all stakeholders

Nigeria's cassava production and processing sector							
Provision of advisory and technical services to the farmers	Provision of infrastructural facilities to support production	Provision of improved plant varieties by IITA Opportunities for new research emerging	Capacity building through training,, seminars and workshops Extension services	Producers direct link with processors Processors linked with local and foreign markets	Increase in productivity Access to markets Increase in income	Ongoing meetings between USAID Markets, ADP, Private sector and NGOs	Benefits received by all stakeholders
Nigeria, rice production in Katsina state							
Production input subsidy and market linkages	Provision of infrastructural facilities – irrigation, feeder roads, etc. to support production	Provision of improved plant varieties Opportunities for new research emerging	Capacity building through training, seminars, workshops Extension services	Producers direct link with processors. Processors linked with local markets	Increase in productivity Access to markets Increase in income	Ongoing meetings between SSA ACP, USAID Markets, ADP Private sector and NGOs	Benefits received by all stakeholders

Annex 3: Key interactions that supported innovation activities

Eastern Africa

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Ethiopia's *Sidama* coffee			
Private–Private	Initially smallholder producers sold their coffee primarily to private foreign traders who were not farmers. Partnerships initiated by private sector stakeholders	Value depends on interaction	
Public–Private	SCFCU obtained special government permission to by-pass organized coffee auctions and sell directly to clients ECX was formed to "Ensure the development of an efficient modern trading system" that would "protect the rights and benefits of sellers, buyers, intermediaries, and the general public"	Improved management practices	
Regional and International	Two of SCFCU's primary societies certified for *Organic Sidama*, and the Union is a registered member of Specialty Coffee Association of America	Higher value for *Sidama* coffee	The need to produce quality coffee as required by clients
Kenya's dairy sector			
Private–Private	Informal interactions between various players along the value chain The producers, processors and traders' activities are not restricted	Fair prices to producers and consumers, Increased supply of milk the private sector has almost fully taken over the formal market	Desire to see fair prices to all players in the value chain profit motive at all levels in the chain
Public–Private	Policy change process from subsidy dependence; Activities of the KDSCP to liberate the sector from subsidy tendencies Milk gazette as a strategic food reserve	Liberalisation of the dairy industry and privatisation of non-strategic services Commercialisation of the industry	The Smallholder Dairy Project initiated activities that lead to policy change, to include the many small-scale players in the industry that had been excluded
Regional and International	Export of some processed commodities Activities of the regional EADDP includes sharing best practices among member countries	Increasing production, marketing and demand Kenya is Dairy Centre of Excellence 2011	Regional integration and cooperation; many international NGOs are stakeholders

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Kenya's, sweet potatoes			
Private–Private	Farmers are able to exchange planting material easily, and farmer groups are willing to grow the crop if assured of market	Many farmers are growing for the market, and demand is still greater than supply	The renewed interest in root tubers, and in sweet potato especially the OFSP in particular
Public–Private	Research efforts of KARI and CIP, involving farmers in the process	Several (over 2000) varieties with various attributes	Hidden hunger and nutrient deficiencies
Regional and International	Certification under various schemes such as Ethical/FairTrade, Nature's Choice or as organic products Certification under EUREP GAP and GLOBAL GAP Regional research and experiences, exchanging varieties	Desirable varieties in the region developed	The need to complement staple grains, and the recognition of health attributes of the potato; involvement of many international humanitarian NGOs
Kenya's horticulture industry			
Private–Private	Various export companies contracting farmers and training them to produce for the export market	More small scale players in the entire value chain, with increased incomes	Globalisation, international trade agreements, adoption of and compliance with GAPs
Public–Private	Government initiating training of farmers on GAPs	More farmers producing for the export market but it is not clear what percentage of consumer price gets to the farmer	The realisation of commercial opportunities in the industry, especially where other traditional cash crops like coffee have met challenges
Regional and International	Certification under various schemes such as Ethical/FairTrade, Nature's Choice or as organic products Certification under EUREP GAP and GLOBAL GAP	High-quality produce for the export market	Kenya's ability to provide high-quality products every month throughout the year, and the daily airfreight arrivals to key destinations

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Rwanda's climbing beans			
Private–Private	Exchange of uncertified seed of desirable varieties	Adoption of varieties with desirable characteristics although pest and disease susceptibility remained	Relatively high cost of certified seed Farmers' informal networks providing information
Public–Private	CIAT and ISAR research initiatives; Stakeholder innovation platforms	Opportunities for value- chain improvements	Information sharing among the stakeholders in the innovation platforms
Regional and International	Regional bean networks share knowledge and experience, Neighbouring countries also taking up the technology through many NGO advocacy programmes, and CIAT/ISAR continued research	Continued variety-improvement efforts	Desire to see most farmers producing adequate quantities of improved bean varieties Beans a staple crop in almost all the countries in SSA
Uganda's dairy industry			
Private–Private	Informal demand-driven interactions between various players along the value chain, basically buying and selling	Fair prices to producers and consumers, Increased supply of milk	Desire to see fair prices to all players in the value chain Profit motive for all
Public–Private	Policy change process after the Dairy Master Plan, which attracted small players throughout the value chain; Government's efforts after the political strife to restore production, improvement of milk collection, processing and marketing, and strengthening dairy extension services	Improved breeds and nutrition and increased processing capacity; Increased production, faster than demand and / or processing; Liberalisation of the dairy industry and privatisation of non-strategic services	
Regional and International	Regional efforts of the EADDP, trying to nurse best practices regionally in production, processing and marketing	Eastern Africa dairy hub, directing efforts in the whole region	The interest by many donors and NGOs, and the position of milk in household diets

Southern Africa

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Botswana's beef sector			
Private–Private	Proposal to form one representative body for a number of regional cattle owner associations	Formation of BCPA and study undertaken	Low prices paid to cattle producers Industry in decline
Public–Private	BCPA study presented to industry stakeholders including Government	Government consideration of policy issues and acceptance of important changes	Wide publicity given to research results
Regional and International	EU and Southern Africa health authorities meetings with Botswana MoA	Compliance with Import/export regulations by stakeholders	Desire to see the cattle sector prosper by all stakeholders
Malawi, Building public–private partnerships in the cotton sector			
Private–Private	Partnerships initiated by private-sector stakeholders, in particular the ginning and agri-input supply companies	Greater understanding of common constraints facing the industry and the need for an industry-wide advocacy to Government	Facilitation by AICC and RIU
Public–Private	Government participation on CDT provides forum for building partnerships	Better understanding of need for actors to work together Improved trust between public and private sectors on key issues especially the setting of minimum prices Private sector input requested for revision of the Cotton Act	Facilitation by AICC and RIU and the formation of CDT
Regional and International	Participation in a regional Initiative with Mozambique, Zambia and Zimbabwe	Sharing of policy,economic and technical information on production and marketing	Need to consider an improved policy environment
Malawi, Overcoming market challenges – the case of groundnuts			
Private–Private	NASFAM–FairTrade discussions on standards and premiums	Premium prices paid for aflatoxin-free groundnuts produced by smallholder farmers	Desire to see fair producer prices
Public–Private	ICRISAT–DARS–NASFAM–FairTrade	Production and storage practices improved	Need to put research into use
Regional and International	SGS support for MBS to ensure compliance with EU regulations. FairTrade and Liberation activities to ensure fair prices and local community benefits	Inspection, testing and certification of groundnuts exported to EC	Profitable export markets accessed by NASFAM

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Malawi, Increasing the availability of legume seed			
Private–Private	Seed producer seed company interactions through STAM	Certified seed producers producing seed on contract for seed companies	Desire to overcome seed shortages
Public–Private	Seed producers and DARS identify lack of breeders seed as a critical constraint	Private sector produced breeders seed on contract to DARS with revolving funds controlled by the IP	Government requirements for certified legume seed for subsidy programme Critical shortage of legume seed
Regional and International	CIAT support for DARS	Seed companies allowed to produce foundation seed	Desire to support Govt seed initiatives
Malawi, SSA CP Pilot Learning Sites, Balaka and Zomba districts			
Private–Private	Informal discussions		
Public–Private	District and community levels IPs created	Model established for implementation of ASWAp at district and community levels	Leadership and facilitation by research organisations
Regional and International	FARA support for IPs as part of SSA CP PLS	Experiences from other PLS made available	Support by FARA to lead research organisations
Zambia's conservation farming			
Private–Private	ZNFU looking at market and transport issues for maize and legumes, bringing together buyers and sellers through an IT-based commodity exchange. Transporters helped to ensure trucks have two-way loads ZNFU encourages input supply companies to support CA requirements	IT-based commodity markets established Transporters and traders IT links established	Realisation that CA must be supported by improved marketing and transport arrangements
Public–Private	ZNFU and MoA&C support for CA in light of improved marketing conditions	Increased funding for CA research through GART and CGIAR centers Increased funding for CFU for CA training and extension activities IT-based extension being considered by ZNFU	Establishment of a stakeholder forum (CAAZ) to share experiences and learn lessons
Regional and International	FAO and RIU networking support for Zambia CA initiatives through CASPP and FSIRP	NORAD and FAO support for scaling up and looking at policy issues	Longstanding champions for CA in the region

West Africa

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Cameroon production and marketing of bananas			
Private–Private	Need to consolidate farmers associations	Formation of OCB to improve production and marketing	Low producer prices, diseases and low productivity
Public–Private	CDC policy recommendations presented to industry stakeholders	Government consideration of policy issues	Wide publicity given to research results
Regional and International	CARBAP and IRAD collaboration on generation of technology	Development of improved varieties of bananas and environmentally friendly agronomic practices	Desire to improve productivity of bananas and raise farmers' income
Cameroon's garlic industry			
Private–Private	Interactive meetings and collaboration between CFC *SOS Faim* and SAILD on development of garlic industry	Support for NOWEFOR farmers organisation and establishment of a national committee to regulate the supply and demand of garlic to ensure fair producers prices	Need to reduce reliance on traditional exports, primarily bananas, and expand foreign exchange earnings
Public–Private	CFC and NOWEFOR proposals presented to industry stakeholders on development of garlic industry	Government-led collaboration between multiple stakeholders in the public and private sectors, NGOs and farmers' organisations.	Need to ensure that value chain stakeholders worked together in the interest of the sector.
Regional and International	*SOS Faim* meetings with stakeholders on development of export market	FairTrade certified organic garlic exports at premium prices	Need for productivity improvement and improved livelihoods of farmers and marketers
Ghana's pineapple industry			
Private–Private	Interactive meetings between farmers, marketers, NGOs, and International agencies	Establishment of BioPlantlets Ghana Ltd for tissue-culture techniques to produce and distribute MD2 to farmers	Change in the market demand in export markets resulted in difficulty for the Ghanaian pineapple industry to compete
Public–Private	MoFA proposals presented to the World Bank, USAID and private sector stakeholders	Implementation of MCP for the modernisation of agriculture with a strong focus on pineapple industry.	Decline in production and exports of pineapples from Ghana
Regional and International	World Bank and USAID meetings with international companies	Involvement in rehabilitation of the industry through injection of funds and research support	Need to rehabilitate the pineapple industry after loss of valuable export markets to Europe

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Ghana's cassava sector			
Private–Private	Interactive meetings between farmers, processors and NGOs	FFS successfully used as entry points for collaborative research and training and as an extension tool for rapid technology dissemination	Crop failure, rapidly increasing food prices and migration of Ghanaians attempting to escape famine
Public–Private	Meetings between MoFA, IITA and cassava processors on proposals for cassava improvement programmes	Release of new cassava varieties that were capable of more than doubling the yield of existing local varieties Distribution of small-scale processing facilities to private small-scale processors	Low productivity of existing varieties
Regional and International			
Niger's vegetable production			
Private–Private	*Asusu* and *Taimakon Manoma* initiated interactive meetings with stakeholders	Formation of farmer groups and producers' associations Improvement in productivity and incomes of farmers	Low production and productivity Huge local and regional markets Desire to see improvement in productivity and welfare of farmers
Public–Private	INRAN collaboration with stakeholders on PPILDA project	IP formation and disease and pest management practices were evaluated with farmers and improved production practices were been promoted	Desire to overcome food insecurity problem
Regional and International	FARA's SSA CP PLS and CORAF/WECARD collaborated with INRAN and NGOs to provide technical and financial support for farmers to overcome production and marketing constraints.	Farmers provided with technical and financial supports	Desire to enhance welfare and livelihood of vegetable farm households

	Main types of interaction	Consequences of interaction	Factors shaping interactions
Nigeria's cassava producing and processing sector			
Private–Private	Interactive meetings between farmers, processors and NGOs	Mitigation of the impact of CMD through participatory evaluation, multiplication, and distribution of CMD-resistant germplasm to farmers	Need to address critical threat of an outbreak of CMD and to revitalise Nigeria's agricultural economy
Public–Private	PICPE launched and collaboration with NDDC, MARKETS, SPDC, NSM, NNPC and others	Introduction of policy changes to reduce subsidies favouring cereals. Breeding breakthroughs by IITA breeders and successive waves of new variety releases to national breeding programmes resulted in highly productive new cassava varieties across the continent Formation of an Integrated Cassava Project (ICP)	Large demand for domestic and industrial use of cassava
Regional and International	IITA-led initiative on production of early-maturing, high-yielding and disease-resistant varieties UNIDO support on development of Master Plan for cassava development	Development and distribution of CMD-resistant varieties, increased yields for a large number of farmers, establishment of large-, medium- and small-scale processing units through support to local fabricators	Challenges posed by CMD and other production constraints.
Nigeria, Rice production in Katsina state			
Private–Private	Premier Seed Ltd, Maslaha Seed, Golden Fertilizer Ltd, NOTORE Chemicals, GoldAgric and GOLAM support for rice production	Improved input supplies and marketing arrangements for farmers	Low productivity and poor marketing
Public–Private	Katsina State ADP, IFDC and IP actors present proposals to industry stakeholders	Improved farmers' access to quality seeds of improved rice varieties and better techniques for growing rice Scaling out of IP achievements	Need to assist rice producers overcome production and marketing problems
Regional and International	Comprehensive initiatives by AfricaRice FARA/ CORAF/WECARD, IFDC in collaboration with national stakeholders.	Availability of improved seeds particularly, N-efficient and early-maturing NERICAs	Desire to improve productivity and income among rice farmers

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Acronyms and abbreviations

AAK	Agrochemical Association of Kenya
ABU	Ahmadu Bello University (Nigeria)
ACT	African Conservation Tillage
ADB	African Development Bank
ADMARC	Agricultural Development and Marketing Corporation (Malawi)
ADP	Agricultural Development Programme (Nigeria)
ADRA	Adventists Development and Relief Agency
AERC/CMAAE	African Economic Research Consortium / Collaborative Masters program in Agricultural and Applied Economics (Kenya)
AEZ	agro-ecological zone
AfricaRice	Africa Rice Center (previously West African Rice Development Association, WARDA)
AGRA	Alliance for a Green Revolution in Africa
AI	artificial insemination
AICC	African Initiative of Corporate Citizenship
AMC	Association Management Centre (Malawi)
ARDAP	Appropriate Rural Development Agriculture Program (Kenya)
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASSMAG	Association for Smallholder Seed Multiplication Action Groups (Malawi)
ASWAp	Agricultural Sector-Wide Approach Programme
AU	African Union
BCPA	Botswana Cattle Producers Association
BMC	Botswana Meat Commission
BMGF	Bill and Melinda Gates Foundation
BMZ	*Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung* (Federal Ministry for Economic Cooperation and Development, Germany)
CA	conservation agriculture
CAAZ	National Conservation Agriculture Association of Zambia
CAADP	Comprehensive Africa Agricultural Development Programme
CASP	Conservation Agriculture Scaling-up Programme (Zambia)
CARBAP	*Centre Africain de recherches sur bananiers et plantains* (African Centre for Banana and Plantain Research (Cameroon)
CBD	Coffee Berry Disease
CC	Cotton Council (Malawi)

CDC	Cameroon Development Corporation
CFC	Cameroon Farmers' Corporation
CDT	Cotton Development Trust (Malawi)
CF	conservation farming
CFU	Conservation Farming Unit (of the Zambia National Farmers' Union)
CGIAR	Consultative Group on International Agricultural Research
CIAT	*Centro Internacional de Agricultura Tropical* (International Center for Tropical Agriculture)
CIDA	Canadian International Development Agency
CIMMYT	*Centro Internacional de Mejoramiento de Maíz y Trigo* (International Maize and Wheat Improvement Center)
CIP	*Centro Internacional de la Papa* (International Potato Center)
CMD	Cassava Mosaic Disease
CMP–CU	Cassava Multiplication Programme Coordinating Unit (Nigeria)
CLUSA	Cooperative League of the USA
COFAM	National Cotton Farmers' Association of Malawi
COMESA	Common Market for Eastern and Southern Africa
CORAF/WECARD	*Conseil ouest et centre Africain pour la recherche et le développement agricoles* / West and Central African Council for Research and Development
COSCA	Collaborative Study of Cassava in Africa
CREADIS	Community Research in Environment and Development Initiatives
CRS	Catholic Relief Services
DAAD	*Deutscher Akademischer Austausch Dienst* (German Academic Exchange Service)
DAES	Department of Agricultural Extension Services (Malawi)
DAO	District Agriculture Office (Malawi)
DAPP	Development Aid from People to People
DARS	Department of Agricultural Research Services (Malawi)
DANIDA	Danish International Development Agency
DC	Dairy Corporation (Uganda)
DDA	Dairy Development Authority (Uganda)
DERN	*Développement de l'élevage dans la Région du Nord* (Rwanda)
DFID	Department for International Development (of the UK Government)
DMI	Del Monte International
DONATA	Dissemination of New Agricultural Technologies In Africa
EADDP	East African Dairy Development Project

EARO	Ethiopian Agricultural Research Organization
EC	European Community
ECABREN	East and Central Africa Bean Research Network
ECGPEA	Ethiopian Coffee Growers, Producers and Exporters Association
ECX	Ethiopia Commodity Exchange
EAPGREN	East African Plant Genetic Resources Network
EDPRS	Economic Development and Poverty Reduction Strategy (Rwanda)
EDRI	Ethiopian Development Research Institute
EPA	Extension Planning Area (Malawi)
EPC	Export Promotion Council (Kenya)
EPZA	Export Processing Zone Authority (Kenya)
ERA	Economic Review of Agriculture (Kenya)
ERP	Economic Recovery Programme (Ghana)
EU	European Union
Euro GAP	Euro-retailer produce working group on Good Agricultural Practice
FAO	Food and Agriculture Organization of the United Nations
FANR	Food Agriculture and Natural Resources (SADC)
FARA	Forum for Agricultural Research in Africa
FFS	farmers' field school
FPEAK	Fresh Produce Exporters Association of Kenya
FSIRP	Farmer Suggested Initiative and Response Programme (Zambia)
FUM	Farmers' Union of Malawi
GAEC	Ghana Atomic Energy Authority
GALA	Grain Legumes Association (Malawi)
GAP	good agricultural practice
GART	Golden Valley Agricultural Research Trust (Zambia)
GDLN	Global Development Learning Network
GEPC	Ghana Export Promotion Council
GLOBAL GAP	GLOBAL Good Agricultural Practice (previously EUREP GAP)
GoK	Government of Kenya
GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit* (German Agency for International Development - previously GTZ)
HCDA	Horticultural Crops Development Authority (Kenya)
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HPI	Heifer Project International
IAR4D	Integrated Agricultural Research for Development

ICP	Integrated Cassava Project (Nigeria)
ICRA	International Centre for Development-Oriented Research in Agriculture
ICRAF	International Centre for Research in Agroforestry (now World Agroforestry Centre)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	information and communication technologies
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IP	innovation platform
IPM	integrated pest management
IRAD	*Insitut de recherche agricole pour le développement* (Institute of Agricultural Research for Development, Cameroon)
IRAT	*Institut de recherches agronomiques tropicales* (Institute for Tropical Agronomic Research, France)
ISAR	*Institut des sciences agronomiques du Rwanda* (Rwanda Agricultural Research Institute)
ISFM	Integrated Soil Fertility Management (Malawi)
IT	information technologies
JETRO	Japan External Trade Organization
JKUAT	Jomo Kenyatta University of Agriculture and Technology (Kenya)
JICA	Japanese International Cooperation Agency
KARI	Kenya Agricultural Research Institute
KCC	Kenya Cooperative Creameries
KDDP	Kenya Dairy Development Programme
KDB	Kenya Dairy Board
KDSCP	Kenya Dairy Sector Competitiveness Programme
KEBS	Kenya Bureau of Standards
KEPHIS	Kenya Plant Health Inspectorate Services
KFC	Kenya Flower Council
KHC	Kenya Horticulture Council
KHCP	Kenya Horticulture Competitiveness Project
KIRDI	Kenya Industrial Research and Development Institute
KKM	Kano–Katsina–Maradi
KTARDA	Katsina Agricultural and Rural Development Authority (Nigeria)

LGA	Local Government Area (Nigeria)
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries (Uganda)
MAHUDE	Majasio Human Development (Kenya)
MAL	minimum acceptance level
MBS	Malawi Bureau of Standards
M&E	monitoring and evaluation
MARD	Ministry of Agriculture and Rural Development (Cameroon)
MARKETS	Maximizing Agricultural Revenue and Key Enterprises in Targeted Sites (Nigeria)
MFP&ED	Ministry of Financial Planning and Economic Development (Uganda)
MLFD	Ministry of Livestock and Fisheries Development (Kenya)
MoA	Ministry of Agriculture
MoA&C	Ministry of Agriculture and Cooperatives (Zambia)
MoA&FS	Ministry of Agriculture and Food Security (Malawi)
MoFA	Ministry of Food and Agriculture (Ghana)
MoLG	Ministry of Local Government (Malawi)
MoTI	Ministry of Trade and Industry (Ghana)
MSADP	Multi-State Agricultural Development Project (Nigeria)
NAERLS	National Agricultural Extension, Research and Liaison Services (Nigeria)
NARO	National Agricultural Research Organisation (Uganda)
NARP	National Agricultural Recovery Programme (Ghana)
NASFAM	National Association of Smallholder Farmers (Malawi)
NCRI	National Cereals Research Institute (Nigeria)
NDDC	Niger Delta Development Commission (Nigeria)
NDDP	National Dairy Development Project (Kenya)
NEEDS	National Economic, Empowerment and Development Strategy (Nigeria)
NEMA	National Environment Management Authority (Kenya)
NEPAD	New Partnerships for Africa's Development
NERICA	New Rice for Africa
NGO	non-governmental organisation
NNPC	National Petroleum Corporation (Nigeria)
NIC	National Innovations Coalition (Malawi)
NORAD	Norwegian Agency for Development Cooperation
NOWEFOR	North West Farmers Organization (Cameroon)
NRCRI	National Root Crops Research Institute (Nigeria)
NRM	natural resource management

NRTIP	National Root and Tubers Improvement Project (Ghana)
NSM	Nigerian Starch Mills (Limited)
NSS	National Seed Service (Nigeria)
NUR	National University of Rwanda
OCB	*Organisation Camerounaise de la banana (*Cameroon Banana Organisation)
OFSP	orange-fleshed sweet potato
ONAREST	National Office for Scientific and Technical Research (Cameroon)
PABRA	Pan Africa Bean Research Alliance
PCPB	Pest Control Products Board (Kenya)
PICPE	Presidential Initiative on Cassava Production and Export (Nigeria)
PLS	Pilot Learning Site
ppb	parts per billion
PPILDA	*Projet de promotion de l'initiative locale pour le développement à Aguié* (Project for the Promotion of Local Initiatives for Development in Aquié) (Niger)
PPP	public–private partnership
PPRS	Plant Protection and Regulatory Services (Ghana)
PRAPACE	*Programme regional d'amelioration de la pomme de terre et de la patate douce en Afrique Centrale et de l'Est.* (Regional Potato and Sweet Potato Improvement Network in Eastern and Central Africa)
PULSE CRSP MSU	Pulse Collaborative Research Support Program Michigan State University
R&D	research and development
RADA	Rwanda Agricultural Development Authority
RDO	Rwanda Development Organization
REFSO	Rural Energy Food Supply Organization (Kenya)
RESAPAC	*Réseau pour l'amélioration du haricot (Phaseolae) dans la région de l'Afrique Centrale*
RIU	Research-Into-Use (a DFID-funded initiative)
SADC	Southern Africa Development Community
SAILD	*Service d'appui aux initiatives locale de developpement (Cameroon)*
SASHA	Sweet Potato Action for Security and Health (Kenya)
SCFCU	*Sidama* Coffee Farmers Cooperative Union
SDC	Swiss Development Cooperation
SDP	Smallholder Dairy Project (Kenya)
SGS	*Société générale de surveillance* (the original name of a company now called SGS)
SHDP	Smallholder Horticultural Development Project (Kenya)

SHEPUP	Smallholder Horticulture Empowerment and Promotion Unit Project (Kenya)
SHoMAP	Smallholder Horticultural Marketing Project (Kenya)
SIDA	Swedish International Development Agency
SOFECSA	Soil Fertility Consortium for Southern Africa
SPDC	Shell Petroleum Development Company
SPEG	Sea-Freight Pineapple Exporter of Ghana
SRO	sub-regional organisation
SSA	sub-Saharan Africa
SSA CP	Sub-Saharan Africa Challenge Programme
SSA CP PLS	SSA Challenge Programme Pilot Learning Sites
STAM	Seed Trade Association of Malawi
SWAP	Sector-Wide Agricultural Plan
Texagric	Texaco Agro-Industries Nigeria Ltd
TF	task force
UCCCU	Uganda Cranes Creameries Cooperative Union
UNDFA	Uganda National Dairy Farmers Association
UNDP	United Nations Development Programme
UNDTA	Uganda National Dairy Traders Association
UNICEF	United Nations Children's Emergency Fund
UNIDO	United Nations Industrial Development Organization
UPU	Umutara Polytechnic University (Rwanda)
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
UWADEP	Upper West Agricultural Development Project
VITAA	Vitamin A Partnership for Africa,
WFP	World Food Programme
WV	World Vision
ZMM	Zimbabwe–Malawi–Mozambique
ZNFU	Zambia National Farmers' Union

About FARA

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

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

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

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

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

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

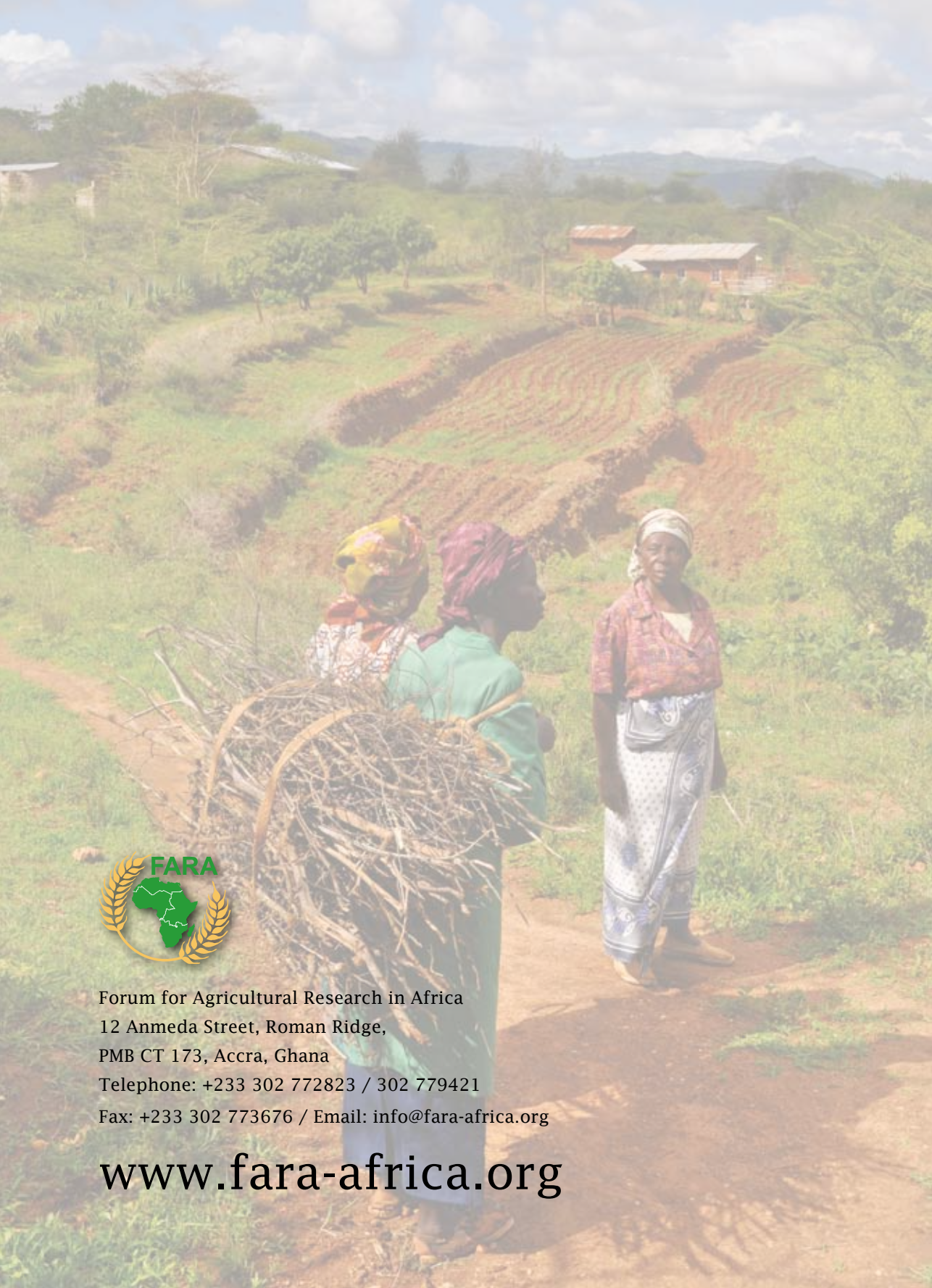
Key to this is the delivery of five *Results,* which respond to the priorities expressed by FARA's clients. These are:

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

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

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

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



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