

# REALIZING THE POTENTIAL OF AFRICAN AGRICULTURE

*Innovations and Market Access for Smallholder Farmers*



May 2013

Ajmal Abdulsamad, Lukas Brun and Gary Gereffi

# Duke

CENTER on  
GLOBALIZATION,  
GOVERNANCE &  
COMPETITIVENESS

Contributing CGGC researchers: Smriti Sharma, Yanyun Xiao, Todd Royal

Oxfam America sponsored the research for this report. We gratefully acknowledge Kimberly Pfeiffer for sponsoring the project, Oxfam America staff, and members of the internal and external advisory teams for reviewing the document and making helpful suggestions.

Errors of fact or interpretation remain the exclusive responsibility of the authors. The opinions expressed or conclusions made in this study are not endorsed by the project sponsor, companies mentioned, or individuals interviewed. We welcome comments and suggestions. The authors may be contacted at:

Ajmal Abdulsamad: [ajmal.abdulsamad@duke.edu](mailto:ajmal.abdulsamad@duke.edu)

Lukas Brun: [lukas.brun@duke.edu](mailto:lukas.brun@duke.edu)

Gary Gereffi: [ggere@soc.duke.edu](mailto:ggere@soc.duke.edu)

Front picture: Microsoft Clip Art, used with permission

## List of Abbreviations

IFOAM	International Foundation for Organic Agriculture
ABS	African Breeders Services
AGRA	Alliance for a Green Revolution in Africa
AIS	Agriculture Innovation Systems
AKIS	Agriculture Knowledge and Information Systems
AMPU	Autonomous Mobile Processing Unit
AU	African Union
B2F	Business-to-Farmer
BAT	British American Tobacco
CAADP	Comprehensive African Agriculture Development Program
CBN	Central Bank of Nigeria
CDM	Cervejas de Mocambique
CGGC	Center on Globalization Governance & Competitiveness
CGIAR	Consultative Group on International Agricultural Research
DADTCO	Dutch Agricultural Development & Trading Company
DFBA	Dairy farmer Business Association
DFID	Department for International Development
EADD	East Africa Dairy Development
ECX	Ethiopian Commodity Exchange
F2B	Farmer-to-business
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural Research in Africa
FDI	Foreign Direct Investment
FtM	Farmers to Markets
GDP	Gross Domestic Product
GVC	Global Value Chain
Ha	Hectare
HACCP	Hazard Analysis & Critical Control Points
HACCP	Hazard Analysis and Critical Control Points
ICRAF	World Agro-forestry Center
ICS	Inventory Credit System
ICT	Information & Communication Technology
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
IIAM	Instituto de Investigação Agrária de Moçambique
ILRI	International Livestock Research Institute
IRR	Internal Rate of Return
ISO	International Organization for Standardization
MT	Metric Ton

NARS	National Agricultural Research Systems
NGO	Non-governmental Organizations
NIRSAL	Nigeria Incentive-based Risk-sharing System for Agricultural Lending
NYAMIG	Nyagatere Maize Investment Group
P4P	Purchase for Progress
PPA	Participatory Policy Analysis
SME	Small and Medium-sized Enterprises
SQF	Safe Quality Food
SSA CP	Sub-Saharan Africa Challenge Program
STRYDE	East Africa Farm Development
TNC	Transnational Companies
TSP	Technology Supply Push
UN	United Nations
UNCTAD	United National Conference on Trade and Development
USAID	United Stated Agency for International Development
USDA	U.S Department of Agriculture
USDA	United States Department of Agriculture
WFP	World Food program
WTO	World Trade Organization

<b>Executive Summary .....</b>	<b>1</b>
<b>1. Introduction .....</b>	<b>2</b>
<b>2. The Agricultural Value Chain .....</b>	<b>5</b>
2.1. Input-Output Structure.....	5
2.2. Dynamics in Agricultural Value Chains .....	7
<b>3. Agricultural Research and Innovation Systems: Conceptual Frameworks .....</b>	<b>12</b>
<b>4. African Smallholders and Innovations across Agricultural Value Chains .....</b>	<b>15</b>
4.1. Smallholder Farming: Competitiveness Constraints .....	15
4.2. What is Innovation? .....	20
4.3. What Are the Relevant Types of Innovation? .....	21
<b>5. Evidence from Case Studies .....</b>	<b>24</b>
5.1. Innovations in Africa’s Agriculture: Overview of the 13 Cases .....	24
5.2. Evidence from the 13 Selected Cases .....	27
<b>6. Conclusion.....</b>	<b>35</b>
<b>Appendix A: Historical Context .....</b>	<b>38</b>
<b>Appendix B: Agro-food Product Categories, Based on Trade Data Classifications .....</b>	<b>43</b>
<b>References: .....</b>	<b>44</b>
<b>About the Duke Center on Globalization, Governance &amp; Competitiveness.....</b>	<b>50</b>
<b>About the Authors.....</b>	<b>50</b>

## Figures

Figure 1: Agricultural Value Chain.....	5
Figure 2: Percent Share of Value in Africa’s Agro-Food Exports by Product Group (1990 – 2011) .....	9
Figure 3: Value Composition of Sub-Saharan Africa’s Agro-food Exports by Product Type (1970 – 2009) .....	10
Figure 4: Agricultural Market Characteristics: Access Conditions .....	15
Figure 5: Financial Services and Sources of Borrowing for Rural Population in Africa .....	17
Figure 6: Percent Share of Government Expenditures for Agriculture in Africa, 2007 .....	19
Figure 7: Innovations across the Agricultural Value Chain Involving Smallholder Farmers .....	23

## Tables

Table 1: Structural Transformation of Agro-food Value Chains in Developing Countries .....	7
Table 2: Prominent Public and Private Standards in the Horticulture Industry .....	8
Table 3: Conceptual Frameworks in Agricultural Innovations: Main Characteristics .....	12
Table 4: Agribusiness Finance Challenges.....	16
Table 5: Overview of Cases .....	24
Table 6: Innovations Identified in Case Studies .....	25
Table 7: Addressing Financial Constraints .....	28
Table 8: Creating Value Chain Linkages with Smallholders .....	30
Table 9: Building Technical and Managerial Skills .....	31
Table 10: Balancing Food Security and Commercial Agriculture .....	33
Table 11: Facilitating Multi-Stakeholder Arrangements.....	35

## Boxes

Box 1: Four Pathways for Economic Upgrading.....	9
Box 2: Value-Added Opportunity: Looking Inside for Agricultural Markets .....	10
Box 3: Common Definitions of Innovation.....	20

## Executive Summary

The relationship between integration into value chains and innovations for smallholder farming is endogenous and mutually reinforcing. Integration in value chains offers smallholders the opportunity to innovate through information exchange and learning. Sustained integration of smallholders in value chains also critically depends on their ability to acquire, absorb, and apply new technological, organizational and institutional innovations. The existing inter-relationship has further strengthened with the structural transformation in agricultural value chains and the emergence of new perspectives in innovation systems over the last decades.

Since the 1980s, agricultural value chains have increasingly been restructured. These structural changes were characterized by market liberalization, increased consolidation, and the rise of concentrated buyer power in the chains (Lee et al., 2012; Reardon et al., 2009). These dynamics transformed the way agricultural production and trade used to function. As typical “buyer-driven” chains, agricultural value chains are coordinated by lead firms who largely determine the conditions for production processes and products. They require suppliers to comply with those requirements irrespective of their production scale. This buyer-driven organizational structure is no longer limited to markets in developed countries. With the rapidly growing urban markets inside Africa, it is increasingly becoming common in retail markets serving the burgeoning large cities in Africa. In these chains, the small scale of production constrains smallholder competitiveness. Whatever productivity or production cost advantage smallholder farming might have would remarkably be eroded by the high transaction costs they face in input and product markets of the value chains.

As the most recent perspective on agricultural research systems, Agricultural Innovations Systems (AIS) also places markets at the center of its focus, and recognizes that the source of innovations can occur at any point in the system. Our case studies have similarly showed that multiple innovations, often in pre- and post-production segments, are required to enhance smallholder competitiveness in modern agricultural value chains. We have classified the relevant innovations into six categories: product innovation, process innovation, service innovation, organizational innovation, market innovation and policy innovation. Adoption of a systemic approach allows AIS to better identify what innovations are needed, who is in a position to develop or supply them, and how interventions supporting smallholder innovation will unfold. However, AIS lacks a multi-scalar definition of markets and recognition of the existing power relations and governing structures in these systems. Today, agricultural markets operate at national, regional and global levels and widely differ in their governing structures.

Influenced by these relationships, patterns of technology development and adoption have also been reshaped. The centers of research and development have shifted from public institutions to private businesses. In these organizations, the constellation of the value chain actors not only sustains information flow and the generation of knowledge about the production technologies but also largely influences patterns of innovation. For producers in developing countries, innovation often involves technology import and adaptation in local contexts. Global value chains (GVCs) not only provides access to these sources knowledge and innovation but also integrates producers to national, regional and global markets. In this context, farming is considered as a business and the signals for the adoption of certain production technologies are derived from and linked to market requirements.

## 1. Introduction

Agriculture and agribusiness contribute significantly to the economy of sub-Saharan Africa (SSA) accounting for nearly 45 of Gross Domestic Product (GDP) (World Bank, 2013), 65 per cent of employment and 75 per cent of its domestic trade (UNIDO, 2011). The value of SSA's agriculture and agribusiness will reach a US\$ 1 trillion by 2030 compared to US\$ 313 billion in 2010 (World Bank, 2013). Smallholder<sup>1</sup> farmers will be the backbone of that effort as the number of small farms in Africa reaches approximately 33 million representing 80 percent of all farms in the continent (Nagayets, 2005). Women farmers make crucial contribution in agriculture in Africa. They provide significant share of the agricultural labor force which varies from 36 percent in Côte d'Ivoire and the Niger to over 60 percent in Lesotho, Mozambique and Sierra Leone (FAO, 2011).

The strong growth potential provides a significant opportunity for agriculture and smallholders in Africa. The growth prospect shows a divergence from the declining competitiveness, measured in terms of its share of global exports, which characterized the continent's agriculture over the last decades of the 20<sup>th</sup> century. Africa's share of global agricultural exports has declined from nearly eight percent to about two percent between 1970 and 2009 (World Bank, 2013). The future growth will be driven by agro-food markets inside Africa. The rapidly growing urban population generates demand for more and higher quality agricultural commodities (IFPRI, 2013). Urban food markets are projected to increase four fold to exceed US\$ 400 billion by 2030 (World Bank, 2013). In large cities across Africa, the change in consumption patterns will also increase demand for processed agricultural products, so adding value to farmers' outputs will provide further income and employment opportunities (IFPRI, 2013; Lagerkvist et al., 2013).

A major step in realizing these potential opportunities is recognizing smallholder farms as agribusinesses and integrating them to the center of national strategies for growth and poverty reduction. Commercial agriculture by smallholders requires enhanced productive capabilities. In Africa, yields are typically low and smallholder farmers rarely generate marketable surpluses, because they generally lack access to improved inputs and productivity enhancing technologies as well as market linkages that facilitate learning and innovation. As a risk mitigating strategy, smallholder farmers prioritize growing subsistence food crops over growing crops for market because rural food markets are also risky with wide seasonal price variations.

Innovations across the agricultural value chains are needed to empower smallholders profitably participate in agro-food markets. Using the GVC and AIS frameworks, this report identifies and evaluates the different innovation categories across the agricultural value chains. The frameworks provide a systemic analytical lens that allows understanding the complex interaction of actors and processes that co-determine innovation.

---

<sup>1</sup> The definition of smallholder in this paper is on the basis of the information from the relevant cases that define smallholders in terms of size of landholding, i.e., less than 2 hectares (or livestock numbers).

### 1.1. Project purpose and scope

The purpose of this study is to identify what innovations have supported smallholder farming as drivers of economic growth. The study specifically focuses to:

- Investigate the value chains constraints to market access for smallholder agriculture
- Identity and evaluate innovations that supports commercialization of smallholder agriculture in Africa

### 1.2. Research Methods

The research has been conducted in four phases. In the first phase, we reviewed secondary source materials –academic articles and reports by agriculture development organizations in the nonprofit and international development community – to develop categories of innovations. The purpose of this phase of research was to better understand how innovations had been categorized by scholars, and what connection, if any, had been made between the types of innovation and their position in the agricultural value chain.

In the second phase, we conducted a broader review of the relevant literature to better understand the current thinking on the interrelationship between innovation, value chains, and smallholder farming. We tracked the progression of agricultural development models from the early “technology supply push” interventions of the 1970’s Green Revolution, to the Agricultural Knowledge and Information Systems (AKIS) model of the 1980’s and 1990’s, and the AIS model of the 2000’s. We recognized that, while attempts had been made to connect innovation, smallholders, and “sustainable development” in agriculture, work remained to connect a value chain framework to those considerations.

In the third phase of research, we scanned – with the assistance of our research partner Oxfam America – cases on agricultural innovations in Africa. Details on case selection are provided in section 1.3 below. In the fourth phase, we applied the value chain and innovation framework to the selected cases and analyzed how the innovations affected smallholders’ access to markets.

Two limitations to our research should be noted. First, the time allotted to complete the research and writing was remarkably limited. The three month study and report-writing period for an issue as complex and dynamic as identifying innovations linked to market access for African smallholder farmers limited our ability to fully explore the issues debated within the literature, or to go beyond materials produced by the major international development organizations. Second, the availability of information on the specific case studies was limited, particularly systematic evaluations of how smallholders were affected by the adopted innovations.

### 1.3. Case Selection

We selected cases that collectively had representative distribution across the five parameters: region, product, innovation type, value chain position, and sustainability. We identified cases that represented a number of African countries in both East and West Africa. The identified cases represent 13 different countries, eight cases from East Africa and 5 cases from West Africa. The selected cases also varied across product type and agriculture sub-sectors including grains, root crops, horticulture and livestock. The identified cases also vary across the types of innovation adopted (product, process, service, organizational, market, and policy). We also assessed whether the adopted innovation occurred in the pre-production, production, or post-production phases of the value chain, and how they interacted with the other segments across the whole chain. Section 5 provides a discussion of findings from the case studies. An overview of the cases is provided in Table 5 (p.241).

### 1.4. Report Organization

The report is organized in four parts. The first part provides an introduction to the project and the agricultural value chain. The second part discusses perspectives from the academic and development community on the role of innovations in the agricultural value chain and the opportunities and challenges for smallholders. The third section summarizes evidence from the case studied about how innovations adopted by smallholders have facilitated access to markets. The fourth part summarizes our findings and concludes.

- Part 1: Overview
  - Section 1: Introduction
  - Section 2: Agricultural value chains
- Part 2: Innovations and market access for smallholders
  - Section 3: Agricultural research and innovation systems
  - Section 4: Smallholders and innovations across agricultural value chains in Africa
- Part 3: Evidence from case studies
  - Section 5: Innovations in Africa's agriculture: overview of the 13 case
- Part 4: Conclusions

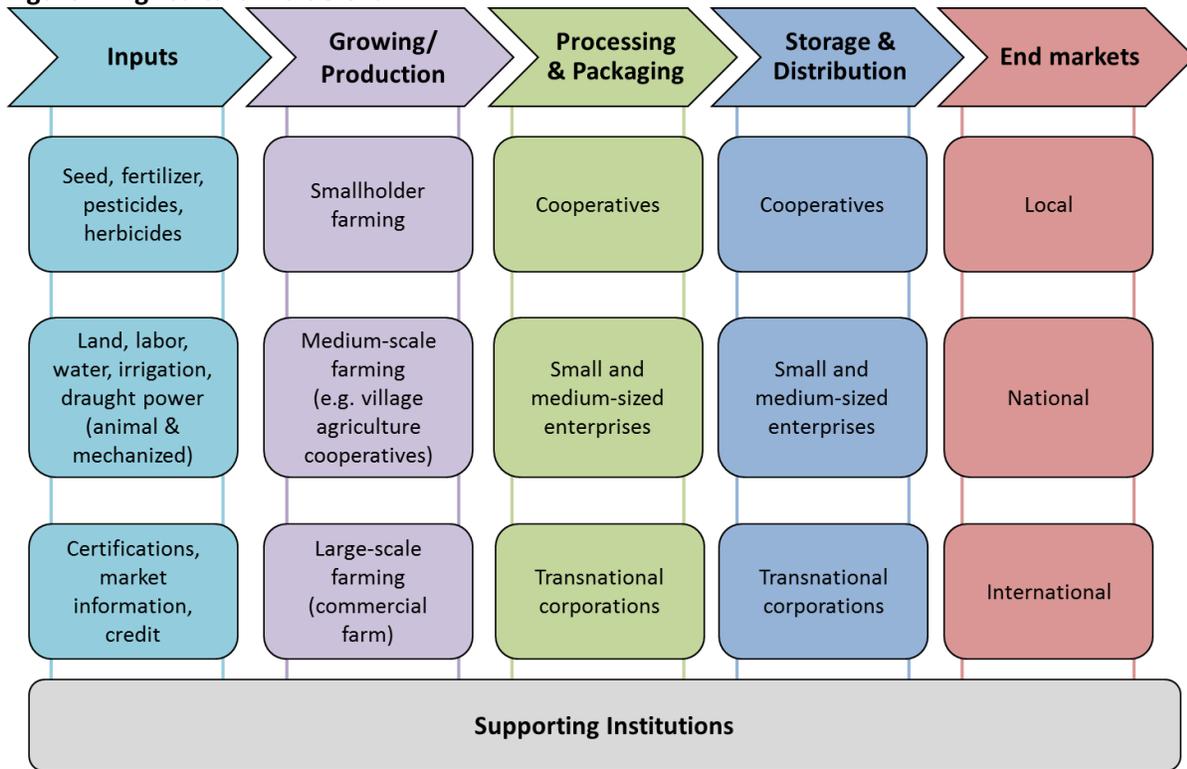
## 2. The Agricultural Value Chain

### 2.1. Input-Output Structure

An agricultural value chain describes the set of actors and full range of activities required to bring an agricultural product from production in the field to its final consumption (Figure 1)

It examines industry- and location-specific input-output structures and related technologies, standards, regulations, processes, and dynamics in relationships among chain actors, and thus provides a systemic analytical lens that allows top down and bottom up assessment of industries (Gereffi & Fernandez-Stark, 2011). Figure 1 presents a typical agricultural value chain and identifies the relevant stages and actors.

**Figure 1: Agricultural Value Chain**



Source: Duke CGGC

#### 2.1.1. Pre-production

The pre-production or *inputs* phase of the agriculture value chain consists of the requirements for production. The production requirements will depend on the specific agriculture product, but minimally includes land, labor, stock, farming equipment and water. Stock may either be seed stock or livestock of indigenous, imported or improved types. Other material inputs for agriculture are weed and pest control (fertilizers, pesticides, and herbicides), irrigation, and animal or mechanized draught power. Services in the pre-production phase can include veterinary and extension services, market information, credit, and certifications for production in niche organic or other high-value markets.

### 2.1.2. Production

The *growing/production* phase of the agricultural value chain requires continued access to many of the material and service inputs in the pre-production phase. Land, labor, water, weed and pest control, extension services, credit, and market information remain relevant for the production phase.

The actors in the production phase can vary according to size. Three major types of actors in the production phase exist: smallholder farms, medium scale farms, and large scale commercial farming. The major difference between these producer categories is the scale and quantity of production. They are not mutually exclusive, however. For example, smallholders may produce in coordination with large scale commercial farms in some regions. Large-scale commercial farms may contract with smallholders as a way to manage demand fluctuation, or to produce specialized, niche product varieties. These *out-grower schemes* are increasingly important governance structures in the agriculture value chain, as they can help achieve economies of scale or producing specialized products.

### 2.1.3. Post-production

The post-production phase of the agriculture value chain consists of processing and packaging, storage and distribution, and sale to end-markets.

*Processing & packaging* – three major actors in the processing and packaging phase of the agriculture value chain are local cooperatives, small and medium sized enterprises, and large firms such as transnational corporations. The processing and packaging phase is heavily influenced by the demand for product type and quality from global brands and retail buyers in different end markets.

*Storage & distribution* – the storage and distribution phase of the value chain aggregates the produce, often essential for smallholder farming to capture scale economies, and provides the necessary linkage between production and post-production phases. Three major actors in the storage and distribution phase of the agriculture value chain are local cooperatives, small and medium sized enterprises, and transnational corporations. Storage and distribution requires specialized capital equipment and training to minimize spoilage and maintain product quality suitable for sale to global brands and retail buyers.

*End market* – wholesale, global brands and retail buyers exist to serve local, national, and international product markets. The agriculture value chain is a buyer driven chain in that buyers serving local, national, and international markets determine the upstream production specifications. Although differences exist among products, buyers serving Western developed markets will tend to have the most stringent product and process specifications for agriculture products. Buyers for developing world, regional, national and local markets typically will have lower product and process requirements.

## 2.2. Dynamics in Agricultural Value Chains

### 2.2.1. Structural Transformation

Over the past three decades, agricultural value chains have been restructured, characterized by market liberalization, increased consolidation, and the rise of concentrated buyer power in post-production segments of the value chain (Lee et al., 2012; Reardon et al., 2009). These changes transformed the way agricultural production and trade functioned (Table 1). The sourcing strategies of global brands and retailers now largely determine the conditions for production process and products in agricultural GVCs. Following the adoption of liberalized policies, the centers of research and development also shifted from public institutions to private businesses. In this context, farming is considered as a business and the production signals are derived from requirements by global brands and retailers. The constellation of the value chain actors and the business development services, however, supports information flow and the generation of knowledge about the production technologies, thus, largely influencing patterns of innovation in agricultural value chains.

**Table 1: Structural Transformation of Agro-food Value Chains in Developing Countries**

Early 1980s	1990s – 2000s
<b>Public Policy</b>	
<ul style="list-style-type: none"> <li>Prevalence of public investment and state-controlled agro-food systems</li> </ul>	<ul style="list-style-type: none"> <li>Policy liberalization, privatization, public-to-private shift in governance of agro-food value chains</li> </ul>
<b>Wholesale Segment</b>	
<ul style="list-style-type: none"> <li>Rapid spread of state-run wholesale markets driven by increased public investment</li> <li>State programs linking smallholders and urban wholesale markets</li> </ul>	<ul style="list-style-type: none"> <li>1990s: Rise of private actors in newly deregulated wholesale markets</li> <li>2000s: Increased consolidation and globalization of wholesale markets</li> <li>2000s: Increased importance of ‘chain intermediaries or exporters’ specialized either in a product category or dedicated to specific ‘downstream’ clients</li> </ul>
<b>Processing Segment</b>	
<ul style="list-style-type: none"> <li>Large-scale state-owned processing (particular state dominance in grains, meat, and export crop sectors)</li> </ul>	<ul style="list-style-type: none"> <li>1990s: Proliferation of small- and medium-sized private processing firms; intense competition through product differentiation</li> <li>2000s: Consolidation through mergers and acquisition; globalization through FDI inflows</li> <li>Emergence of specialized processors functioning as ‘chain intermediaries’ in niche markets</li> </ul>
<b>Retail Segment</b>	
<ul style="list-style-type: none"> <li>Subsidized public retail food distribution</li> <li>State-run retail system governed by national governments; and public “wet-markets” governed by municipal governments</li> <li>Private supermarkets rarely existed and only served high-income consumers in large cities</li> </ul>	<ul style="list-style-type: none"> <li>Massive FDI inflows and domestic private investment</li> <li>Rapid diffusion of private domestic and transnational supermarket and fast food chains.</li> </ul>

Source: Reardon et al., 2009

### 2.2.2. Vertical Coordination and Quality-Based Competition

In agro-food value chains, sourcing strategies by lead firms are increasingly characterized by quality-based competition and vertical coordination. These features spur far reaching implications upstream in value chains including those segments where smallholder farming occurs (Lee et al., 2012; Reardon et al., 2009). The proliferation of standards and vertical coordination are interlinked and respond to three broad patterns in value chains: i) change in consumers’ conception of quality; ii) globalization of supply chains and assurances required of product and conditions of production; and iii) public-private shift in governance of the agro-food value chains.

First, consumer attitudes about quality have changed as demand has shifted towards higher-value, ready-to-make, and pre-packaged agro-food products (Jaffee et al., 2011; Memedovic & Shepherd, 2009). Standards are not only related to food safety and physical attributes but increasingly encompass attributes related to social and environmental impacts of food production processes.

Second, with the globalization of supply chains, agro-food products traverse boundaries of multiple firms, and countries that have diverse food production systems and regulatory requirements. These fragmented and globalized supply chains tremendously increase not only risk of contamination (Lee et al., 2012). Accordingly, lead firms require their suppliers to comply with private standards motivated by concerns about food safety risks and erosion of brand capital.

**Table 2: Prominent Public and Private Standards in the Horticulture Industry**

Scope	Public		Private	
	Mandatory	Voluntary	Individual	Collective
National	<ul style="list-style-type: none"> <li>- National legislation (pesticide use, labor regulations, sanitary inspections, and so forth)</li> <li>- USDA standards</li> </ul>	<ul style="list-style-type: none"> <li>- HACCP certification</li> <li>- USDA national organic program</li> </ul>	<ul style="list-style-type: none"> <li>- Nature’s Choice (Tesco)</li> <li>- Field-to-Fork (Marks &amp; Spencer)</li> <li>- Terre et Saveur (Casino)</li> <li>- Conad Percorso Qualita (Italy)</li> <li>- Albert Heijn BV: AH Excellent (The Netherlands)</li> </ul>	<ul style="list-style-type: none"> <li>- British Retail Consortium (United Kingdom)</li> <li>- Assured Foods Standards (United Kingdom)</li> </ul>
Regional	<ul style="list-style-type: none"> <li>- European Union Regulation</li> </ul>		<ul style="list-style-type: none"> <li>- Filieres Qualite (Carrefour)</li> </ul>	<ul style="list-style-type: none"> <li>- EurepGAP</li> <li>- Dutch HACCP</li> <li>- Qualitat Sicherhiet (QS) – Belgium, Holland, Austria</li> <li>- International Food Standard (German, French, Italian)</li> </ul>
International	<ul style="list-style-type: none"> <li>- World Trade Organization</li> </ul>	<ul style="list-style-type: none"> <li>- ISO 9000</li> <li>- ISO 22000</li> </ul>	<ul style="list-style-type: none"> <li>- SQF certification</li> </ul>	<ul style="list-style-type: none"> <li>- GlobalGAP</li> <li>- Global Food Safety Initiative</li> <li>- Social Accountability International, SA8000*</li> <li>- Certification</li> <li>- IFOAM Standard</li> </ul>

Source: Gereffi & Lee, 2009; Henson & Humphrey, 2009; Staritz & Reis, 2013

Third, with the restructuring and diminished role of the state, lead firms have become the main actors governing agro-food supply chains. In developed countries, states even placed new legal responsibilities on agro-food firms following a number of high profile food safety failures (Jaffee et al., 2011).

In the face of these dynamics, lead firms constantly innovate to create niche markets and respond to sophisticated consumer preferences. These changes reverberate along the value chain and require value chain actors, including smallholders, to innovate and upgrade. In the GVC framework, this movement along the value chain is referred to as economic upgrading (Box 1). Accordingly, vertical coordination has become an essential instrument to facilitate innovation and upgrading through the uninterrupted flow of information and knowledge along value chains.

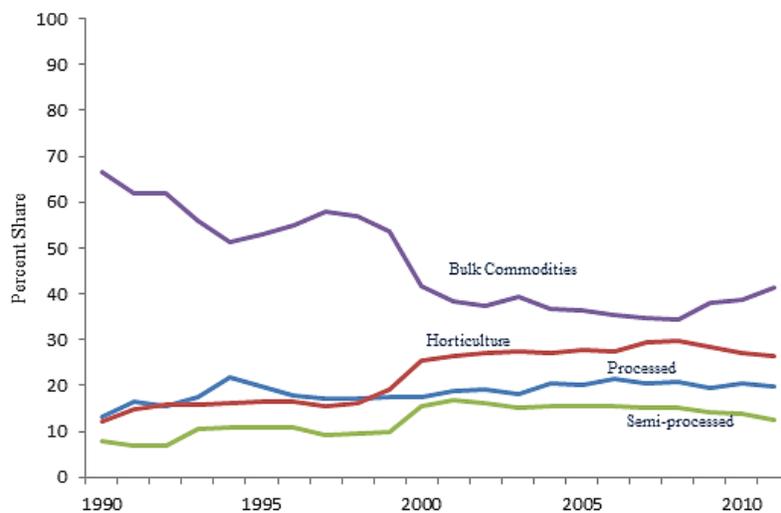
**Box 1: Four Pathways for Economic Upgrading**

- *Process upgrading* that refers to the reorganization of production system or the adoption of better technologies to product more efficiently
- *Product upgrading* that is entry into production of higher value products
- *Functional upgrading* which is engagement into new functions that require a new set of skills
- *Inter-sectoral (or chain) upgrading* that refers to entry into new industries which often require similar knowledge and skills

Source: Humphrey & Schmitz. 2002Humphrey and Schmitz (2002)

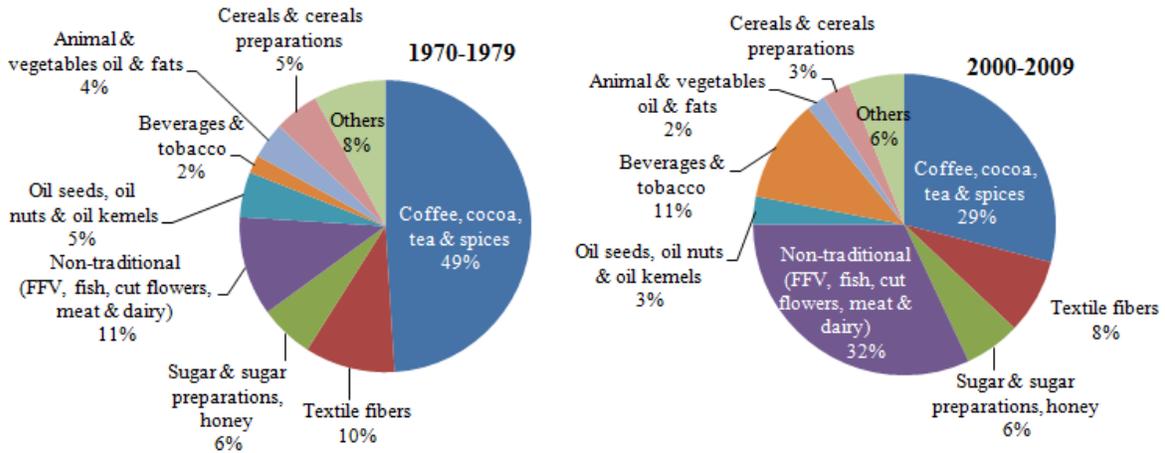
Upgrading linked to private standards and consumer preferences has provided substantial value-added opportunity for the agriculture sector in Africa. With the changing patterns of consumer demand, the value composition of Africa’s agro-food exports has dramatically shifted away from bulk commodities towards higher value products over the past two decades (Figures 2 & 3).

**Figure 2: Percent Share of Value in Africa’s Agro-Food Exports by Product Group (1990 – 2011)**



Source: Duke CGGC, based on UNComtrade (Note: Commodity classification based on Regmi et al. (2005) – Appendix B)

Figure 3: Value Composition of Sub-Saharan Africa’s Agro-food Exports by Product Type (1970 – 2009)



Source: Duke CGGC, adapted from Jaffee et al., 2011

These opportunities are not limited to export markets and increasingly characterize domestic agro-food markets in large cities in Africa. Recent empirical evidence indicates that urban consumers in large cities of Africa are willing to pay higher premium for food safety and the convenience of daily grocery shopping at modern retail stores (Box 2). A major advantage in African markets is also their less stringent buyer requirements (Henson & Humphrey 2010). In this context, innovations and future market opportunities for smallholder are intertwined. The potential opportunity is also enormous. Urban agro-food markets in African are projected to grow fourfold to exceed US\$400 billion by 2030 (World Bank, 2013), from a US\$51billion market in 2008 (UNIDO, 2011).

**Box 2: Value-Added Opportunity: Looking Inside for Agricultural Markets**

Kenya has a population of over 44 million with 3.37 million living in the capital Nairobi. The population has been growing at a rate of 2.3% while the rate of urbanization since 2010 is even higher, averaging 4.2% annually. This phenomenon of rising urban population along with rising income is giving rise to a strong domestic market. Food quality and safety standards for these domestic pockets are emerging driven by consumer lifestyle changes and income, among other factors. Customers are asking for food products that are not genetically modified, use less pesticide and are environmentally friendly. Better still, consumers are even willing to pay more for food products that are safer and have higher nutritional value. A study undertaken by IFPRI established that the overall willingness of the average consumer to pay for kale safety in Nairobi was KES 8.24/kg. This represents a price premium of 39% per kilogram for safety attributes of kale. This change is also reflected in the shopping habits of consumers who are increasingly flocking to super-markets and high specialist shops over traditional markets. Super-markets or high end markets are perceived by their customers as safer, compared to traditional markets that are considered less hygienic and clean.

In Ethiopia too, the flourishing modern retail sector is pointing at consumers’ willingness to pay more for higher quality food products. Factors like how the food was grown, how it was transported and how well it was shelved are concerns that consumers are concerned about. The absence of FDI in Ethiopia is allowing the domestic modern retail to flourish. Another reason that can be attributed to the expanding modern retail in domestic market is compliance risks associated with export markets. While domestic consumers expect clean, ripe and safe products, the standards for export markets are far more stringent. The export market has strict demands of grades and standards. To export globally producers and sellers need to be cushioned with instruments to manage price and market risks.

Source: IFPRI, 2013; Lagerkvist et al. 2013

In a remarkably concise description of the “changing context for agricultural development,” the World Bank (WB, 2006) summarized six changes in the agricultural production system requiring “the need to examine how innovation occurs in the agricultural sector” (pp.2-3).

1. *Markets, not production, increasingly drive agricultural development.* For most of the 20th century, major progress in agricultural development was inextricably linked to major improvements in the productivity of staple food crops, but this situation is changing. With falling staple food prices and rising urban incomes, the pay-off has shifted to strategies that enhance agricultural diversification and increase the value added of agricultural production. Despite their past prominence in driving agricultural development, centralized public research systems are finding it difficult to cater to this trend.
2. *The production, trade, and consumption environment for agriculture and agricultural products is growing more dynamic and evolving in unpredictable ways.* If farmers and companies are to cope, compete, and survive in contemporary agriculture, they need to innovate continuously. Drivers for innovation include, for example,... changing patterns of competition in local but particularly in global markets; changing trade rules and the need for continuous upgrading to comply with them; and changing technological paradigms, such as biotechnology and information technology and the opportunities and challenges that they present.
3. *Knowledge, information, and technology increasingly are generated, diffused, and applied through the private sector.* Private businesses develop and supply a substantial number of the technologies that farmers use or introduce (examples include seed, fertilizer, pesticides, and machinery). The role of the private sector is expected to grow with the increasing intensification of agriculture.
4. *Exponential growth in information and communications technology has transformed the ability to take advantage of knowledge developed in other places or for other purposes.* Both the ICT and the biotechnology revolutions have driven home the fact that many innovations within the agricultural sector—examples include geographic information systems, global positioning systems, and bioinformatics—are based on knowledge generated in other sectors. The question of how to take advantage of new knowledge has become just as urgent as the question of how to generate and diffuse new knowledge.
5. *The knowledge structure of the agricultural sector in many countries is changing markedly.* Thirty years ago, the number of people with postgraduate degrees was very small, and the number of uneducated farmers and farm workers was in the hundreds of millions. Under these circumstances, it made perfect sense to create a critical mass of intellectual resources in a few places, mostly in national agricultural research institutes, to generate new technologies. Since then, overall and agricultural education levels have increased in many countries. Greater numbers of experienced and educated people—in the farm community, the private sector, and in nongovernmental organizations (NGOs) — now interact to generate new ideas or develop responses to changing conditions. Technical change and innovation have become much more interactive processes, which can be led by many different types of actors.
6. *Agricultural development increasingly takes place in a globalized setting.* This change affects all of the five changes mentioned previously: the domestic market is not the only market that defines demand; environmental and health issues cross the borders of any country; knowledge from abroad

may be more important than domestically generated knowledge; and ICT allows information to spread through internationally organized networks of practitioners. Globalization causes quality standards to be defined increasingly by international markets and leads small sectors suddenly to confront huge potential demand. It raises the stakes in agricultural development: success, for example in the export of nontraditional products, may assume larger dimensions than in a more insular world, but failure to adapt to new conditions will also have larger consequences and may cause traditional trade patterns to erode rapidly.

### 3. Agricultural Research and Innovation Systems: Conceptual Frameworks

With the dynamics in agricultural value chains, the perspective on agricultural innovations has also evolved over the past decades (see Appendix A for details). The stark differences between the major frameworks are in how they conceptualized: the processes of technology development, diffusion, and adoption; actors involved in these processes; and the major drivers and outcomes (Table 3).

**Table 3: Conceptual Frameworks in Agricultural Innovations: Main Characteristics**

Characteristics	National Agricultural Research Systems (NARS)	Agricultural Knowledge and Information Systems (AKIS)	Agricultural Innovation Systems (AIS)
<b>Period</b>	Since 1960s	1990s	2000s
<b>Drivers</b>	Technology supply-push from research	Farmer technology needs	Responsiveness to changing context
<b>Actors</b>	National agricultural research organizations (NARO)	NAROs and farmers	Multiple actors, innovation platforms
<b>Intended Outcomes</b>	Technology adoption and uptake	Technologies better fit to livelihood systems	Capacities to innovate, learn and change

Source: CGGC, Adapted from World Bank (2006)

The initial framework, called the National Agricultural Research Systems (NARS), was dominant since the 1960s. It was based on a linear technology-supply push approach. Its change theory is that agricultural research leads to technology innovation, adoption by farmers and growth in productivity. The approach of the NARS was for researchers at national research centers to develop better plant breeds and pass on the technology to extension departments, who, in turn interacted with farmers. The approach focuses its investments in scientific infrastructure and researchers with no concern for the conditions under

which the technology is adopted, or its interactions with the agricultural production system or value chain.

The Agricultural Knowledge and Information Systems (AKIS) emerged in response to the limitations of and the top-down approach by NARS. AKIS shifted the emphasis away from national research centers and recognized the importance of interaction between technology development and technology users, farmers. These trends reflected the overall economic and policy liberalization occurring during the 1980s and 1990s.

The AKIS framework developed during the mid to late 1990s to co-evolve technologies to better fit the unique conditions faced by farmers. Strongly promoted by FAO, AKIS focused how information and ideas are communicated between actors (WB, 2006). Its goals are to develop technologies suited to historically defined social, political, economic and environmental contexts (Klerkx et al., 2012). In contrast to the supply-push perspective of NARS, it is a demand-pull perspective of technology development led by farmers. However, AKIS continued to have limited focus on the role of markets and concentrated only on actors and processes in the rural environment. As pointed out by DFID, the framework does not account for the important role of the private sector in generating knowledge and in developing the agriculture sector (DFID-RIU, 2010).

During the 2000s, the field of agricultural development recognized that agriculture is a production system consisting of pre-production, production, and post-production activities. Each link in the production-to-consumption system, or value chain, can provide new opportunities for innovation and for achieving sustainable production systems (WB, 2006). Rather than focusing on more productive inputs and the methods for their use, the Agricultural Innovations System (AIS) seeks to develop the capabilities of actors across the production system. AIS is defined as a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with policies and institutions that affect the way these different agents interact, share, access, exchange and use knowledge (Hall & Dijkman, 2006). In contrast to previous frameworks, AIS places markets at the center, and recognizes that the source of innovations can occur at any point in the production system. The adoption of a systemic approach allows AIS to better identify what innovations are needed, who is in a position to develop or supply them, and how interventions will affect the production system, including their economic, social, and environmental sustainability.

The shift to the AIS approach by the international community constitutes a major shift in the field of agricultural development. It draws attention to the actors needed for innovation and growth, the role of the private sector, the interaction between value chain actors, and the effects of adopting technology on agriculture throughout the production system. Thus, AIS recognizes a broader set of actors, a wider set of activities, and a wider set of relationships than other frameworks (WB, 2006). While research may be an important component of innovation for some agricultural value chains in some regions, it cannot be assumed as the central or only component. Instead, innovations may come from any segment, or combination of segments in the value chain. Developing the enabling environment, or “absorptive

capacity” of actors to adopt relevant innovations, is seen as the key to overcoming constraints and developing competitiveness in the agricultural production system.

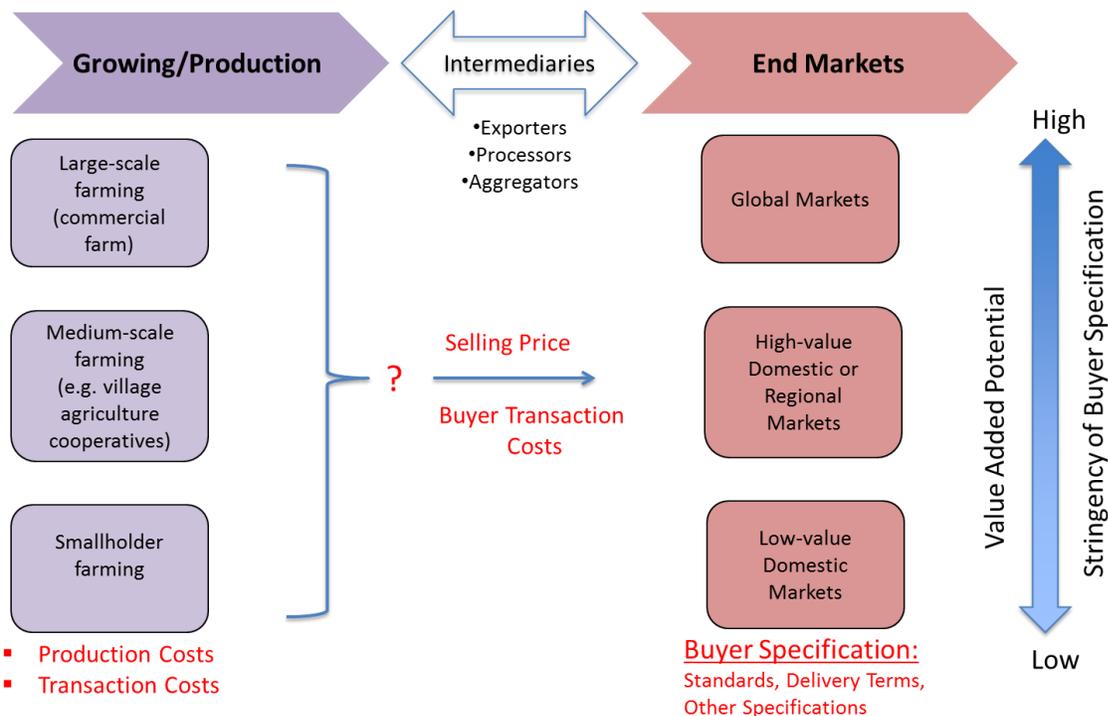
One limitation of AIS is that – unlike in the GVC – AIS plays down the multi-scalar dimension of markets and their interaction with opportunities and challenges for innovation. AIS approach is then becoming contested in the nature of its definition, operationalization and methods (Klerkx et al, 2012). Some see the main question for analysis the extent to which the system supports or constrains agricultural innovation (the “infrastructural view of AIS). Others see process issues as primary, in which describing how innovators change the socio-institutional and technological environment is important (“process view of AIS”). They focus to understand the enablers and constraints to innovation. A third definition of AIS focuses on whether specific functions present in a purportedly well-functioning system have been fulfilled, such as knowledge development and diffusion, market formation, entrepreneurial activity, resource mobilization, and overcoming resistance to change (“functionalist perspective”). The implication of these different definitions to operationalization and intervention is significant because they lead to different conclusions about the appropriate level and type of intervention consistent with an AIS approach.

## 4. African Smallholders and Innovations across Agricultural Value Chains

### 4.1. Smallholder Farming: Competitiveness Constraints

The interaction of GVCs and innovations framework applies to smallholders in Africa in several ways. Whereas AIS emphasizes the interaction between actors and co-creation of knowledge and learning, from an economic standpoint, the unique constraining aspect about smallholders is the scale of their production. The small scale of production and isolation introduces barriers to market entry in the form of ‘transactions costs’ and often, their remoteness and isolation from knowledge and information systems (UNCTAD, 2010a). These transaction costs are rooted at inadequate farm-level resources, farm-to-market logistical bottlenecks, and more general transaction costs in matching and aggregating dispersed supplies to meet buyer and consumer demand (Jaffee et al., 2011).

**Figure 4: Agricultural Market Characteristics: Access Conditions**



Source: CGGC

In agricultural value chains, as typical buyer-driven chains, buyers have the option to select from among the available set of suppliers that are able to competitively meet their specifications. The total cost of procurement borne by buyers will be determined by (Figure 4): the selling price by suppliers and buyer’s own supplier-specific transaction costs. Whatever productivity or production cost advantage smallholder farming might have would remarkably be eroded by the burgeoning transaction costs that buyers would face in facilitating, monitoring, and certifying smallholder compliance if they sources from smallholders. These costs can take various tangible forms, including staff time in searching and screening to determine potential buyers and suppliers, travel and communications, licensing fees,

product inspection and audit fees, system management costs, insurance premiums, storage and handling costs, legal fees, and so forth. Similarly, small scale and dispersed nature of demand by smallholders lead to higher transaction costs for them when they interact with input and services suppliers, such as:

#### 4.1.1. Poor Access to Finance:

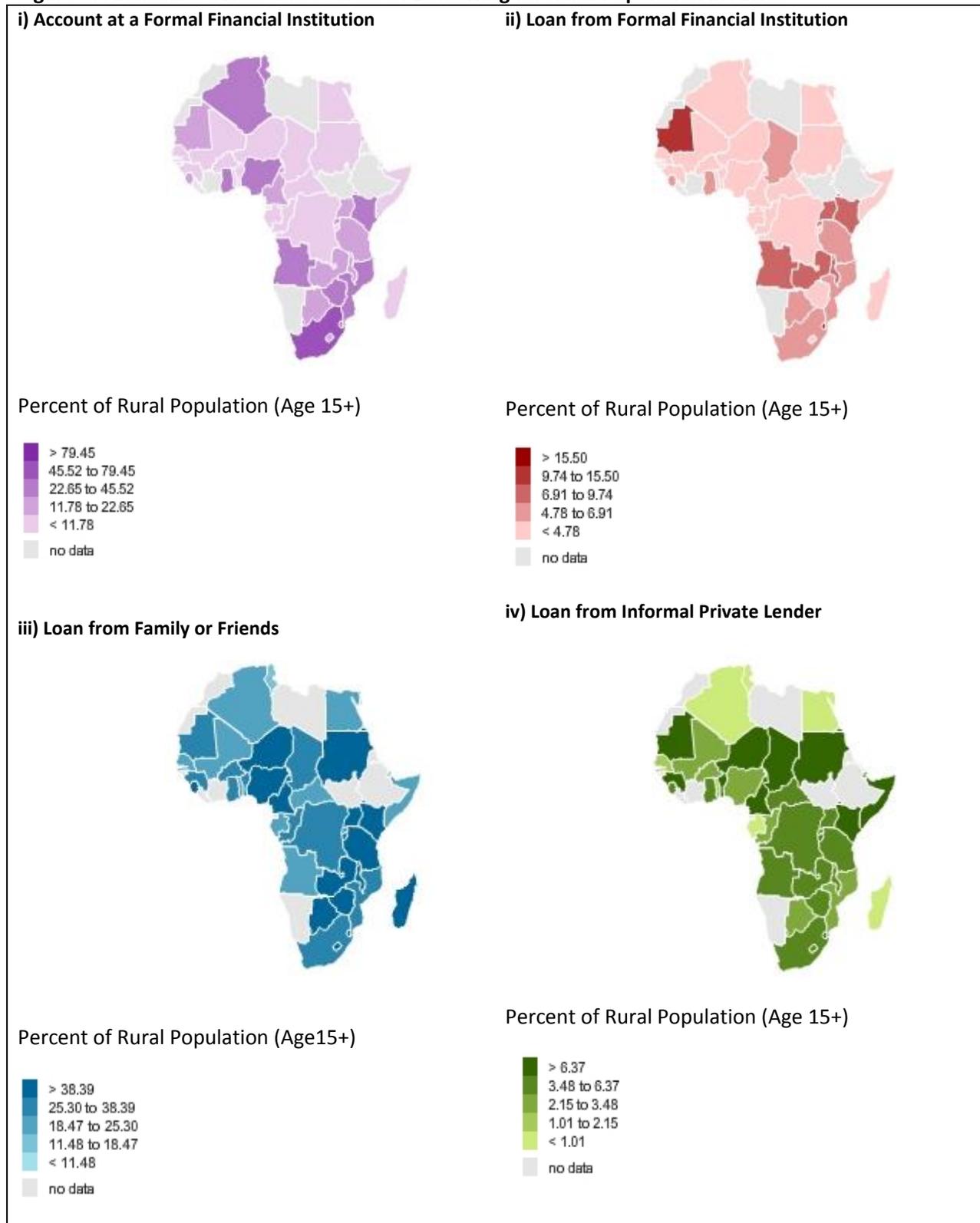
In order for smallholders to commercialize and act as the engine of economic growth for Africa, they need to invest in irrigation, farming equipment, inputs and certification. However, smallholders generally face credit constraints for a number of reasons. First, financial services to farmers are constrained because of high operational costs and the fact that agriculture is subject to climatic and market risks (Table 4) In addition, the smallholder risk profile is exacerbated by lack of collateral, dispersed nature of demand, low financial literacy and irregular cash flows (Fernandez-Stark & Bamber, 2012; World Bank, 2007). Female smallholder farmers' access to credit is generally 5 – 10 percentage points lower than male smallholders (FAO, 2011). Unequal access to finance is linked to social and cultural barriers, limited education and mobility, and misconceptions about the role of women in agriculture (IFPRI, 2009; Staritz & Reis, 2013). In the context of high risks and transaction costs, commercial banks rarely develop financial products meeting the needs and expectations of smallholders (World Bank, 2013). Consequently, smallholders most often find it difficult to access investment and operating capital, and they generally rely on own meager savings or loans from families and friends to address liquidity constraints (Figure 5).

**Table 4: Agribusiness Finance Challenges**

<b>Market Risk</b>	<ul style="list-style-type: none"> <li>• Price volatility influenced by global markets, subsidies, exchange rates, and trade policies</li> <li>• Farmers have very little control over pricing levels and tend to be price takers</li> <li>• Dynamic market standards and requirements</li> </ul>
<b>Production Risk</b>	<ul style="list-style-type: none"> <li>• Rainfall dependence and drought</li> <li>• Diseases and pest</li> </ul>
<b>Financial Institutions</b>	<ul style="list-style-type: none"> <li>• Not strategically focused on agribusiness for commercial lending</li> <li>• Mostly lack proper understanding of agriculture and agribusiness sector</li> <li>• Cumbersome loan application procedures</li> </ul>
<b>Operational</b>	<ul style="list-style-type: none"> <li>• High transaction cost for service providers</li> <li>• Dispersed and small nature of client demand</li> <li>• Property rights and unsecured land tenure system</li> <li>• A lag between investment needs and expected revenue due to seasonality</li> </ul>

Source: UNDP, 2012

**Figure 5: Financial Services and Sources of Borrowing for Rural Population in Africa**



Source: Duke CGGC, based on World Bank, 2012

### 5.1.2 Poor Organization and Market Linkages:

To match the scale advantages preferred by buyers and service providers, smallholders need collective action. Geographic dispersion, in conjunction with small scale, inflicts high unit costs in almost all non-labor pre- and post-harvest transactions involving smallholders (Poulton et al., 2010). This inefficiency turns smallholders into less attractive clients for both service providers and buyers (Kolk & Van Tulder, 2006). It causes a vicious cycle such that, on the one hand, the dispersed and small-scale nature of demand discourages private suppliers to invest in input and services supplying smallholders in Africa (BMI, 2013; Poulton et al., 2010). On the other hand, the thin markets deprive smallholders of inputs and services essential for productivity enhancement and risk management (Block, 2010). Similarly, poor organization and weak forward market linkages also divest smallholders of guaranteed markets for their products.

### 4.1.2. Poor Technical and Business Skills:

As noted by Hall et al. (2006), the agriculture sector is rapidly changing. Knowledge about existing agricultural innovations and how they can be adapted to local conditions is critical to the competitiveness of African smallholders. Smallholders often lack the skills and training to respond to rapidly changing technology and markets (World Bank, 2013). In vertically-coordinated chains, product quality and consistency of supply is often managed through strict contracts; gains from market access depends on whether smallholders understand contract requirements, manage costs and cash flows, and negotiate with the buyers (Fernandez-Stark & Bamber, 2012). Realizing the gains requires farmers to have access to information, skills, and tools they need to improve their yields. Even though public agencies aim to provide extension services, they either lack the capacity or provide little relevant support to enhance skills required in market-driven value chains (Fernandez-Stark & Bamber, 2012). Such skills can include postharvest handling, processing, accounting and basics in business management. While there are variations by type of crop or livestock, poor recognition of women's role in agriculture makes it even more difficult for them to access technical and extension services (World Bank, 2010).

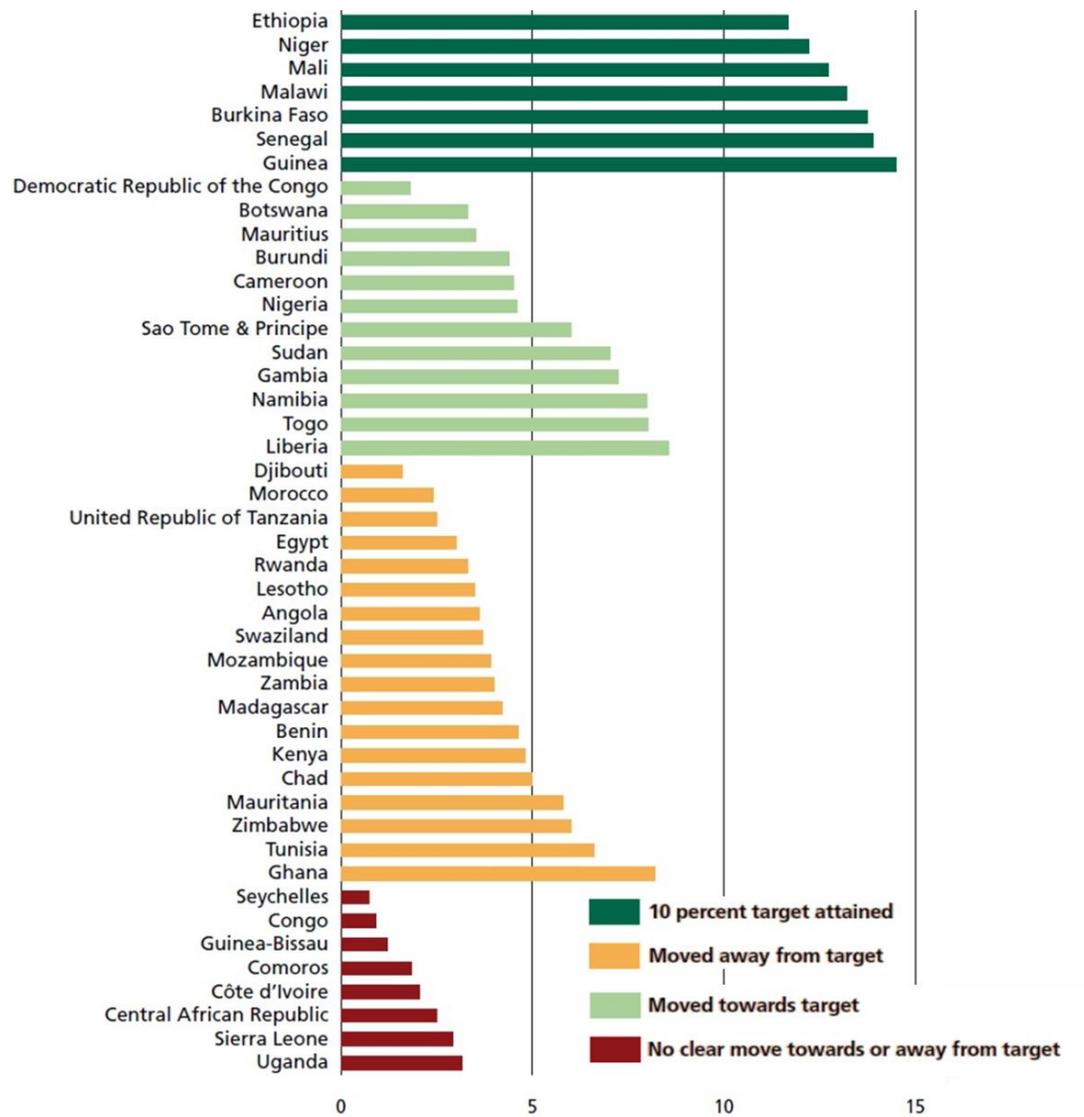
### 4.1.3. Absence of Supportive Policies:

Integration in value chains for smallholders is often compromised by the absence of supportive policies. Following the restructuring in the 1980s, policies primarily focused on enhancing the regulatory environment and investment climate. Expectation was that removing the state would free the market for private actors to take over these functions— reducing costs, improving quality, and eliminating inefficiencies. Too often, that didn't happen, mainly leaving majority of the smallholders exposed to extensive market failures, high transaction costs and risks, and service gaps (World Bank, 2008). While policy focus to create favorable regulatory frameworks are necessary, the benefits assumed to stem from improved regulatory environment is not automatic for smallholders. For instance, little evidence exists about easing of credit for smallholder farmers based on formalization of land tenure (UNIDO, 2008). Similarly, investment policies supporting rural infrastructure and agriculture production often receive the lowest priority. Although initiatives such as the Comprehensive African Agriculture Development Program (CAADP) promise increased investment in agriculture and achieving coherent

policies synchronizing agriculture and industry policies at the country and regional level, many of the African countries have yet to fulfill the pledged target of allocating 10 percent of their national budgets to agricultural development (Figure 6).

Driven by these issues, market failures exist in almost all pre- and post-production inputs and services markets (seeds, fertilizer, irrigation, finance & insurance, storage, processing, and transportation) involving smallholder farmers (Poulton et al., 2010). A key policy question to be addressed is whether and how public and private sectors can cooperate in developing smallholder inclusive agro-industry, and how that institutional set-up should be crafted to facilitate effective public-private collaboration in Africa.

**Figure 6: Percent Share of Government Expenditures for Agriculture in Africa, 2007**



Source: FAO, 2012

Thus, smallholder competitiveness goes beyond the production stage and largely depends on the nature of interactions in pre- and post-production segments of the value chain. Improvements in “horizontal” relationships to access to finance, technical and extension training, and other services as well as “vertical” linkages to access market information and knowledge can all be seen as ways to reduce the transaction costs of smallholders, which in turn allows them to become more competitive market actors. Over time, the transaction costs involved in dealing with those pre- and post-production markets would be expected to fall considerably for smallholders as many aspects of the relationship would be routinized. Thus, finding innovative ways to catalyze those relationships is remarkably important for smallholders’ innovation and integration in value chains.

#### 4.2. What is Innovation?

Innovation has been defined in many ways, from “something new” to simply “change.” Box 3 illustrates some of the common definitions of innovation and their source.

##### **Box 3: Common Definitions of Innovation**

- *Anything new introduced into an economic or social process –(OECD, 1997)*
- *A process through which new ideas, objects, and practices are created, developed or reinvented, and which are new for the unit of adoption – (Walker, 2008)*
- *Innovation is the first application of knowledge in practical use –(Dahlman, 2007)*
- *A process that adds value or solves problems in new ways –(IFAD, 2007)*
- *Economically successful use of invention is innovation, delivers social and economic change...knowledge cannot be regarded as innovation unless it is transformed into products and processes that have social and economic use – (ILRI, 2009)*

The distinction between invention and innovation is key. Stated simply, an invention may not be an innovation because the invention may not be useful within a time or space-bound context. Similarly, an innovation may not be an invention because it is not entirely new, but rather new within a time and space-bound context. Therefore, the term “invention” focuses on the creation of new knowledge, while “innovation” focuses on the application of the invention within a context.

However, we recognize that these distinctions are debated within the literature. Many believe that invention is the same as innovation, and leave the issue of context to the analysis of the diffusion of innovation. For our purposes, the distinctions are important as ways to select among the definitions of innovation. We use Barnett (2005) definition of innovation: “Innovation...means the use of new ideas, technologies, or ways of doing things in a place where people have not used them before. The distinction between ‘invention’ (the creation of new knowledge) and ‘innovation’ (in the sense of first application) is crucial.”

### 4.3. What Are the Relevant Types of Innovation?

Innovation types have been categorized by various authors in the innovation literature. The categories include product and process innovations (Damanpour & Gopalakrishnan, 2001; Tornatzky & Fleischer, 1990), technical and administrative innovations (Damanpour & Evan, 1984; Kimberly & Evanisko, 1981), service, organizational process and ancillary innovations (Walker, 2008); and radical and incremental innovations (Ettlie et al., 1984; Germain, 1996). In addition, the business and technology literature contrasts “sustaining” innovations (an innovation that does not affect existing markets) with “evolutionary”, “revolutionary”, and “disruptive” innovations that vary to the extent to which they affect existing markets (Christensen, 1997). Some innovation scholars contend that innovation types are artificial distinctions and that they are conceptually and operationally alike (Archibugi et al., 1994; Edquist et al., 2001).

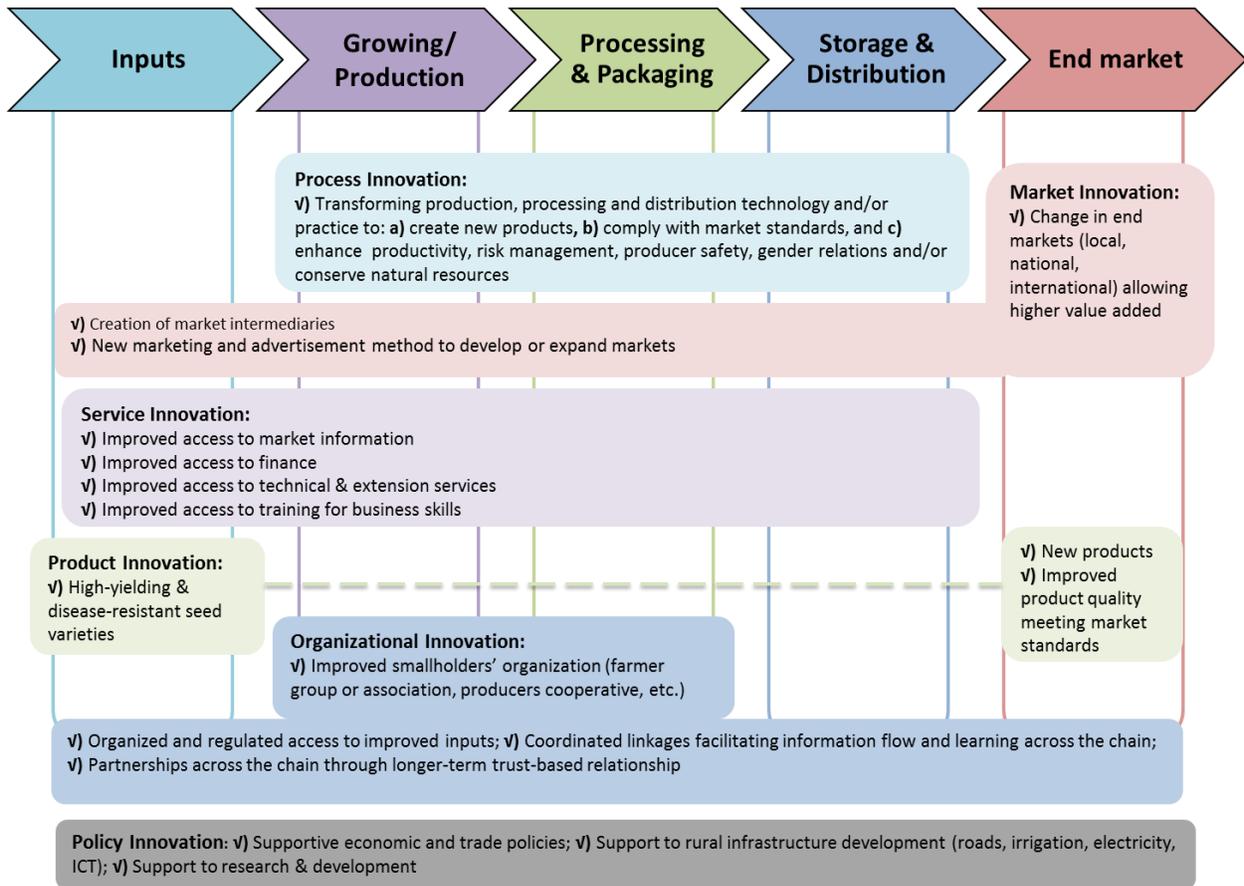
While this debate continues in the literature, we suggest innovation possibilities in value chains are diverse and can relate to input supply, production technology, production organization, post-harvest technology and management, processing, marketing and market functions, the supply of business development services, and policy and regulatory issues. In this regard, we have found it analytically useful to divide innovations into six categories:

- Product innovation: defined as new or improved products. Product innovations are concerned with *what* is produced. Examples include:
  - New end-products (e.g., potatoes vs. potato chips)
  - High-yielding & disease-resistant seed varieties
  - Improved product quality that meets market standards
- Process innovation: defined as improved production technology and/or practices. Process innovations are concerned with *how* products are produced, including:
  - compliance with market standards;
  - enhancement of productivity, risk management, gender relations, producer safety, and natural resource conservation
- Service innovation: defined as services provided by external actors/agents to meet a smallholder or market need. Three types of service innovations exist: new services to new users, new services to existing users, and existing services to new users (Osborne, 2002; Walker et al., 2002). Services relevant to smallholders are:
  - Improved access to market information
  - Improved access to finance
  - Improved access to technical & extension services
  - Improved access to training for business skills
- Organizational innovation: defined as innovations in the development, structure, strategy, or administrative process of an organization (Damanpour, 1987; Walker, 2008). Organizational innovations can occur within and across value chain segments. Relevant examples include:
  - Development or improvements to smallholders’ organization (farmer group or association, producers cooperative)

- Improved producer-buyer relationship (contract-grower, private intermediary, cooperative)
- Coordinated linkages facilitating information flow and learning across the chain;
- Partnerships across the chain through longer-term trust-based relationship
- Organized and regulated access to improved inputs
- Market innovation: defined as innovations that develop new end-markets and/or expand sales to existing markets to capture more value. Specifically, market innovations include:
  - Development or change in product end-markets to capture more value. Change can be in geographic markets (local, national, international), and in the quantity and quality of production.
  - New marketing or advertising methods to create or stimulate demand of product
  - Creation of intermediary markets within and across the value chain, including tiered suppliers and buyers for inputs, collection, distribution, and sale.
- Policy innovation: defined as innovations facilitating the development of public goods and access to markets. These include:
  - Supportive economic and trade policies;
  - Support to rural infrastructure development (roads, irrigation, electricity, ICT);
  - Support to research & development

The innovations listed above tend to cluster in different phases of the agricultural value chain (Figure 7). Product innovations tend to be located at the input/pre-production phase and the post-production/final sale segment. Process innovations tend to be located in the production and the post-production phase. Market innovations, although logically concentrated at the post-production phase, can extend throughout the value chain as markets can develop or exist between the pre-production and production as well as production and post-production phases. Similarly, service, organizational, and policy innovations can be located throughout the value chain, and indeed, tend to be most effective when they address each major phase of the value chain. Successful dynamic improvement in value chain performance critically depends on the ability of the chain actors to acquire, absorb, disseminate and apply new technological, organizational and institutional innovations in a continuous manner.

Figure 7: Innovations across the Agricultural Value Chain Involving Smallholder Farmers



Source: Duke CGGC

## 5. Evidence from Case Studies

### 5.1. Innovations in Africa's Agriculture: Overview of the 13 Cases

An overview of the cases investigated for this project is provided in Table 5. Readers interested in case details may consult the Case Appendix.

**Table 5: Overview of Cases**

ID	Project Name	Country	Region	Product
1	E. Africa Dairy Development	Kenya, Rwanda, Uganda	E. Africa	Dairy
2	Olam Nigeria	Nigeria	W. Africa	Rice, Cashew, Cocoa, Coffee, Sesame, Shea Nut, Cotton, Ginger, Sugar
3*	Malawi Sub-Saharan Challenge Program (FARA's SSA-CP)	Malawi	E. Africa	Various
4	Senegal - Weather Integrated Risk Management	Senegal	W. Africa	Various
5*	Zambia Mobile Banking	Zambia	E. Africa	Various
6	Rwanda Warehouse Receipt System	Rwanda	E. Africa	Maize
7	West Africa Seed Program (WASP)	Benin, Burkina Faso, Ghana, Mali, Niger, Nigeria and Senegal	W. Africa	Sorghum, maize, millet, rice, groundnut, cowpea, cassava, yam, potato, tomato, onion, soya (and other foundation and certified seeds)
8	Mozambique Cassava	Mozambique	E. Africa	Cassava
9*	Ghana ICT (MFarms)	Ghana	W. Africa	Maize, rice, sorghum and soybeans
10*	E. Africa Farmer Development [STRYDE]	Kenya, Rwanda, Uganda	E. Africa	Various
11	Ethiopia Commodity Exchange (ECX)	Ethiopia	E. Africa	Coffee, sesame, haricot beans, maize and wheat
12*	Nigeria Incentive-Based Risk-Sharing System for Agricultural Lending (NIRSAL)	Nigeria	W. Africa	Maize, rice, sorghum, soybeans
13	Uganda Urban Agriculture	Uganda	E. Africa	Cocoyam, bananas, sweet potatoes, cassava, indigenous vegetables and fruits, poultry, dairy, pigs, aquaculture and fishing

\*Denote cases for which further field-based information was not collected either due to issues of information accessibility or relevance of the case to smallholder innovations.

Table 6 summarizes the number and type of innovations identified in the cases across the three major phases of the agricultural value chain. The first column provides in parentheses the number of cases addressing each type of innovation. For example, six cases had product innovations; five had process innovations, and so on. The remaining columns provide the case ID number for each innovation type across the three major phases of production in the agricultural value chain. For example, cases numbered 6 and 7 had policy innovations in the pre-production phase, case number 13 had a policy innovation in the production phase, and cases 6 and 8 had policy innovations in the post-production phase. Note that the number of *unique* IDs in the last three columns will total the number in the first column.

**Table 6: Innovations Identified in Case Studies**

Innovation type (# of cases)	Pre-production (ID#)	Production (ID#)	Post-production (ID#)
Product (6)	1,3,6,7,8,12	--	8
Process (5)	1,2,7	12	8
Service (11)	1,2,3,6,7,8,9,12	1,4,8,10,12	1,3,6,8,9,11,12
Organizational (6)	2,8,9,12	--	1,6,8,9
Policy (4)	6,7	13	6,8
Market (6)	2	--	1,2,3,6,8,11

\* please note: totals do not equal 13 due to multiple innovations across multiple phases of the agricultural value chain for each case.

Overall, the cases represented innovations in all three major phases of production. The most common innovations in the pre-production phase were service (extension services) and product (better inputs) innovations. The production phase included service innovations. Service innovations in the production phase included access to finance and market information. The post-production phase featured service and market innovations, particularly access to business development skills and access to new local, regional, and international markets.

*Product innovations* – Six of the 13 cases reviewed contained product innovations. The product innovations consisted of better inputs (seeds, fertilizers) and related extension services in the pre-production portion of the agricultural value chain. The cases reviewed for this project did not include product innovations in the production and post-production phases of the value chain, which, for example, would have included creating new products for markets.

*Process innovations* – Five of the 13 cases contained process innovations. The process innovations ranged across the three major phases of the agricultural value chain. Three of the five cases, East Africa Dairy Development, Olam Nigeria and WASP focused on the pre-production process innovations by providing improved inputs and related training. NIRSAL focused on the production phase of the value chain by providing banks incentives to lend to smallholders. The Mozambique Cassava case improved the post-production processing of cassava, permitting access to new markets.

*Service Innovations* – 11 of the 13 cases reviewed for this report contained service innovations in the agricultural value chain. Service innovations existed throughout the agricultural value chain, and were – by far – the most prevalent type of innovation in the cases reviewed for the report. Eight cases were in the pre-production phase, five cases were in the production phase, and seven cases provided service innovations in the post-production phase.

Improved access to market information existed in six cases. The adoption of information and communication technology in the Ghana ICT (MFarms) and Ethiopia's Commodity Exchange improved access to pricing information and market standards. Improved access to finance featured prominently in five cases. Access to banking services were provided in Rwanda's Warehouse Receipt system through a

micro-finance partner, allowing smallholders to pay for inputs and household expenses during the growing season. WASP and NIRSAL developed access to credit to purchase improved farm equipment and other inputs needed for agricultural production, while weather insurance mitigated the financial risk to smallholder farmers in the Senegal Weather Integrated Risk Management case. Improved access to technical and extension services was important in the East Africa Dairy Development and Olam Nigeria cases. The Dairy Development case provided services necessary to increase the productivity of the livestock, including breeding programs and veterinary services. Olam Nigeria provided extension services that familiarized smallholders with scientific production techniques. Finally, improved access to training for the development of business skills was important in at least three cases. The East Africa Dairy Development case promoted business development skills for transporting milk and the growth of commercial grade fodder. The Mozambique Cassava case offered rural business development services. STRYDE promoted smallholder farms as businesses and developed training and mentorship to rural youth in East Africa.

*Organizational Innovations* – Six of the 13 cases contained some form of organizational innovation. The cases typically formed farmer’s groups in either the pre-production phase and/or post-production phase. Olam Nigeria, Mozambique Cassava, Ghana ICT (MFarms) and NIRSAL developed organizational innovations and focused on the pre-production phase of the agricultural value chain. Post-production organizational innovations developed in the E. Africa Dairy Development project, Rwanda’s Warehouse Receipt project, Mozambique’s Cassava processing, and Ghana’s ICT (MFarms).

*Policy Innovations* – Four of the 13 cases contained significant policy innovations. Supportive economic and trade policies, support to rural infrastructure development, and public support of research & development were particularly important in these cases. The WASP seed program developed and implemented pre-production policy innovations in the form of national seed laws and regulations, and greater harmonization among different local/regional policies. Rwanda’s Warehouse Receipt System required pre-and post- production policy innovations to achieve an improved production, storage and distribution system for maize. Uganda Urban Ag developed innovative policies during the production portion of the value chain to permit production in cities. The Mozambique Cassava case featured post-production policy innovations to achieve its intended outcomes.

*Market innovations*— six of the 13 cases reviewed for this report contained market innovations. The market innovations for the cases were concentrated in the post-production phase of the agricultural value chain. The innovations accessed new local, regional, or international markets. Malawi’s Challenge Program and the East Africa Dairy Development accessed new local markets for their products. In Malawi’s case, local schools, restaurants, and hospitals were supplied with agricultural products produced more locally, while the Dairy Development case developed chilling plants to serve the local and regional market. Stakeholders in Rwanda’s Warehouse Receipt System accessed regional markets by contracting with the World Food Program to provide food relief supplies. The Ethiopian Commodity Exchange developed better information exchange between buyers and sellers located in the local, regional, and international market. Global customers were accessed through Olam Nigeria’s Nucleus Estate Initiative developing smallholder capacity through its innovative outgrower production method. Olam’s market innovation covers both pre- and post-production phases of the agricultural value chain. A second group of cases created branding and marketing of products for new local or regional markets.

Olam Nigeria branded its rice produced in Nigeria as “Mama’s Pride” to compete against rice imports purported to have better quality. The Mozambique Cassava case created a partnership with Cervejas de Moçambique (CDM) and SABMiller to produce a cassava based beer for the Mozambique called “Impala.”

## 5.2. Evidence from the 13 Selected Cases

### 5.2.1. Increasing Access to Operating and Investment Capital

As discussed in Section 4.1.1, lack of access to finance is a major barrier to upgrading and market access for smallholders. In addressing smallholders’ credit constraints, the cases demonstrate innovative models that developed new financial products and delivery channels meeting smallholders’ demand (Table 7). These models particularly focus on de-risking agricultural finance, alternative collateral, and technology-based systems to reduce risk and operational costs associated with delivery of financial services to smallholders. However, each model has its distinctive features that are described below:

- De-risking agricultural finance:** The *Nigerian Incentive-Based Risk-Sharing System for Agricultural Lending (NIRSAL)* (Case ID: 12) and *R4 Rural Resilience Initiative* (Case ID: 4) introduce innovative finance models that are built on integrated risk management. NIRSAL is built on five-pillars (case summary for Case ID: 12) that tackle lending risks associated with agriculture. It works with both agricultural value chains and financial institutions to improve competitiveness of loan pricing, increase accessibility of financial services, and engage insurance companies to provide Credit Risk Guarantees. The R4 initiative also addresses lending risk through community level capital mobilization and index-based crop and livestock micro-insurance. Besides these institutional arrangements to incentivize financial services to smallholders, the two models also intend to reduce production risks in agriculture through investment in irrigation and productivity enhancement mechanisms (Table 7).
- Alternative collaterals:** The *Olam Nigeria’s Outgrower Scheme* (Case ID: 2) and the *Nyagatere Maize Investment Group (NYAMIG)* (Case ID: 6) assess risk and evaluate collateral in innovative ways that open up new avenues of financing for smallholders. The outgrower scheme uses group lending and future income rather than smallholders’ assets as collateral. Using group lending, it leverages social capital to minimize risk of default. On the other hand, the NYAMIG alternative collateral is built on the warehouse receipt system. The warehouse receipt system, also known as Inventory Credit System (ICS), issues certified transferable warehouse receipts, which can be used as collateral for short-term bank loans or can be sold to buyers as proxies for the underlying commodities.
- Reducing operational costs:** The E-Voucher System is a mobile-based payment and transfer system. The system innovatively uses ICT to reduce fixed costs of serving smallholders even when there are few clients who have small financial needs. The system supports business-to-farmer (B2F) and farmer-to-business (F2B) models, with payments from businesses to farmers or vice versa. The B2F model typically involves buyers of agricultural products paying farmers. In Zambia, Dunavant, the leading cotton producer, adopted the B2F model and was able to reduce costs, improve efficiency, and most important, reduce the time lag in paying smallholder

contract farmers. Similarly, through F2B model, the E-Voucher system improves access to inputs such that farmers can take the voucher to agro-dealers to purchase the desired inputs worth the value on the vouchers.

**Table 7: Addressing Financial Constraints**

Case ID	Innovative Case	Description
2	Private sector scheme: alternative collateral to promote access to finance	<ul style="list-style-type: none"> <li>• Olam Nigeria, a subsidiary of Olam International, is a leading global supply chain manager of agro-food products</li> <li>• Its outgrower scheme gives smallholders timely access to input credit in terms of fertilizer, chemicals or seedlings</li> <li>• Using group lending, the company leverages social capital and future income as collateral</li> <li>• It has partnered with First Bank to facilitate farmer access to bank lending services for capital intensive equipment such as tractors</li> </ul>
4	Integrated risk management: de-risking agricultural finance	<ul style="list-style-type: none"> <li>• R4 Rural Resilience Initiative was launched by Oxfam America and the UN World Food Program</li> <li>• The initiative is built on comprehensive risk management strategy:                             <ol style="list-style-type: none"> <li>i) <b>Risk reduction</b> focuses to strengthen the productive capacity of smallholders by providing input and technical training, improving access to irrigation, and improving soil quality</li> <li>ii) <b>Risk transfer</b> via index-based crop and livestock micro-insurance for smallholders</li> <li>iii) <b>Risk reserve</b> forms community saving groups and mobilizes capital to cope with shocks</li> <li>iv) <b>Risk taking</b> facilitates access to finance through group lending which leverages social capital to reduce repayment risks</li> </ol> </li> </ul>
5	E-Voucher System: reducing operational costs through mobile-based financial transactions	<ul style="list-style-type: none"> <li>• Zoona, a for-profit company, created the pre-paid E-Voucher system in Zambia</li> <li>• The system leverages ICT to enable rapid farmer-to-business and business-to-farmer financial transactions</li> <li>• The business-to-farmer system helps reduce the cost and time lag associated with large buyers paying smallholder contract farmers</li> <li>• The farmer-to-business system improves access to inputs such that farmers can take the voucher to the desired agro-dealer and purchase desired inputs worth the value on the voucher</li> </ul>
6	Warehouse receipt system: alternative collateral addressing post-harvest liquidity constraint	<ul style="list-style-type: none"> <li>• The Nyagatere Maize Investment Group (NYAMIG), a farmer-owned company, administers the warehouse receipt system (Inventory Credit System) in which producers receive credit using stored grain as collateral</li> <li>• It partnered with the Institution de Micro-Finance, a micro-finance bank, to facilitate banking services to members</li> <li>• The system relies on three essential elements:                             <ol style="list-style-type: none"> <li>i. Trained and organized farmer's association</li> <li>ii. Financial institutions and banking regulations recognizing stored maize as an asset to guarantee loans</li> <li>iii. Licensed and well-managed storage facility</li> </ol> </li> </ul>
12	Integrated risk sharing and risk management: de-risking agricultural finance	<ul style="list-style-type: none"> <li>• The Nigeria Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL) is the result of partnership between the Central Bank of Nigeria (CBN) and AGRA</li> <li>• NIRSAL built its approach on financing agricultural value chain by:                             <ul style="list-style-type: none"> <li>○ Tackling the agricultural low productivity and high risk to encourage bank lending</li> <li>○ Providing technical assistance and incentives to banks</li> <li>○ Organizing smallholders to minimize banks' service costs</li> <li>○ Supporting the development of input markets for seed and fertilizer</li> </ul> </li> </ul>

### 5.2.2. Creating Market Linkages: The Role of Value Chain Intermediaries and ICT

As discussed in Sections 2.2.2 (p.8) and 5.1.2 (p.18), market access for smallholders is a function of value chain linkages created to support cost-efficient vertical coordination and compliance to standards. Value chain linkages and coordination serve mutual interest of both firms and smallholders. It ensures reliability of supply to the former while the latter gets guaranteed market for their products (Table 8). Moreover, linking farming operations of planting and harvesting with off-farm processing are fundamental to avoid the prevailing post-harvest losses in Africa (Case ID: 8).

The selected cases illustrate innovative ways of creating such linkages between smallholders and market actors in agro-food value chains. The distinctive features of the different models are discussed below:

- **Backward integration:** This model demonstrates inclusion of smallholder farmers into supply chains of value chain intermediaries (Case ID: 2). The model is built on mutual interest such that it addresses most of the challenges encountered by smallholders while ensuring Olam Nigeria, the value chain intermediary, reliable supply of quality products. Olam plays important role of not only connecting farmers to markets but also serving as the de facto service provider. The firm provides input credit to smallholders in terms of seeds, fertilizer, and chemicals as well as free training and extension services.
- **Smallholder producer aggregators:** This model refers to producer-driven aggregation such as cooperatives and farmer-owned businesses (Case ID: 1 and Case ID: 6). Leveraging economies of scale, the aggregator links smallholder producers to upstream service providers and downstream committed buyers in the value chain. In doing so, the aggregator model helps to lower operational cost of supplying to or sourcing from smallholders. In contrast to backward integration model by value chain intermediaries, this model typically requires facilitation and social finance by aid agencies. With the financial support from government or development organizations, initial supportive infrastructure, such as chilling plants (Case ID: 1) also needs to be built.
- **The Ethiopian Commodity Exchange (ECX):** In Ethiopia, this model links smallholders and traders through dissemination of market information, establishment of quality standards and testing services, and an organized central market place. The ECX functions as central marketplace such that prices recorded on the exchange floor are transmitted to farmers across the country. Farmers receive market information through internet and radio programs broadcast in several languages by a local private FM station. Farmers are, thus, able to compare prices, plan sales, and negotiate accordingly with the buyers. Additionally, the ECX also adopted its own standard and grading system which facilitates trade by providing buyer-seller matching services.
- **ICT-based Market Linkages:** This model, the MFarms platform, leverages web and mobile phone SMS communication technology that lowers transaction cost and increases transparency of market information reaching smallholders located in widely dispersed rural areas. The MFarms platform is central to the Farmers to Markets (FtM) project that aims to link smallholder farmers to structured staple food markets and them in planning, production and marketing of agricultural products.

**Table 8: Creating Value Chain Linkages with Smallholders**

Case ID	Innovative Case	Description
1	Smallholder producer aggregation: linking dairy farmers to formal markets	<ul style="list-style-type: none"> <li>The East African Dairy Development Program (EADD) facilitated establishment of farmer-owned business associations</li> <li>The business associations manage milk chilling plants and facilitate milk collection, preservation, and market linkages</li> <li>They effectively function as aggregators v through bulking, storing and negotiating marketing contracts with downstream buyers such as processors and dairy boards</li> <li>Associations also represent 'service hubs' linking members to services such as animal health and commercial fodder suppliers</li> </ul>
2	Backward integration model: access to pre-production services and guaranteed market	<ul style="list-style-type: none"> <li>Olam Nigeria demonstrates backward integration model that facilitates inclusion of smallholders</li> <li>The company organizes smallholders and works with them as its main suppliers</li> <li>Olam gives farmer groups access to finance, agricultural inputs, technical services, and guaranteed market</li> <li>As a value chain intermediary, Olam also maintains long-term relationship with large buyers downstream the value chain</li> <li>Backward integration model helps Olam to ensure reliable supply in fulfilling its downstream contracts</li> </ul>
6	Smallholder producer aggregation: marketing staple products	<ul style="list-style-type: none"> <li>Nyagatere Maize Investment Group (NYAMIG) is a farmer-owned business association</li> <li>As an intermediary, it aggregates smallholders' surplus produce, provides storage service, and facilitates buyer contracts</li> <li>NYAMIG has secured sale contract under the World Food Program (WFP) initiative called Purchase for Progress Program</li> <li>NYAMIG maintains market relations by ensuring compliance to standard requirements by WFP and the Rwanda Bureau of Standards</li> </ul>
8	Backward integration model: bringing processing factory to the farmgate	<ul style="list-style-type: none"> <li>The Dutch Agricultural Development &amp; Trading Company (DADTCO), a processing company, creates farm-market linkages by serving as intermediary between cassava farmers and large private sector agro-food manufacturers</li> <li>DATCO's patented Autonomous Mobile Processing Unit (AMPU) brings processing factory to farmgate, thereby, significantly minimizes post-harvest waste</li> <li>The company guarantees market to smallholders by linking smallholders and large private sector operators, e.g. Flour Mills of Nigeria, Honeywell, breweries such as SABMiller, Heineken and Unilever that uses cassava derivatives in their production processes</li> </ul>
9	Mobile-based supplier-buyer linkages: ICT for inclusive agro-food value chains	<ul style="list-style-type: none"> <li>The MFarms platform, a web and cell-phone ICT system, is central to facilitation of supplier-buyer relationships</li> <li>It serves as the main vehicle supporting information flow and operational efficiency in linking smallholders to input and product markets</li> <li>It assists smallholders in timely planning, monitoring, and marketing of agro-food products</li> <li>The MFarms database contains the geo-referenced profiles of over: 140 warehouses, 40 transport companies, 37,000 farmers, 75 agents and 30 aggregators</li> <li>The Savanna Farmers Marketing Company Ltd., a farmer-owned company, uses the MFarms platform and serves as an aggregator linking smallholders to food manufacturers</li> </ul>
11	Commodity exchange: linking smallholders to national and regional markets	<ul style="list-style-type: none"> <li>The Ethiopian Commodity Exchange (CEX) is a member-based non-profit commercial entity formed under a public-private partnership</li> <li>As a central market place for coffee, it links buyers and sellers and facilitates trade through information sharing and product grading services</li> <li>It disseminates real time price and market information via web and radio programs for all actors in the coffee value chain</li> <li>The CEX helps producers by-passes middlemen and guarantees contract enforcement through timely delivery of merchandise and payment to farmers</li> </ul>

### 5.2.3. Organized and Trained Smallholders: Building Technical and Business Skills

As discussed in Sections 5.1.2 (p. 18) & 4.1.2 (p.18), collective action and technical and managerial capabilities are essential to smallholders' competitiveness and inclusion in modern agro-food value chains. The selected cases (Table 9) show that smallholder collective action, in the form of organized producers, helps achieve economies of scale by creating joint-demand for pre- and post-production services such as transportation of produce, storage and distribution. Case (ID:1) contributes to empowerment of women farmers as women play an important role in the governance and operations of farmer associations and represent 33 percent of shareholders in the 22 established business associations.

Moreover, the cases illustrate that collective action is effective when it is complemented with technical and managerial trainings. Additionally, farmer organization also multiplies the benefits of technical and business trainings because the ensuing networking and information sharing opportunity also makes organized farmers vehicles for learning and technology adoption (Case ID: 6).

The selected cases indicate that collective action should not necessarily be in the form of cooperatives but can occur in multiple forms including Farmer Business Associations (Case ID: 1), Farmer Group in outgrower schemes (Case ID: 2), or Cooperatives (Case ID: 6). While all these farmer organizations serve as media to mobilize collective action, each fills specific gaps of 'public good' nature in the respective value chains. Collective action, for instance, address institutional gap related to technical training, product quality assurance, market information, and infrastructure such as chilling plants. The cases also demonstrate the differentiated upgrading opportunities which differ between the farmer-owned businesses in value chains serving domestic markets (Cases ID: 1 & 6) and the farmer groups organized by value chain intermediaries primarily serving export markets (Case ID: 2). In the latter case, farmer groups have limited opportunity for functional upgrading because almost all of the post-harvest activities are handled by the value chain intermediary, Olam Nigeria in this case.

**Table 9: Building Technical and Managerial Skills**

Case ID	Innovative case	Description
1	Organized and trained smallholders: business association of dairy producers	<ul style="list-style-type: none"> <li>• The East African Dairy Development Program (EADD) facilitated organization of smallholders into business associations that operate milk-chilling plants</li> <li>• EADD trains and supports dairy producers' business association on management of plant operations</li> <li>• Association members also are trained on modern animal husbandry practices including feeding, breeding and milking</li> <li>• Nestle and Tetra Pak train dairy producers and business associations along the farm-processing chain on food safety and quality standards</li> <li>• More than 125,000 farmers have registered in 22 business associations, and 33 percent of shareholders are women</li> </ul>
2	Organized and trained farmers: farmer groups in Olam's outgrower schemes	<ul style="list-style-type: none"> <li>• Olam Nigeria organizes farmers into producer groups and trains them on modern farming and production technologies</li> <li>• The technical training focuses on utilization of inputs (seeds, fertilizer &amp; chemicals) and harvesting</li> <li>• Participating farmers are required to join farmer groups in any of the 150 farmer groups formed by Olam Nigeria</li> </ul>

Case ID	Innovative case	Description
		<ul style="list-style-type: none"> <li>Farmer groups are capable to manage group lending schemes and organize regular meetings to manage group activities</li> </ul>
6	Organized and trained farmers: local empowerment via maize innovation platform	<ul style="list-style-type: none"> <li>The 'Maize Innovation Platform' works with organized and trained farmers to facilitate maize development in Nyagatare</li> <li>Nyagatare Maize Investment Group (NYAMIG), a farmer-owned business, relies on well-functioning and organized farmer associations</li> <li>Technical and extension services focus on land use consolidation and the use of improved seeds and fertilizer</li> <li>The platform has also piloted bottom-up extension system whereby technical agents and farmers could network and share information on crop husbandry, improved seed varieties and fertilizer, and disease control</li> <li>NYAMIG has trained participating farmers on quality standards that enabled farmer groups to sell directly to World Food Program's Purchase for Progress (P4P)</li> </ul>
9	Capacity building of organized farmers: Farm to Market (FtM) Initiative	<ul style="list-style-type: none"> <li>The Savanna Farmers Marketing Company, a farmer-owned business, is the main vehicle through which the FtM projects organizes and trains farmer groups</li> <li>The FtM project trains farmer groups on technical topics such as production methods and post-harvest handling of products</li> <li>It also provides tailor-made business training on contract and supply requirements and the use of mobile phone application</li> <li>The project trains group leaders on data collection and analysis well as topics such as group dynamics and conflict resolution essential to well-functioning farmer organizations</li> </ul>

#### 5.2.4. Conducive Policies: Public-Private Partnerships and Urban Food Security

The cases illustrate that government play an important role in facilitating upgrading and market access for smallholders (Table 10). The cases reveal two key features of government policies important for smallholder inclusion in agricultural value chains. First, balanced policy approach is essential in pursuit of commercial agriculture and national food security goals. Second, public-private partnership provides the mechanism not only in developing infrastructure but also facilitating market-oriented regulatory frameworks.

The Ethiopian government, for instance, played a key role in the design and development of the ECX in the country. It was because of the policy interventions that the ECX adopted coffee rather than grains, unlike other commodity exchanges in Africa, as the pilot commodity for the exchange. The policy decision was motivated by food security concerns because the country is prone to droughts and could not rely on free-market facilitated by the ECX for grain supplies. Similarly, the policy decision granting the ECX monopoly over coffee exports was critical to transformation of the coffee market and potential

success of the ECX (Robbins, 2011). Moreover, in partnership with the private sector, the Ethiopian government regulated the ECX pricing system to control rapid price volatility in domestic coffee market.

Public-private partnership is also essential in stimulating private investment and expanding smallholder access to new technologies and markets. Cassava commercialization was facilitated via a public-private partnership project between DADTCO, the private cassava processing company, and the local/state governments in Mozambique. The public-private joint venture created new market for cassava while facilitated cassava processing at the farmgate. Because cassava rapidly perishes after harvest, the farmgate processing can help significantly reduce post-harvest waste. Additionally, favorable government trade policy provided incentives in development of cassava-based new product, in this case the Impala beer.

As the cases illustrate, balancing the objectives of commercial agriculture and food security is critical. Understanding the food security impact of cassava commercialization, for instance, should inform policies to determine continuation and expansion of the project. Similarly, urban food security will be a key challenge with the rapid urbanization in Africa. Favorable policy and regulatory frameworks governing urban agriculture can enhance livelihoods and food security of the urban poor. The Kampala case is an instance of policy response supporting urban agriculture by a municipal government. It represents an important perspective change by permitting urban agriculture and incorporating farming activities into the planning and management of a rapidly growing city. The paradigm shift seeks to establish regulations to assist farmers for the growing, handling, and commercial distribution of plants, fish, and livestock within Kampala.

**Table 10: Balancing Food Security and Commercial Agriculture**

Case ID	Innovation Case	Description
8	Commercializing cassava production: public-private joint venture to address market failure	<ul style="list-style-type: none"> <li>• Cassava commercialization represents a public-private partnership to transform cassava from subsistence to cash crop in Mozambique</li> <li>• DADTCO forms joint ventures with local/state governments where the company operates</li> <li>• DATDCO farmgate processing service reduces post-harvest waste and link smallholders to markets controlled by large private sector operators, e.g. Flour Mills of Nigeria, Honeywell, breweries such as SABMiller, Heineken and Unilever that use cassava derivatives in their production processes</li> </ul>
11	Commodity exchange: public-private partnership to link smallholders to national and regional markets	<ul style="list-style-type: none"> <li>• Government of Ethiopia was the dominant player in the development of the ECX and policy decision piloting coffee rather grains</li> <li>• The regulatory frameworks governing the ECX require all collectors and larger traders to store their coffee in registered warehouses allowing the ECX to emerge as a central market place for coffee in Ethiopia</li> <li>• Towards the same goal, government policy allowed the ECX to maintain monopoly for all coffee export sales – except over the specialty coffee markets linked to foreign outlets</li> <li>• Government policy required the ECX to moderate coffee price volatility by fixing margins periodically, i.e., market prices can only deviate 5 percent from the base price fixed for a period of 10 days</li> </ul>

Case ID	Innovation Case	Description
13	The City Council of Kampala: policy shift allowing urban agriculture	<ul style="list-style-type: none"> <li>• The new Urban Agriculture Ordinances represent an innovative and pro-poor policy shift, formally approved in May 2005, by the City Government in Kampala</li> <li>• The new framework allows urban agriculture as a legitimate economic activity</li> <li>• This policy change has facilitated smallholder support by enabling stakeholders to openly support and promote appropriate agricultural activities in the city, and has allowed the City Council to establish various partnerships to develop urban agriculture (UA) related projects</li> </ul>

### 5.2.5. Facilitating Multi-Stakeholder Arrangements

A key pattern across almost all selected cases was collaborative multi-stakeholder arrangements. These arrangements, also often called ‘innovation platforms’, involve stakeholders from the entire spectrum of actors including public agencies, private firms, non-governmental organizations, and organized smallholders (Table 11). Because actors in the agro-food value chains have different capabilities and incentives, the arrangements are in most cases facilitated by specialized partnership facilitators (Table 11). The role of facilitator is critical in creating new set of incentives, and bringing together the value chain actors based on shared interests and opportunities for improvements.

Despite creating new incentives, the selected cases illustrate that facilitators also change the capabilities of smallholders so they can respond to the new set of incentives. For instance, Heifer International, in partnership with four specialized agencies, facilitates collaborative arrangement between the dairy value chain actors, primarily the DFBA, processors, Nestle and local institutions to support development of the dairy sector. While the emerging new dairy market creates price incentives for smallholders, the EADD also enhances farmer capabilities through organization, training, access to services, and creating the required infrastructure, i.e., chilling plants. As the EADD case illustrates, value chain linkages and stakeholder arrangements work well, therefore, when the emerging new system of incentives and capabilities are balanced along the value chain (Case ID: 1 & 8).

With these changes, the roles of stakeholders in the value chain also evolve. For instance, farmer-owned business associations emerged as the main aggregator linking smallholder dairy producers to downstream markets and upstream service providers such vet clinics and commercial fodder producers. Therefore, identifying the right group of actors and understanding their existing and potential incentives and capabilities are critical to sustainable inclusion of smallholders in agro-food value chains.

**Table 11: Facilitating Multi-Stakeholder Arrangements**

Case ID	Multi-Stakeholder Arrangement
1	The EADD is a collaborative arrangement between five international development organizations and the local dairy value chain stakeholders. The stakeholders are International Livestock Research Institute (ILRI), TechnoServe, African Breeders Services (ABS), World Agroforestry Center (ICRAF) and local value chain actors including Dairy Farmer Business Associations (DFBAs) and dairy processors.
8	The cassava commercialization case illustrates close collaboration between stakeholders facilitated by the two lead partners, the Dutch Agricultural Development and Trading Company (DATCO) and the International Fertilizer Development Center (IFDC). Other facilitating partners are Instituto de Investigação Agrária de Moçambique (IIAM), Corredor Agro (an agricultural supply chain business in Mozambique), Cervejas de Mocambique (CDM) - a subsidiary of SABMiller.
12	The Nigeria Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL) is a complex collaborative arrangement between the actors in the agricultural value chain and financial institutions. The complex stakeholder arrangement is managed by a dedicated board of directors also involving as members the Ministries of Agriculture & Rural Development, Finance and Trade & Investment in Nigeria. The strength of these complex multi-stakeholder arrangements can also become its weakness. The overlapping stakeholder roles often becomes complex and are not easily understood, particularly, by the smallholder farmers.

## 6. Conclusion

The purpose of this report was to provide a value chain perspective on how innovations can increase access to markets by smallholder farmers in Africa. Our review of the agricultural development literature highlighted the main constraints of smallholders participating in value chains. In brief, the constraints for smallholders are capacity, capability, access, and value chain consolidation.

Capacity refers to the small scale of production for smallholder farmers, introducing transactions costs between producers and commercial buyers for intermediate and final markets. Commercial buyers are interested in purchasing agricultural commodities in volumes greater than typically produced by smallholders. Buyers will, however, consolidate smallholder production volumes if smallholders deliver the product at specified times, quality, and quantity. Organizational innovations, including cooperatives and outgrower schemes, help to consolidate the output of smallholders and to reduce transactions costs for buyers.

Capability refers to the ability of smallholders to meet production requirements for buyers, which in agriculture typically refers to quality but also quantity and timeliness of production. The innovations introduced to smallholder farmers by agro-food businesses are characteristically product, process, and organizational innovations needed to improve the capability of smallholders to meet market specifications.

Access refers to limitations on the availability of products and services needed by smallholder to effectively produce for markets. These limitations or constraints exist throughout the value chain. Products to which smallholders need access include suitable production inputs, specifically land, labor,

seeds/stock, and water. Services to which smallholders need access include extension and financial services in the pre-production, production and post-production phase. Extension services are typically regarded in the agriculture sector as limited to pre-production and production phases; these include training on the proper application of fertilizers, herbicides and pesticides, irrigation techniques, or growing techniques. However, post-production extension services are needed to reduce crop loss during harvest, storage, and distribution. Similarly, access to financial services is important for smallholders in the pre-production, production, and post-production segments of the agricultural value chain. Credit is needed to purchase or improve inputs and to pay for household expenses while crops are in the field. Crop insurance and banking services are needed during production and post-production. Innovations introduced in many of the cases reviewed for this report focused on ways to improve access to products and services, including access to training, finance, and improved inputs.

Consolidation in the pre-production and post-production segments of the agricultural value chain inhibits the opportunities for smallholders to access markets. Input markets are increasingly dominated by large agro-food suppliers, which include transnational firms supplying hybrid seeds, fertilizers, pesticides, and herbicides. Access to specialized inputs is increasingly important for smallholders to participate in GVCs, particularly for commodity crops. Simultaneously, the diffusion of specialized inputs makes it more difficult for smallholder farmers to participate in markets if they do not have access to finance and training. In addition to the consolidation in input markets, access to high-value export and domestic markets is increasingly controlled by large transnational agro-food firms. The implication for smallholders is that they continue to struggle to meet the production and handling requirements of these large global buyers.

Product, process, service, market, organizational and policy innovations help smallholder farmers overcome limitations faced in pre-production, production, and post-production segments of the value chain. The competitiveness of smallholders in the pre-production phase is enhanced by product, service, and organizational innovations. Process, service, organizational and market innovations are particularly well suited to improve the competitiveness of smallholders in the production phase of the agricultural value chain. Smallholders' competitiveness in the post-production phase can be enhanced through market, product, and organizational innovations. The cases profiled in this report illustrate how innovations adopted in specific economic, sociological, technical and political contexts assisted farmers to better access markets.

Policy innovations by governments can facilitate smallholders' access to markets through the provision of public goods and the development of supportive economic and trade policies. Public goods relevant to agriculture include roads, irrigation, electricity, education, and ICT. In some cases, it may also include investing in capital goods or providing technical training for their use. Supportive economic and trade policies are important to ensure that consistent signals are sent throughout the agricultural production system. Almost all governments intervene in agricultural production systems in an effort to achieve a variety of policy goals; however, policies often have different consequences for actors positioned in various segments of the value chain. For example, the goal of governments to guarantee low prices for staple foods in urban areas may conflict with the goal of smallholders to access markets. The effect on the competitiveness of smallholders should be considered when governments adopt or modify policies.

The role of governments will depend on political will, financial and technical capability, and the desired level of intervention into the agricultural food systems in particular countries, locales, and regions. In areas where the role of government is very limited, agriculture-oriented NGOs and IGOs may help fill the gap. However, the interventions within the capability and capacity of development organizations are often quite different than those of governments. NGOs and IGOs are particularly well suited to introduce innovations and develop skills relevant to promoting smallholder competitiveness, including methods for stakeholder engagement and other methods for inclusive development.

A hallmark of agriculture development in recent years has been addressing the constraints of particular groups historically tied to smallholder agricultural production, particularly women and youth. Engaging the private sector has been a second trend in agricultural development, as governments and the donor community have recognized the important role of markets in addressing the constraints faced by smallholders and limiting the dependence on external actors. A third trend in agricultural development has been to increase agricultural production in ways that do not reduce the quality and availability of the inputs required for production. Often this means a concern for the environmental effects of agricultural production and finding ways to achieve sustainable output levels. Innovations are critical to addressing these and related issues affecting the competitiveness of smallholder farmers in Africa and guaranteeing their access to markets.

## Appendix A: Historical Context

The late 1960s illustrated the remarkable capacity of new, more productive varieties of wheat and rice to reduce global food shortages. Termed the “Green Revolution” in 1968 by William Guad, an early director of USAID, the development and diffusion of new wheat and rice varieties is credited with the elimination of food shortages in India, Pakistan and the Philippines in the 1960s and 1970s, and, remarkably, turning them from net importers into net exporters of food over the next few decades. The success of the new varieties, in combination with the adoption of modern irrigation techniques, inorganic fertilizers, and pesticides, led to the push for the adoption of intensive, mono-culture agriculture techniques globally. Agricultural research into new varieties and production methods, combined with agriculture extension services, were viewed as central to increasing global food availability.

The Rockefeller Foundation and Ford Foundation were early supporters of the Green Revolution, going as far back as Norman Borlaug’s wheat research in Mexico during the 1940s (Ekboir, 2009). During the late 1960’s, the World Bank pushed to institutionalize agriculture research to improve food availability in the developing world. In May 1971, the Consultative Group on International Agricultural Research (CGIAR) was established, in coordination with the World Bank (Robert S. McNamara as president), and co-sponsored by the FAO, IFAD and UNDP (Wikipedia). CGIAR’s mission was to reduce hunger by increasing the productivity of staples in small farms. Since cereal (rice, wheat, and maize) make-up about 60 percent of human foods (FAO, 2007a), its highest priority was to develop improved cereal varieties and to find mechanisms for inducing their adoption, typically by encouraging policymakers to provide economic subsidies to agriculture. In many ways, the approach resembled the model used since the 1920s and 1930s in the U.S. to increase agriculture production (Kramer, 2006).

The intervening decades have led to an extended critique and reconceptualization of how to increase the availability of food in developing countries. The critique is based on three main perceived deficiencies of the Green Revolution: its focus on the intensive production of cereals, a focus on agriculture inputs, and the omission of Africa. We discuss each of these three critiques below.

### A.1.1: Intensive production of cereal crops

Intensive production of cereals is problematic for three main reasons. First, the Green Revolution did not pay attention to vegetables, livestock, poultry and fish which constitute important sources of nutrition for developing nations. Second, intensive agriculture is not economically, socially, and environmentally sustainable in developing countries. Third, the chief beneficiaries of the Green Revolution were consumers, not producers, of food. We discuss the sustainability and beneficiaries of the Green Revolution below.

Economically, the Green Revolution relied on government subsidized inputs and price supports. In the case of India, subsidies were part of a complex food policy regime, supported by senior government officials, to coordinate agricultural price supports, procurement policies and infrastructure, and the public food distribution system (UNCTAD, 2010b). In the absence of the continued willingness or capacity to provide government funds, the gains achieved would be starkly reduced. In addition,

concerns were raised about the newly created dependency of the agriculture sector on government. Socially, the Green Revolution interrupted the social fabric, including shifting gender roles. Several studies found that the established roles of women and their traditional power bases were challenged by the introduction of new technology in agricultural systems (Serageldin (1995); Shiva (1991)in (FAO, 1996). More generally, income inequality increased as a result of the Green Revolution, as farmers with greater access to capital and skills were better able to increase their agricultural production (FAO, 1996). Environmentally, intensive mono-culture agriculture contributed to soil erosion, the pollution and depletion of water resources, and negative health effects to famers applying agrochemical fertilizers, pest, and weed control. Others have raised concern about the destruction of native, genetically diverse varieties in favor of new, and high yielding varieties. An additional environmental concern is that increased food production in Africa and Latin America has largely been the result of expanding the cropping area, often into areas with marginal fertility (FAO, 1996). The need for ever more intensive agricultural production may result, on the whole, in farmers being worse off because of the requirement for expensive inputs and reduced stability in production on these marginal lands (FAO, 1996).

Third, the chief beneficiaries of the Green Revolution were consumers, not producers, of food. Real food prices have declined over the past 30 years as a result of the high yielding varieties and production methods introduced by the Green Revolution. The uneven distribution of benefits of the Green Revolution to urban dwellers, rather than the characteristically poor, rural smallholders, strikes some observers as particularly problematic.

#### **A.1.2: Focus on inputs and the omission of Africa**

The Green Revolution is also criticized for focusing on agriculture inputs. In many ways, the Green Revolution was a “technology package” (FAO, 1996) for better agricultural inputs – better seeds, better fertilizers, better pest control – and associated agriculture extension services needed to make use of the new technology. The implicit program theory of the Green Revolution and its leading proponents was that better, more technologically advanced, agricultural inputs would lead to increased yields, which, in turn, would lead to the eventual elimination of food shortages in developing countries. However, as the Green Revolution expanded beyond India and Asia, actors such as CGIAR and FAO recognized that “technology supply push” had limited effectiveness in other parts of the world, particularly Africa. One cause of its limited effectiveness was due to the complex food policy regime required to make the Green Revolution a success. As pointed out by UNCTAD (UNCTAD, 2010b), the Green Revolution in India occurred at a time when the state dominated the economy, and where the political and administrative support was available to supply publicly-provided agriculture inputs, develop a price support structure, provide public infrastructure, and link the increased production with a state-run food distribution system.

Such an approach could simply not be replicated in Sub-Sahara Africa characterized by its complex social, economic, and political medley. Excerpting from a 2010 UNCTAD report, “the particular characteristics of African farms pose significant problems in realizing an Asian-type Green Revolution. The features that set Africa apart include:

- lack of a dominant farming system on which food security largely depends;
- predominance of rain-fed agriculture as opposed to irrigated agriculture;
- heterogeneity and diversity of farming systems and the importance of livestock;
- key roles of women in agriculture and in ensuring household food security;
- lack of functioning competitive markets;
- under-investment in agricultural R&D and infrastructure;
- dominance of weathered soils of poor inherent fertility;
- lack of conducive economic and political enabling environments;
- large and growing impact of human health on agriculture exacerbated by diseases such as Aids and malaria;
- low and stagnant labor productivity and minimal mechanization; and
- predominance of customary land tenure.”

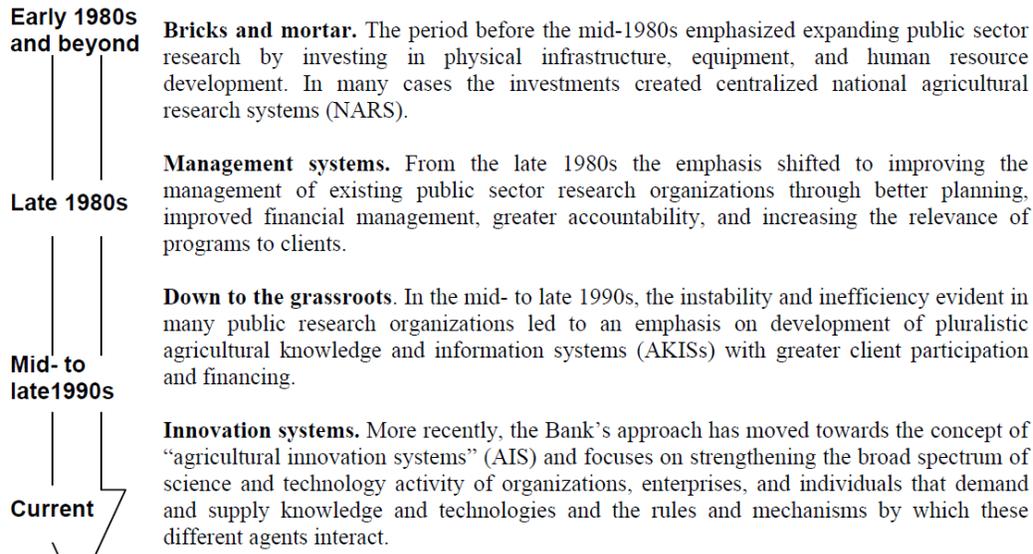
The report (p.58) continues: “Today’s African farmers could easily produce far more food than they do, but they are constrained by their lack of access to credit to cover production costs and difficulties in finding buyers and obtaining fair prices to give them a minimal profit margin. Under such circumstances, what difference will a new technology package make? Without addressing the underlying reasons why African farmers leave farming or why they under-produce, most initiatives will have little impact on this trend” (UNCTAD, 2010b).

This leads to a critical point. A second reason for the limited effectiveness of the Green Revolution in other parts of the world was due to its emphasis on improving the productivity of inputs rather than access to markets. CGIAR, by the late 1990s, recognized that one of the lessons of the Green Revolution is that “there is ample experience now to show that farmers’ willingness to increase food production in many developing countries is closely linked to the existence of markets for their produce. Similarly, the adoption by smallholders of improved management techniques on their farms seem to occur when there is ready access to input supplies and assured markets with fair and predictable prices for the produce” (Ekboir, 2009). The trend during the late 1990s was to emphasize the role of markets as an important factor in eliminating food shortages in developing countries. Awareness was dawning in the IGO/NGO community that programs providing supply-side solutions had to be matched with demand-side opportunities to absorb the added production in order to achieve their desired programmatic outcomes.

The recognition by the IGO/NGO community about the role of markets in the successful adoption of the input technology packages led to a better understanding of how *context* matters to agriculture. The focus on context, though initially still focused on the better adoption of improved inputs, eventually led to re-conceptualizing the role of CGIAR and the IGO/NGO community as one of fostering the successful adoption of innovation within agricultural systems.

During the 2000s, the concept of adopting innovation to increase the availability of food in the developing world changed from one exclusively focused on inputs to one where innovations could be located throughout the production system, or value chain, of agriculture. This new approach was called the Agriculture Innovation System (AIS). With AIS came the recognition of the role of private actors

throughout the production system of agricultural products, from pre-production inputs, production, and post-production processing, marketing, distribution and final sale to markets. Public actors were seen as playing a supportive role to develop the conditions necessary for agricultural production systems to flourish. The figure below illustrates the development of approaches over the years to the development of agriculture in the developing world.



Source: WB (2006)

AIS changed the focus of agricultural development from the government-sponsored input and research-driven narrative of the Green Revolution to one concerned about linking farmers to markets. Linking farmers to markets, in turn, became seen as a function of developing the innovative capacity of local agriculture production networks and connecting them with actors in the production system with market-relevant knowledge, information, and technology. Developing the innovative capacity of agricultural value chain actors in the developing world is now seen as the most important role for IGOs and NGOs. Facilitating the development and adoption of innovations throughout the value chain, includes better inputs (a type of product innovation) and also process, service, policy, organizational, and market innovations.

Program theories for organizations adopting the AIS approach now have a level of sophistication not exhibited during the "technology supply push" days of the early Green Revolution. The program theories are sophisticated in two senses of the word. First, they take into account local factors affecting the "problem." Rather than assuming that the problem requiring intervention is similar for all places (i.e., low productive crop varieties), they define and analyze the problem as potentially caused by both technical and institutional factors, which may be unique to the product or locality. Therefore, in justifying interventions, they seek to define a central problem and its technical and institutional causes within a specific context. A second aspect of the AIS approach is to include stakeholders in defining and addressing the problem. Rather than presuming that a technical solution exists to a predetermined

problem, the AIS approach includes stakeholders in defining, developing, and implementing interventions to perceived problems.

**From:**

- The knowledge elite
- Paper used to store and share knowledge
  
- Research as the key tool to generate knowledge
- The linear model: research→ knowledge→ adaptation→ use of technology

**To:**

- The knowledge society
  - Digital media and the Web used to store and share knowledge
  - Search and consultation to generate knowledge
  - The interactive model: innovations arise from learning-based process that combines problem recognition and knowledge generation
- 

Source: WB (2006)

## Appendix B: Agro-food Product Categories, Based on Trade Data Classifications (HS Codes as Reported)

DESCRIPTION OF PRODUCT GROUPINGS							
PRIMARY BULK COMMODITIES		SEMI-PROCESSED		PRODUCE/HORTICULTURE		PROCESSED	
Description	HS Code	Description	HS Code	Description	HS Code	Description	HS Code
Coffee & Coffee Substitutes	09011	Live Animals	0101-0106	Planting Material	0601-0602	Fresh, chilled meats	0201-0208
Tea	0902	Pig Fat	0209	Cut flowers/plants	0603-0604	Processed Meat	-210
Coffee Mate	0903	Hairs	0501-0503	Edible Vegetables	0701-0709	Dairy Products	0401-0406
Wheat	1001	Animal Products (Guts, bladder & Stomach)	0504-0511	Roots, tubers	0714	Eggs and products	0407-0408
Rye	1002	Dried, shelled beans	0713	Coconut	08011	Honey	0409
Barley	1003	Coffee Husks	09019	Brazilnut	08012	Edible products of animal origin	0410
Oats	1004	Grain flours, groats	1101-1103	Cashew Nuts	08013	Uncooked, steamed vegetables	0710-0712
Corn	1005	Starch (Wheat Starch)	11081	Other Nuts	08021-08025, 08029	Processed fruit	0811-0812, 0814
Rice	1006	Inulin	11082	Fruit	0803-08010	Coffee (Not roasted, nor decaffeinated)	09012, 09014
Sorghum	1007	Wheat Gluten	1109	Frozen Fruit	08119	Processed grains	1104-1107
Other grains	1008	Copra	1203	Dried Fruit	08131-08135	Other vegetables ( Locust beans, seaweeds & other algae)	1212
Soybeans	1201	Soy flour & meal	1208	Pepper	09041-09042	Fish & Animal Oils	1504, 1517
Peanuts	1204-1207	Sowing seeds	1209	Vanilla	905	Prepared meats	1601-1603
Oilseeds	14042	Roots, seeds cut/crushed	1211	Cinnamon	09061-09062	Sugar, sweeteners (Solid cane, beet sugar & chemically pure)	1701-1704
Cotton Linters	1801	Straw, husks, fodder	1213, 1214	Cloves	0907	Chocolates	1806
Cocoa Beans	24011-24013	Gum, lac, plant extracts	1301, 1302	Nutmeg	09081	Flour preparations	1901
Unmanufactured Tobacco	5201-5203	Furnishing material	1401-1404	Mace	09082	Pasta	1902
Cotton	5302	Animal Fat	1501-1503, 1505, 1506	Cardamom	09083	Tapioca	1903
Hemp		Vegetable Oils	1507-1516	Other seeds	09091-09095	Other preparations	1904-1905
		Inedible fats, oils	1518	Other spices	09101-09105	Vegetables preserved in vinegar	2001-2005
		Crude glycerol	1520	Spice mix	091091-091099	Fruit preserved by sugar	2006-2009
		Wax	1521	Hops	12101, 12102	Extracts, essences, broths	2101-2106
		Degras	1522	Stone Fruit (Fruit kernels)	12123	Beverages	2201-2208
		Raw Sugar	17011	Sugarbeet	121291	Vinegar	2209
		Cocoa Products	1802-1806	Sugarcane	121292	Tobacco products (Cigar, cigarettes)	2402-2403
		Grain Products	2301-2303			Other products (Albumins, albuminates)	3502
		Oilseed Cake	2304-2306				
		Plant Waste Material	2308				
		Pet Food Material	2309				
		Glycerol/Sorbitol/Mannitol	2905				
		Special Plant Oils	33011-33013, 33019				
		Proteins/Gelatins/Starches (casein & casein derivatives)	3501-3505				
		Amylaceous Substance	38091				
		Fatty acids, alcohols	3823-3824				
		Hides, skins	4101-4103				
		Fur	4301				
		Silk	5001-5003				
		Wool	5101-5103				
		Flax	530				

## References:

- Archibugi, Daniele, Rinaldo Evangelista and Roberto Simonetti. (1994). "On the definition and measurement of product and process innovations." *Innovation in technology, industries and institutions—studies in Schumpeterian perspectives*.
- Barnett, Andrew. (2005). "Reducing poverty needs an 'innovation system' approach." *Science and Development Network*, 4.
- Barrett, Hazel, AW Browne, PJC Harris, and K Cadoret. (2001). "Smallholder farmers and organic certification: Accessing the EU market from the developing world." *Biological agriculture & horticulture*, 19(2): 183-199.
- Birner, Regina and Danielle Resnick. (2010). "The Political Economy of Policies for Smallholder Agriculture." *World Development*, 38(10): 1442-1452.
- Block, Steven. (2010). *The Decline and Rise of Agricultural Productivity in Sub-Saharan Africa Since 1961: National Bureau of Economic Research*.
- BMI. (2013). *Industry Trend Analysis - Africa GM Outlook: Business Monitor International*.
- Christensen, Clayton. (1997). *The innovator's dilemma: when new technologies cause great firms to fail*: Harvard Business School Press.
- Crucefix, David. (1998). "Organic agriculture and sustainable rural livelihoods in developing countries." *Report by Natural Resources and Ethical Trade Programme*.
- Dahlman, Carl. (2007). *Issues Paper: Innovation in the African Context. Conference: Documento presentado en Innovation in the African context: A forum for policymakers*.
- Damanpour, Fariborz. (1987). "The adoption of technological, administrative, and ancillary innovations: Impact of organizational factors." *Journal of management*, 13(4): 675-688.
- Damanpour, Fariborz and William M Evan. (1984). "Organizational innovation and performance: the problem of" organizational lag"." *Administrative science quarterly*: 392-409.
- Damanpour, Fariborz and Shanthi Gopalakrishnan. (2001). "The dynamics of the adoption of product and process innovations in organizations." *Journal of Management Studies*, 38(1): 45-65.
- DFID-RIU. (2010). *What Does Innovation Smell Like? A Conceptual Framework for Analysing and Evaluating DFID-RIU Experiments in Brokering Agricultural Innovation and Development: RIU Discussion Paper Series# 2010-10*.
- DFID. (2007). *Gender Equality at the Heart of Development: Why the Role of Women is Crucial to Ending World Poverty*. London: Department for International Development (DFID).
- Edquist, Charles, Leif Hommen and Maureen D McKelvey. (2001). *Innovation and employment: Process versus product innovation*: Edward Elgar Cheltenham.

- Ekboir, Javier. (2009). *The CGIAR at a Crossroads: Assessing the role of international agricultural research in poverty alleviation from an innovation systems perspective*: Institutional learning and change (ILAC) initiative.
- Ettlie, John E, William P Bridges and Robert D O'keefe. (1984). "Organization strategy and structural differences for radical versus incremental innovation." *Management science*, 30(6): 682-695.
- FAO (1996). *Lessons for the green revolution: towards a new green revolution*. FAO, from [www.fao.org/docrep/003/w2612e/w2612e06a.htm](http://www.fao.org/docrep/003/w2612e/w2612e06a.htm)
- . (2007a). *Gender and Food Security*. Synthesis Report of Regional DocumentsL Africa, Asia and Pacific. Rome: FAO.
- . (2007b). *Women and Food Security*. Rome: Food and Agriculture Organization of the United Nations.
- . (2011). *Women in Agriculture: Closing the Gender Gap for Development*. Rome: Food and Agriculture Organization of the United Nations.
- . (2012). *The State of Food and Agriculture* Rome: Food and Agriculture Organization of the United Nations.
- Fernandez-Stark, Karina and Penny Bamber. (2012). *Inclusion of Small and Medium Producers in the Value Chain: Assessment of Five High-Value Agricultural Inclusive Business Projects in Latin America*. Durham, N.C.: Duke CGGC. May 2012.
- Gereffi, Gary and Karina Fernandez-Stark. (2011). *Global Value Chain Analysis: A Primer*. Duke University.
- Gereffi, Gary and Joonkoo Lee. (2009). *A Global Value Chain Approach to Food Safety and Quality Standards*: Duke University.
- Germain, Richard. (1996). "The role of context and structure in radical and incremental logistics innovation adoption." *Journal of Business Research*, 35(2): 117-127.
- Gildemacher, Peter and Remco Mur. ( 2012). *Bringing new ideas into practice; experiments with agricultural innovation*. Amsterdam: Royal Tropical Institute (KIT) and Research Into Use (RIU).
- Hall, Andy and Jeroen Dijkman. (2006). *Capacity development for agricultural biotechnology in developing countries: Concepts, contexts, case studies and operational challenges of a systems perspective*: UNU-MERIT, Maastricht Economic and Social Research and Training Centre on Innovation and Technology.
- Hall, Andy, Willem Janssen, Eija Pehu, and Riikka Rajalahti. (2006). "Enhancing agricultural innovation: how to go beyond the strengthening of research systems." *World Bank, Washington*.
- Henson, Spencer and John Humphrey. (2010). "Understanding the Complexities of Private Standards in Global Agri-Food Chains as They Impact Developing Countries." *Journal of Development Studies*, 46(9): 1628-1646.

- Humphrey, J. and H. Schmitz. (2002). "How does insertion in global value chains affect upgrading in industrial clusters?". *Regional Studies*, 36(9): 1017-1027.
- IAASTD. (2009). Agriculture at a Crossroads: International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD).
- IFAD. (2007). Innovation strategy. Rome, Italy: International Fund for Agricultural Development. [www.ifad.org/pub/policy/innovation/e.pdf](http://www.ifad.org/pub/policy/innovation/e.pdf).
- . (2009). *Gender in Agriculture Sourcebook*. International Fund for Agricultural Development: World Bank Publications.
- IFPRI. (2009). Promising Approaches to Address the Needs of Poor Female Farmers: International Food Policy Research Institute.
- . (2013). Urban Food Retail in Africa: The Case of Addis Ababa, Ethiopia: International Food Policy Research Institute, and Ethiopian Development Research Institute.
- ILRI. (2009). Applying innovation system concepts in agricultural research for development: a learning module. Nairobi, Kenya: International Livestock Research Institute
- Jaffee, Steven, Spencer Henson and Luz Diaz Rios. (2011). Making the Grade: Smallholder Farmers, Emerging Standards, and Development Assistance Programs in Africa: World Bank.
- Jiggins, J. (2012). "Diagnostic research in support of innovation." *NJAS-Wageningen Journal of Life Sciences*.
- Jiggins, Janice, R.K. Samanta and J.E. Olawoye (Eds.). (1997). *Improving Women Farmers' Access to Extension Services* (Vol. Ch.9). Rome: Food and Agriculture Organization (FAO).
- Kimberly, John R and Michael J Evanisko. (1981). "Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations." *Academy of management journal*: 689-713.
- Klerkx, Laurens, Barbara van Mierlo and Cees Leeuwis. (2012). Evolution of systems approaches to agricultural innovation: Concepts, analysis and interventions. In *Farming Systems Research into the 21st century: The new dynamic* (pp. 457-483): Springer.
- Kolk, Ans and Rob Van Tulder. (2006). "Poverty alleviation as business strategy? Evaluating commitments of frontrunner multinational corporations." *World Development*, 34(5): 789-801.
- Kramer, S. (2006). Science and Technology Policy in the United States. New Brunswick NJ: Rutgers University Press.
- Lagerkvist, Carl Johan, Sebastian Hess, Julius Okello, and Nancy Karanja. (2013). "Consumer Willingness to Pay for Safer Vegetables in Urban Markets of a Developing Country: The Case of Kale in Nairobi, Kenya." *Journal of Development Studies*, 49(3): 365-382.

- Lee, J., G. Gereffi and J. Beauvais. (2012). "Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries." *Proceedings of the National Academy of Sciences of the United States of America*, 109(31): 12326-12331.
- Memedovic, Olga and Andrew Shepherd. (2009). *Agri-food Value Chains and Poverty Reduction: Overview of Main Issues, Trends and Experiences*. Vienna: United Nations Industrial Development Organizations.
- Nagayets, Oksana. (2005). *Small Farms: Current Status and Key Trends: Prepared for the Future of Small Farms Research Workshop*, Wye College.
- Neven, David, Michael M. Odera, Thomas Reardon, and Honglin Wang. (2009). "Kenyan Supermarkets, Emerging Middle-Class Horticultural Farmers, and Employment Impacts on the Rural Poor." *World Development*, 37(11): 1802-1811.
- OECD. (1997). *National Innovation Systems*. Paris, France: Organization for Economic Co-operation and Development.
- Osborne, Stephen P. (2002). *Voluntary organizations and innovation in public services* (Vol. 1): Routledge.
- Poulton, Colin, Andrew Dorward and Jonathan Kydd. (2010). "The Future of Small Farms: New Directions for Services, Institutions, and Intermediation." *World Development*, 38(10): 1413-1428.
- Rajalahti, Riikka, Willem Janssen and Eija Pehu. (2008). *Agricultural innovation systems: From diagnostics toward operational practices*: Agriculture & Rural Development Department, World Bank.
- Reardon, Thomas, Christopher B. Barrett, Julio A. Berdegue, and Johan F. M. Swinnen. (2009). "Agrifood Industry Transformation and Small Farmers in Developing Countries." *World Development*, 37(11): 1717-1727.
- Reardon, Thomas, Peter C. Timmer, Christopher B. Barrett, and Julio Berdegue. (2003). "The rise of supermarkets in Africa, Asia, and Latin America." *American Journal of Agricultural Economics*, 85(5): 1140-1146.
- Regmi, Anita, Mark Gehlhar, John Wainio, Thomas Vollrath, Paul Johnston, and Nitin Kathuria. (2005). *Market Access for High-Value Foods*. Washinton D.C.: United States Department of Agriculture.
- Robbins, Peter. (2011). *Commodity Exchanges and Smallholders in Africa*: International Institute for Environment and Development.
- Serageldin, I. (1995). *Nurturing Development: Aid and cooperation in today's changing world*. Washington DC: World Bank.
- Shiva, V. (1991). "The green revolution in the Punjab." *The Ecologist*, 21: 57-60.
- Sibanda, Lindiwe Majele (2011). *Enticing Africa's Youth to Agriculture*. Thomson Reuters Foundation. Retrieved May 2, 2013, from [www.trust.org](http://www.trust.org)

- Staritz, Cornelia and Jose Guilherme Reis. (2013). *Global Value Chains, Economic Upgrading, and Gender: Case Studies of the Horticulture, Tourism and Call Center Industries*: World Bank.
- Tornatzky, Louis and Mitchell Fleischer. (1990). "The Process of Technological Innovation." *DC Heath, Lexington, MA*.
- UNCTAD. (2010a). *Technology and Innovation Report 2010* (No. UNCTAD/TIR/2009): United Nations Conference on Trade and Development.
- . (2010b). *Technology and Innovation Report 2010* (No. UNCTAD/TIR/2009): United Nations Conference on Trade and Development. pp. 58.
- UNDP. (2001). *UNDP Capacity Building Program*. from <http://www.undp.org/content/undp/en/home/librarypage/capacity-building/>.
- . (2012). *The Roles and Opportunities for the Private Sector in Africa's Agro-food Industry*: United Nations Development Program.
- UNIDO. (2008). *Creating an Enabling Environment for Private Sector Development in Sub-Saharan Africa*: United Nations Industrial Development Organization.
- . (2011). *Agribusiness for Africa's Prosperity*. Austria: United Nations Industrial Development Organization.
- Walker, Richard M. (2008). "An empirical evaluation of innovation types and organizational and environmental characteristics: towards a configuration framework." *Journal of Public Administration Research and Theory*, 18(4): 591-615.
- Walker, Richard M, Emma Jeanes and Robert Rowlands. (2002). "Measuring Innovation—Applying the Literature-Based Innovation Output Indicator to Public Services." *Public Administration*, 80(1): 201-214.
- WB. (2006). *Enhancing agricultural innovation: how to go beyond the strengthening of research systems*: World Bank.
- Weatherspoon, Dave D. and Thomas Reardon. (2003). "The Rise of Supermarkets in Africa: Implications for Agrifood Systems and the Rural Poor." *Development Policy Review*, 21(3): 333-355.
- Wikipedia. CGIAR. Retrieved March 15, 2013, from <http://en.wikipedia.org/wiki/CGIAR>.
- Williamson, Oliver E. (1981). "The economics of organization: the transaction cost approach." *American journal of sociology*: 548-577.
- World Bank. (2007). *World Development Report 2008: Agriculture for Development*. Washington, D.C.: World Bank.
- . (2010 ). *Gender and Governance in Rural Services: Insights from India, Ghana and Ethiopia*: World Bank.

---. (2012). Measuring Financial Inclusion: The Global Findex Database. In World Bank Policy Research Working Paper 6025 (Ed.).

---. (2013). Growing Africa: Unlocking the Potential of Agribusiness: World Bank.

Zahra, Shaker A and Gerard George. (2002). "Absorptive capacity: A review, reconceptualization, and extension." *Academy of management review*: 185-203.

## About the Duke Center on Globalization, Governance & Competitiveness

The Center on Globalization, Governance & Competitiveness (CGGC), an affiliate of the Social Science Research Institute at Duke University, is built around the use of the Global Value Chain (GVC) methodology, developed by the Center's Director, Gary Gereffi. The Center uses GVC analysis to study the effects of globalization on various topics of interest including: industrial upgrading, international competitiveness, the environment, global health, engineering and entrepreneurship, and innovation in the global knowledge economy. CGGC has a long history of working in agriculture. More information about CGGC is available at <http://www.cggc.duke.edu/>.

## About the Authors

**Ajmal Abdulsamad** is a research analyst at Duke CGGC. Ajmal received his M.A. in International Development Policy from the Sanford School of Public Policy, Duke University. He has over 10 years of international development experience working for various International Development Organizations and the United Nations. His experience includes extensive work in program management and research in international development. Ajmal's research interest is the interface of institutions, industry competitiveness, and economic development strategies. His current research at the CGGC focuses on the value chains of energy in the U.S. and food security in the Middle East and North Africa.

**Lukas Brun** is a senior research analyst at Duke CGGC. His research at CGGC uses global value chain analysis to understand the competitiveness of firms and regions. Lukas holds master's degrees with concentrations in economic development and international political economy from the University of North Carolina at Chapel Hill, and has more than 10 years of experience in economic analysis and economic development-related contract research.

**Gary Gereffi** is Professor of Sociology and Director of the Center on Globalization, Governance, & Competitiveness at Duke University, where he teaches courses in economic sociology, globalization and comparative development, and international competitiveness. He received his B.A. degree from the University of Notre Dame and his M.Phil. and Ph.D. degrees from Yale University. Gereffi has published numerous books and articles on globalization, industrial upgrading, and social and economic development in various parts of the world. Gereffi's research interests deal with the competitive strategies of global firms, the governance of global value chains, economic and social upgrading, and the emerging global knowledge economy.

**Smriti Sharma, Yanyun Xiao, and Todd Royal** are contributing researchers to this report. Smriti is a graduate student at Duke University's Sanford School of Public Policy. Yanyun is a graduating senior at Duke University's Trinity College majoring in economics and public policy. Todd Royal is a Masters in Public Policy (MPP) student at Pepperdine University focusing on international relations.