Agriculture in Africa's Transformation: The Role of Smallholder Farmers

AERC Senior Policy Seminar XVII
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Seminar Papers

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Abbreviations

ACCI	African Centre for Crop Improvement
AERC	African Economic Research Consortium
AfDB	African Development Bank
AU	Africa Union
CAADP	Comprehensive Africa Agriculture Development Programme
CMAAE	Collaborative Master's Programme in Agricultural and Applied Economics
COMESA	Common Market for Eastern and Southern Africa
ECOWAS	Economic Community of West African States
FfD	Financing for Development
FOs	Farmers' Organizations
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
ISTA	International Seed Testing Asociation
MFIs	Microfinance Institutions
NTB	Non-Tariff Barrier
OUP	Oxford University Press
P4P	Purchase for Progress
PP	Producer Price
PPP	Public Private Partnership
PVP	Plant Variety Protection
R&D	Research and Development
SADC	Southern Africa Development Community
SCARDA	Strengthening the Capacity of Agricultural Research and Development in Africa
SDGs	Sustainable Development Goals
SPS	Senior Policy Seminar
SSA	Sub-Saharan African
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
WFP	World Food Programme
WRS	Warehouse Receipts Systems
WTO	World Trade Organization

Acknowledgements

The theme for the senior policy seminar "Agriculture in Africa's Transformation: The Role of Smallholder Framers" is very topical because nearly 70% of Africans depend on agriculture for their incomes, yet the sector accounts for only a third of the continent's gross domestic product (GDP). Efforts to improve farmer productivity and raise incomes can, therefore, drive demand in other important economic sectors. This would increase economic growth while providing the opportunity to simultaneously pull millions of people out of the vicious circle of poverty. According to a recent World Bank report, growth in the agricultural sector is estimated to be more than two times as effective at reducing poverty as growth in other sectors, and more current research shows that in sub-Saharan Africa, growth in agriculture is more than 10 times more effective at poverty reduction than growth in other sectors.

The African Economic Research Consortium (AERC) and the World Food Programme (WFP) partnered to put together this timely senior policy seminar on Agriculture in Africa's Transformation. Since March 2011, AERC has partnered with the WFP to run a Data Analysis and Knowledge Management Hub in support of the pilot Purchase for Progress (P4P) programme. Building on this partnership with WFP and emerging priorities in the region, the AERC strategic plan for 2015-2020 has a dedicated thematic research group on agriculture. Despite the importance of the sector in the continent, agriculture is not getting the requisite attention from policy makers. This is manifested by the non-inclusive growth in most African countries leading to youth unemployment and poverty in the rural areas, where a majority of the population lives.
The AERC is grateful to all those who made the seminar a success, especially the Government of Mozambique, which welcomed us to the country and co-hosted Senior Policy Seminar XVII. I also thank the authors who produced very high-quality papers, and the participants for their active participation in producing the seminar's policy recommendations to be shared with other African policy makers who did not find time to take part in this event.

AERC appreciates the hard work of Dr. Charles Owino, Manager, Publications, for organizing the event and putting this publication together. Dr. Samuel Mwakubo, Collaborative Research Manager, and Dr. Owino again for their role as rapporteurs. Juffali Kenzi, ICT Manager; Winston Wachanga, Programme and Information Re¬sources Administrator, worked on promotional materials, while Sandra Mulluka, Bertha Chedeye, and Hellen Makimi assisted with logistics. To all of these and the many others who were involved, AERC extends its heartfelt gratitude.

Lemma Senbet
Executive Director
African Economic Research Consortium

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Policy Constraints in Smallholder Agri-Food Production and Trade in Africa

by Augustine S. Langyintuo

Introduction

Agriculture remains the mainstay of the economies of many African countries. Nearly 60% of export earnings are from agriculture, and over 76% of the 987 million Africans living in rural areas are employed in agriculture (FAO, 2014). Although agriculture contribution to gross domestic product (GDP), on average, has been declining over time (Table 1), it still remains high. Figure 1 shows that, agricultural value added ranges from 3% to 67%, with an average of 17%. Value added per agricultural worker in 2003 (in 2000 US$) in sub-Saharan Africa (SSA) averaged US$327, growing at a rate of 1.4%; while in the OECD countries, corresponding figures were US$23,081 and 4.4%, respectively (IAASTD, 2009).

Agricultural productivity growth over the decades has been disappointingly low. Whereas in Asia production increases came from rapid uptake of high yielding wheat and rice varieties, the use of fertilizers and irrigation combined with subsidies, which drove down cost of production and raised land and labour productivities (Hazell and Ramasamy, 1991), in Africa, total cereal production has been increasing due primarily to increase in cultivated area (Figure 2). Given the rapidly growing population, increases in production still fall short of demand.

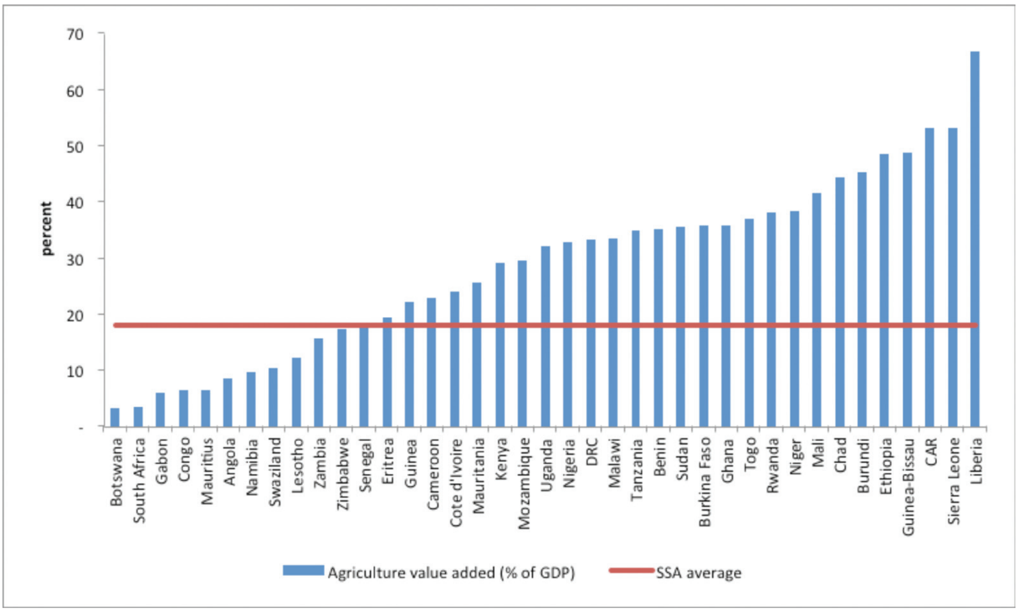
To satisfy demand, the continent spends between US$30 billion and US$50 billion a year to import food, depriving the continent of funds for needed expenditures on infrastructure, social and economic amenities (IFPRI, 2012). Figure 3 gives an indication of the level of cereal import dependency in Africa versus the world average. North Africa appears to depend on cereal imports much more than sub-Saharan Africa. It is estimated that, if continental food supplies do not increase, Africa will spend about US$150 billion on food imports by 2030 (IFPRI, 2012).

Table 1: Selected agricultural production indices

Variable	1964 - 1973	1974 - 1983	1984 - 1993	1994 - 2003	2004 - 2013
Agriculture value added (%age of GDP)	35.59	31.80	29.98	29.52	25.41
Agricultural machinery, tractors per 100 sq. km of arable land	17.95	30.48	42.83	51.58	
Agricultural raw materials exports (%age of merchandise exports)	16.33	13.36	9.56	15.06	10.05
Agricultural raw materials exports (%age of merchandise imports)	2.49	2.03	2.68	2.22	1.66
Agriculture value added per worker (constant 2005 US$)			906.08	1,007.20	1,297.17
Rural population growth (annual %age)	1.67	1.90	1.68	1.84	1.62
Land under cereal production (million ha)	1.33	1.34	1.64	1.90	2.19

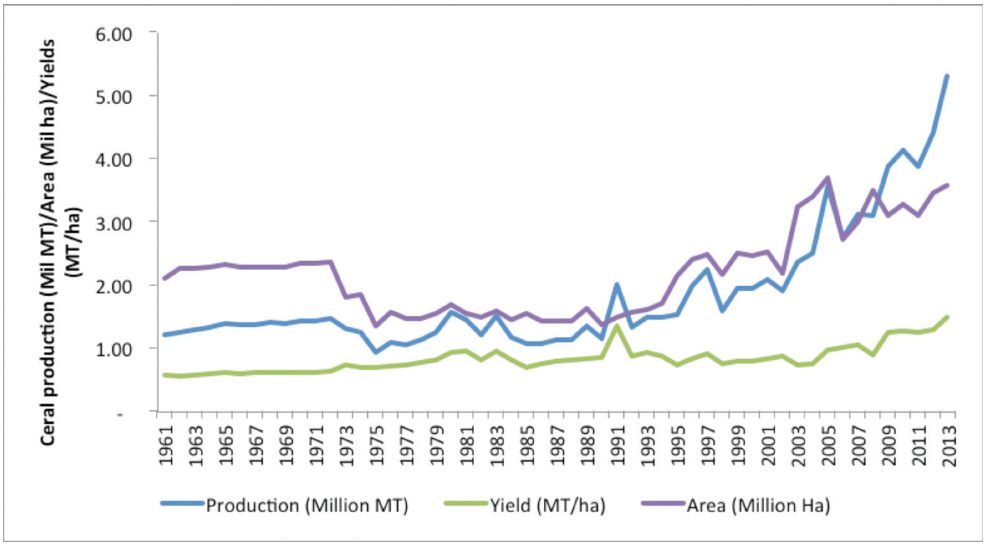
Source: World Bank (2014).

Figure 1: Contribution of agriculture to economies of SSA (%age of GDP)



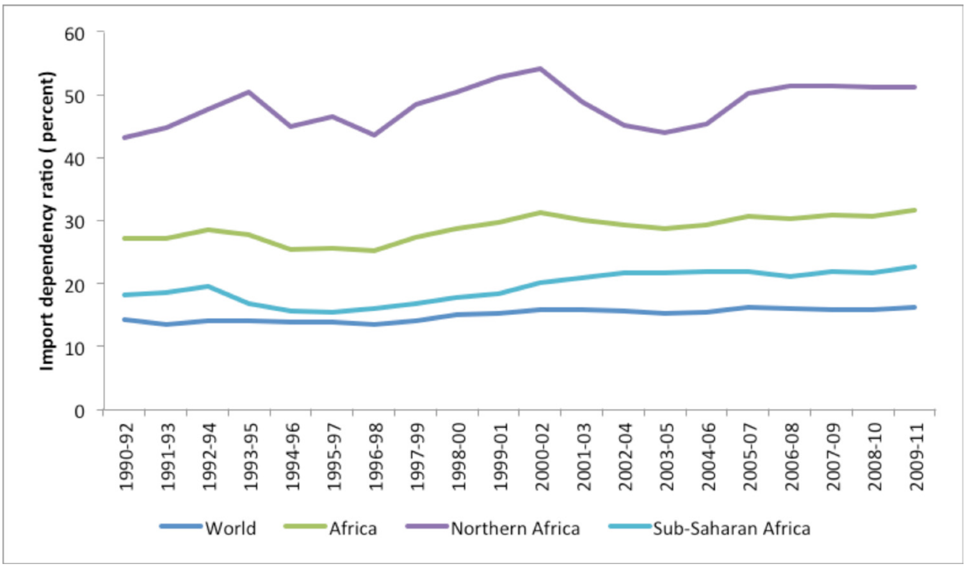
Source: World Bank (2013).

Figure 2: Trends in cereal production, area planted and productivity in sub-Saharan Africa



Source: FAOSTATS (2014).

Figure 3: Cereal imports dependency ratio



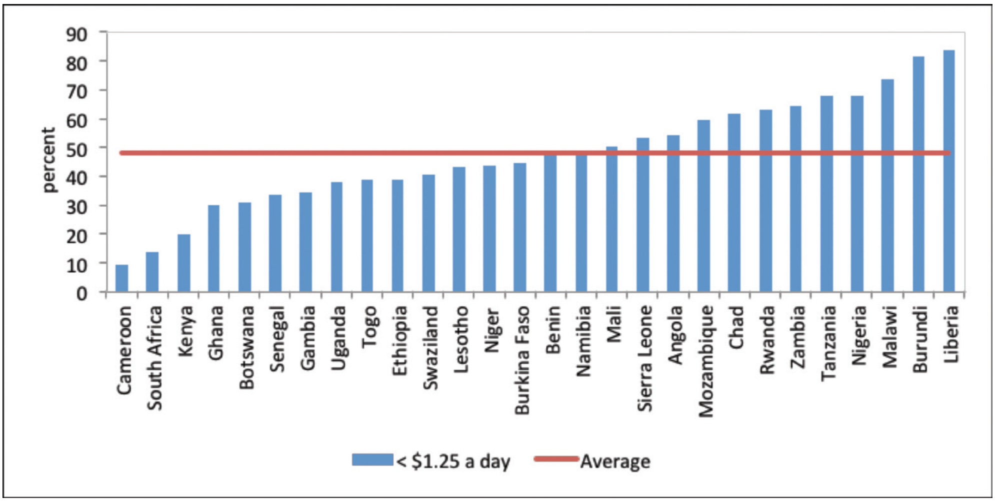
Source: FAOSTATS (2014)

Partly as a consequence of low agricultural productivity, poverty is pervasive in Africa. On average, around 50% of Africans have been living on less than US$1.25 per day since 1981 (Figure 4); and the number of poor people, in absolute terms, has nearly doubled, from 200 million in 1981 to 380 million in 2005 (World Bank, 2009; Chen & Ravallion, 2007) compared to the case in South Asia where the percentage of people living in poverty (<US$2 per day) has decreased from 45% to 30%. A staggering 265 million are undernourished (FAO, 2009).

Reducing poverty and increasing wealth among smallholder farmers is an important policy challenge for African governments. The 2008 World Development Report pointed out that GDP growth originating in agriculture is about four times more effective in reducing poverty than GDP growth of other sectors (World Bank, 2008a). Several experts have observed that the expansion of smallholder farming can lead to a faster rate of poverty alleviation, by raising the incomes of rural cultivators and reducing food expenditure, and thus reduces income inequality (Magingxa and Kamara 2003; Diao and Hazell, 2004; Resnick, 2004; Bahram and Chitemi, 2006; World Bank, 2008b).

A 10% increase in productivity can reduce poverty by 4% in the short run and 19% in the long run (FAO, 2010). This is achievable given sound and consistent policies, as well as strong political will because, in many African countries, the potential yields of many crops are under-underexploited. Uganda, as an example, the yield gaps between observed and potential yields of major crops range from nearly 200% for millet to over 600% for bananas (Table 2).

Figure 4: Population living below poverty line of $1.25/day (%)



Source: World Bank, 2013.

Table 2: Actual and potential yield of selected crops in Uganda

Crop	On-farm yield (t/ha)	Potential yield (t/ha)	Yield gap
(%)			
Maize	1.5	7	376
Millet	1.8	5	186
Beans	0.5	3	512
Sweet potato	4.5	30	564
Cassava	12.7	50	293
Bananas	4.6	35	668

Source: FAOSTAT, 2008

Aware of this, many African governments have been making efforts to support agriculture but are constrained by domestic and global factors. To demonstrate their political will to increase agricultural productivity as a broad-based poverty reduction strategy, African governments made two declarations (Haggblade and Hazell, 2010; Dorward and Chirwa, 2009): namely, the Maputo and Abuja declarations. In Maputo, Mozambique, in 2003, the heads of State launched the Comprehensive African Agricultural Development Programme (CAADP) to spearhead agricultural development efforts at a continental level with a commitment to spend at least 10% of their national budgets on agriculture to raise agricultural productivity to at least 6% (NEPAD, 2004). This was followed by the fertilizer Summit in Abuja, Nigeria, in 2006, where leaders declared that "Given the strategic importance of fertilizer in achieving the African Green Revolution to end hunger, the African Union Member States resolve to increase the level of use of fertilizer from the current average of eight kilograms per hectare to an average of at least 50 kilograms per hectare by 2015".

These declarations are against the backdrop of the high investment requirements for African agriculture. Broadly speaking, financing requirements for African agriculture remain substantial. FAO (2009) estimates that, global food production needs to grow by 70% to feed 9.1 billion people in 2050. This expansion would require an average annual net investments of US$83 billion (in 2009 US$) by developing countries alone. Of this projected investment, US$20 billion would be needed in crops production, US$13 billion for livestock production, and US$50 billion for downstream services. At the regional level, a total estimate of US$11 billion would be needed in sub-Saharan Africa alone, where 41 million farms, representing 80% of all farms, are owned by smallholder farmers (Lowder et al., 2014).

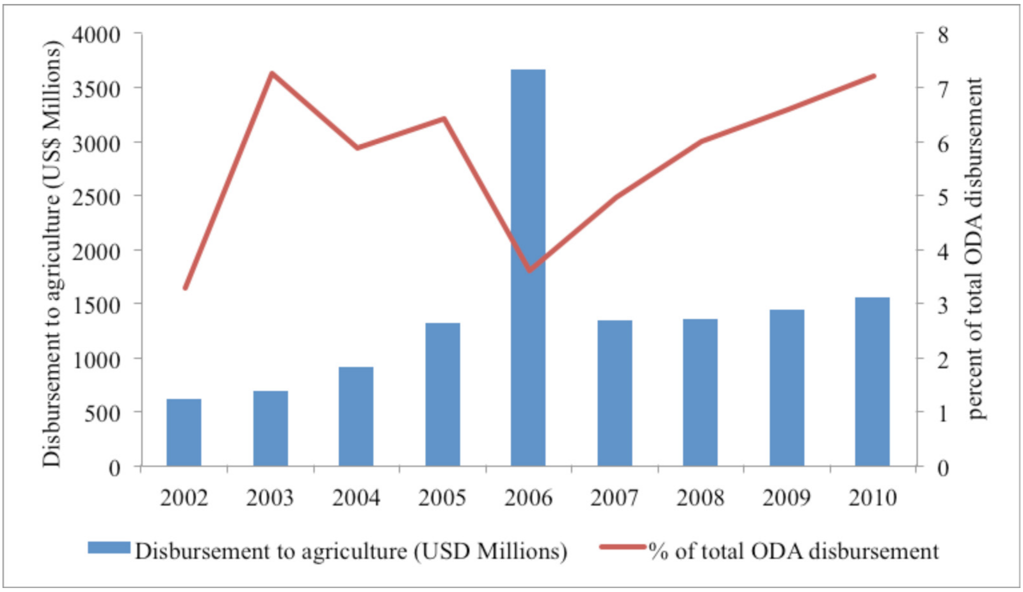
Table 3 suggests that no one country has been consistent in its contribution to agriculture over the years. Countries such as Burkina Faso, Ethiopia, Ghana, Malawi, Mali, Niger and Zambia, however, have been making the efforts to achieve the declaration. The short comings in the governments' political will to support agriculture is a manifestation of the waning global support to agriculture, which many countries depend on. Most African countries rely heavily on Official Development Assistance (ODA) to finance agriculture. But ODA inflows into agriculture in Africa over the years have remained relatively unimpressive and unpredictable and near stagnation between 2008 and 2010 (Figure 5). Except in 2006, when ODA spiked to more than US$2 billion, disbursements have largely averaged US$1.2 billion, representing about 5% of total ODA disbursements. Distribution across countries is variable and uneven as shown in Figure 6, which shows that average disbursements in Ethiopia, Nigeria and Tanzania outstrip all other disbursements among selected countries.

Table 3: Share of agriculture expenditure in selected countries (%age of total expenditure)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Burkina Faso	25.0	18.0	23.0	33.0	20.0	12.0	20.0	16.0	14.0	9.0	11.0	-
Ethiopia	10.4	4.0	5.6	8.4	13.6	16.5	17.5	14.6	11.7	-	-	-
Ghana	3.2	4.7	6.9	5.8	8.8	9.8	10.3	9.9	10.2	9.0		-
Kenya*	6.8	6.6	5.4	4.1	5.1	6.6	5.9	4.4	4.8	1.9	6.7	8.7
Malawi	8.8	4.9	8.7	6.6	7.0	11.1	11	13.2	31.6	24.7		-
Mali**	8.9	12.8	8.9	9.6	11.4	15.5	10.6	11.0	12.7	16.9	13.9	23.9
Mozambique	-	-	-	-	6.2	4.4	3.4	3.9	-	-	-	-
Niger	-	15.8	16.6	16.4	19.5	14.5	15.1	15.4	12.2	12.1	-	-
Nigeria	1.6	6.0	3.5	1.9	3.1	3.4	4.1	4.4	4.6	5.3	5.7	-
Rwanda	-	6.2	8.6	3.9	4.0	3.4	3.3	-	-	-	-	-
Sierra Leone	-	2.4	2.3	3.1	3.0	2.3	2.9	-	-	-	1.2	0.2
Tanzania**	-	-	4.5	6.8	5.7	4.7	5.8	5.8	2.5	7.6	7.8	6.8
Uganda**	2.6	1.6	2.6	2.3	2.1	2.0	3.0	3.0	3.2	4.5	3.8	3.1
Zambia	8.6	6.2	5.2	6.1	6.1	7.2	9.3	13.2	12.5	9.3	-	-

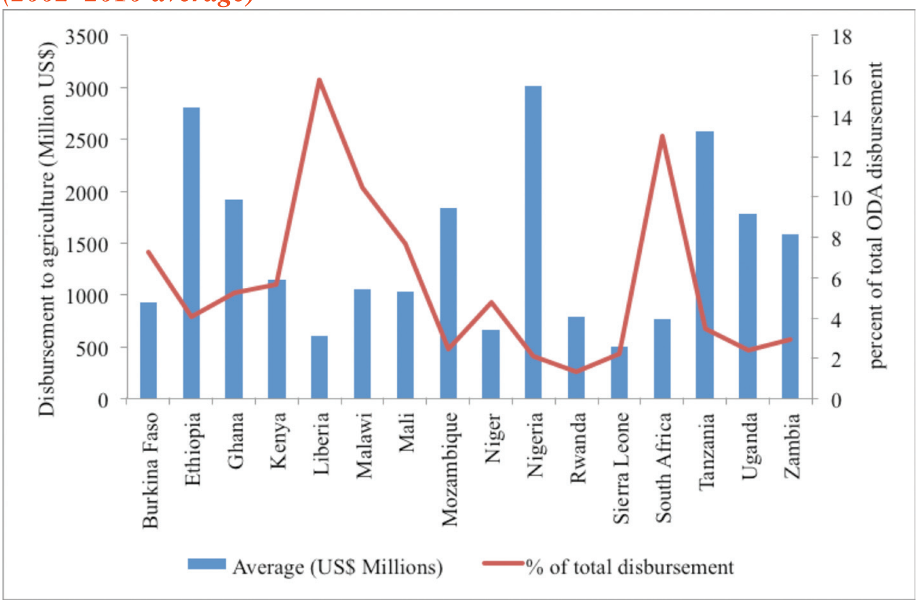
Source: ReSAkSS (http://www.resakss.org/).
Note: * 2010, 2011, 2012 data are from the Central Bureau of Statistics.
** 2009, 2010, 2011, 2012 data from the countries' Bureaus of Statistics.

Figure 5: Trend in average ODA disbursement to agriculture in countries in Africa



Source: Source: Organization for Economic Co-operation and Development (OECD) (2012).

Figure 6: ODA disbursement to agriculture in selected countries in Africa (2002–2010 average)



Source: Source: Organization for Economic Co-operation and Development (OECD) (2012).

The limited political and global support to agriculture, combined with various challenges, not least unconducive private sector policies, binding capital constraints compounded by the apparent lack of provision of support to smallholder farmers to access improved seed and fertilizers, limited communications and transportation infrastructure, and land access and its security (UNDP, 2009) are sustaining poverty among smallholder farm households. Based on existing literature, this paper attempts to discuss the major policy challenges facing smallholder farmers along the agri-food production and marketing value-chain, while recognizing the inter-linkages between policy and the other related challenges. An effort is made to limit the discussions on key policy areas of land, purchased inputs (seeds and fertilizers), agricultural finance, research and development, and general institutional support. Potential interventions to address the challenges are suggested.

The rest of the paper is organized as follows. Section 2 examines the role of smallholders in agriculture, reflecting on their access to production resources. This is followed by a detailed discussion on the policy and institutional constraints to smallholder agriculture production and marketing in section 3.The paper concludes with some remarks in section 4.

2. The role of smallholder farmers in agri-food production and marketing

Smallholder farmers dominate agriculture population globally. It has been estimated that about 570 million farms exist worldwide, providing a livelihood for about 40% of the world's population (FAO, 2014). Nearly 90% of these are small farms, defined as having less than two hectares of land. These farms occupy about 60% of the arable land worldwide, and contribute substantially to global farm production (Nagayets, 2005). An estimated 9% (or 41 million farms) are in sub-Saharan Africa (Lowder et al., 2014), of which 80% (or 32.8 million farms) are less than 2ha and make up less than 40% of the total cropped area (Figure 7).

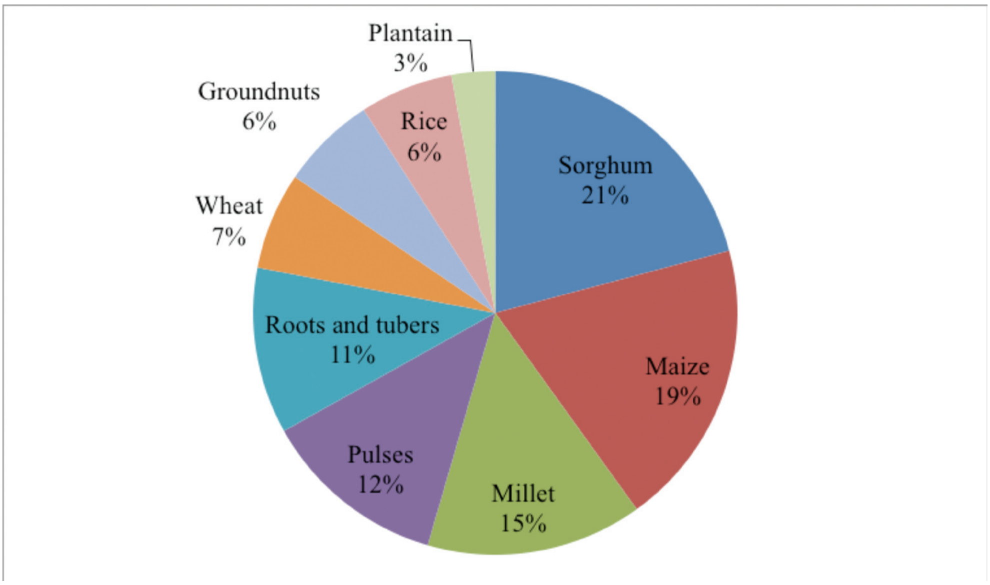
On these holdings, farmers typically practice mixed farming, growing crops and keeping livestock. In terms of field crop production, a 2008 estimate suggests that sorghum accounts for 21%, maize 19%, etc. (Figure 8). Horticultural crops, such as fruits, vegetables, flowers, and other ornamental plants are also very important. Vegetables account for 48% of horticultural crops produced (Figure 9), and Nigeria is the leading producer (Figure 10). As a source of higher earnings, horticultural crops have always been part of the general agricultural endowments in Africa, although commercial production is thought to have been started in the 1970s.

One of the most important inputs to crop production is seed. Seed is an essential, strategic, and relatively inexpensive input to agriculture with a high rate of return on investment that often sets the upper limit for crop production. Improved seeds are typically many-fold higher yielding than traditional unimproved ones. This means that using improved high yielding crop seed by smallholder farmers can mean a difference between improved household livelihoods and staying trapped in rural poverty. Unlike horticultural crop seeds that are generally improved, the use of improved field crops seed is marginal among farmers due primarily to government interventions, which sometimes leads to seed policy failures.

Figure 7: Size distribution of farms in selected sub-Saharan African countries

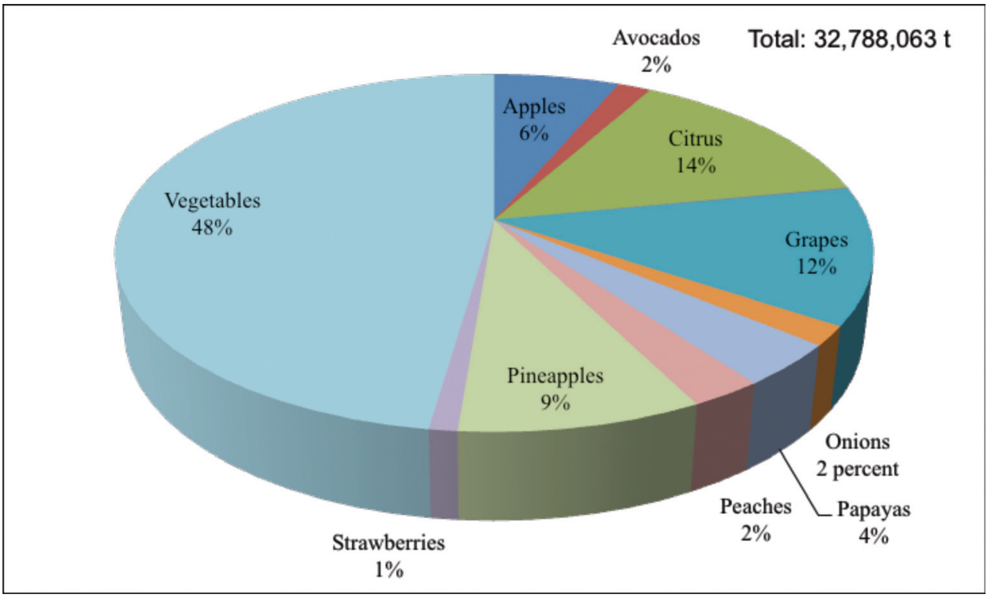
Source: Lowder et al. (2014).

Figure 8: Distribution of area planted in Africa by crop



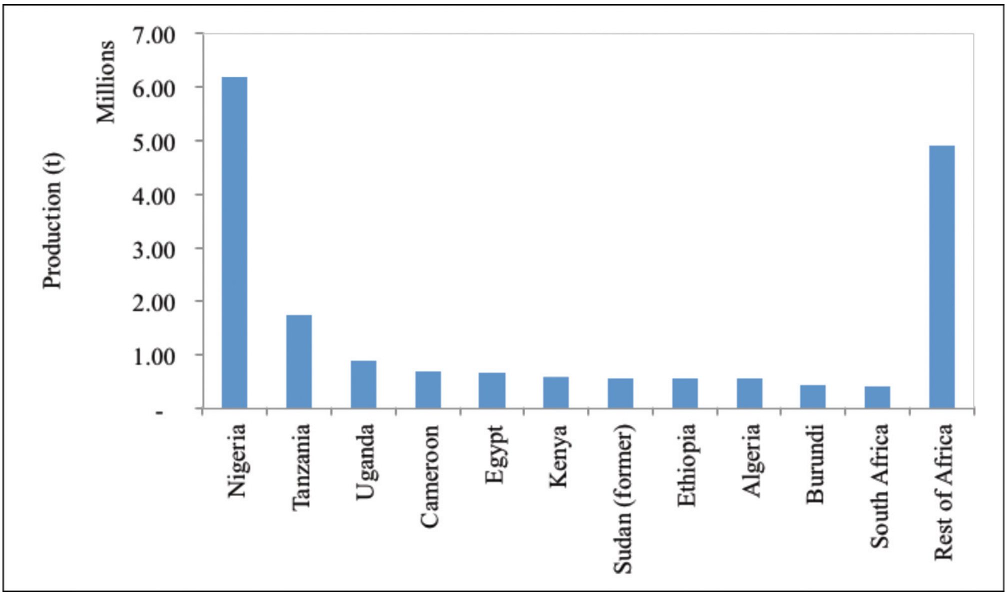
Source: FAOSTATS (2014).

Figure 9: Production in Africa (2003–2012)



Source: FAOSTATS (2014)

Figure 10: Production of vegetables in Africa (t)



Source: FAOSTATS (2014).

Whereas the private sector dominated horticultural sectors in many countries are relatively free from government interference, field crop sectors are typically highly influenced by government policies because they are often considered strategic for national food security. With good intentions, sometimes these policy interventions fail massively leading to poor performance of the sector. A look at the crop seed sector shows less than optimal uptake of improved varieties. For example, in 2006 the adoption rates for maize, one of the most important food crops in Africa, averaged 28% of the estimated 17 million hectares of cultivated maize land (Table 4). This is similar for other field crops. This contrasts sharply with the 100% adoption of improved horticultural seeds. Another most strategic input to increasing crop productivity is fertilizer (organic and inorganic) given that existing soils are exhausted from continuous cropping without adequate soil amelioration. For example, 25% of crop production is lost without application of N fertilizer and by the tenth year, 60% is lost (Donovan and Casey, 1998). Mineral fertilizers remain a key component in integrated soil fertility management and an essential element of any agricultural development strategy to increase crop production (Donovanand Casey, 1998).

That notwithstanding, total consumption of fertilizers in Africa has not changed significantly between 1980 and 2005, averaging one million tonnes per year, with Egypt, South Africa, and Morocco accounting for 69% of total consumption (Wanzala-Mlobela et al., 2011). Average consumption is very low, around 11kg/ha of nutrients with a range of less than 1kg/ha in Uganda and DRC to about 48kg/ha in South Africa (Figure 11) compared with 96kg/ha and 101kg/ha in Southeast Asia and South Asia, respectively (Morris et al., 2007), and over 145kg/ha in the developed world (World Bank, 2006). Compared with the Abuja Declaration of 50kg/ha, only South Africa within sub-Saharan Africa has achieved the target.

Table 4: Adoption rate of improved maize varieties in selected countries in Africa

Country	Area(million ha)	Seed demand (1000 t)	Adoption rate
(%age of area)			
Ethiopia	1.7	42	19
Kenya	1.6	39	72
Tanzania	2.6	64	18
Uganda	0.7	17	35
Angola	0.8	19	5
Malawi	1.4	35	22
Mozambique	1.2	30	11
Zambia	0.6	14	73
Zimbabwe	1.4	34	80
Benin	0.7	16	Na
Ghana	0.7	19	1
Mali	0.3	8	0.3
Nigeria	3.6	89	5
Total	17.3	427	28

Source: Langyintuo et al. (2010).

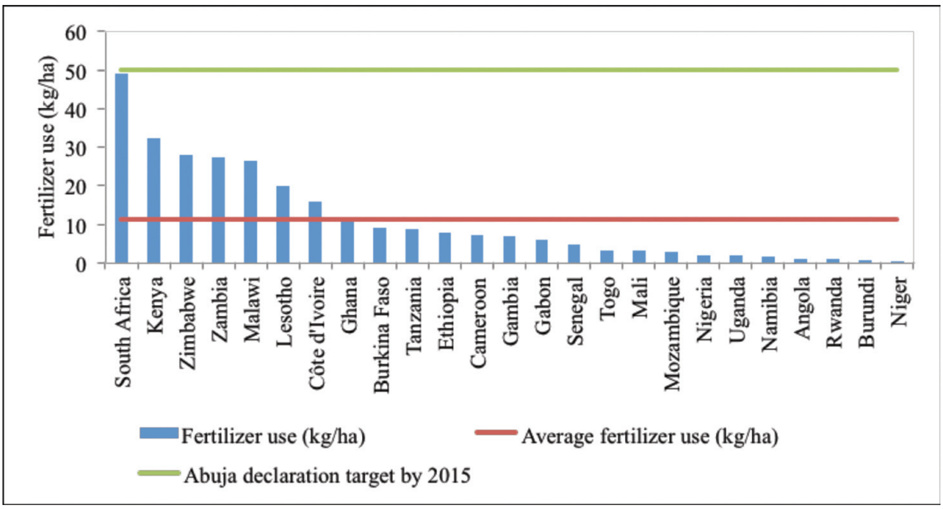
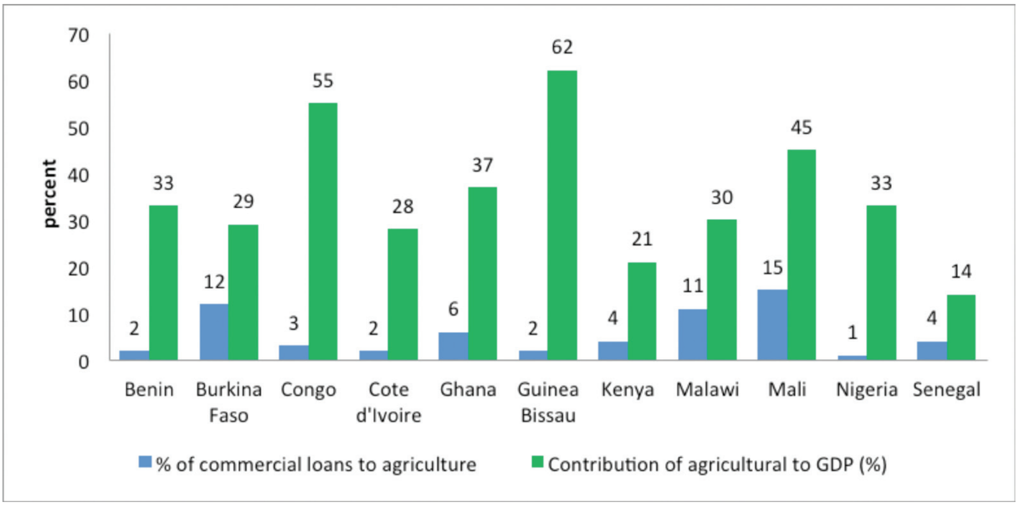


Figure 11: Intensity of fertilizer use in selected countries in Africa

Source: World Bank (2013).

The low use of improved seed and fertilizers by smallholder farmers in particular is because of binding capital constraints. Farmers need finances to purchase seeds and fertilizers, add value to their products and cover their marketing costs. Commercial and agricultural development banks have traditionally been the main sources of lending to investors. But as noted earlier, lending to agriculture is about 3% of total commercial bank lending although agriculture is the predominant activity in most African economies (Figure 12).

Figure 12: Agricultural lending as share of agricultural GDP in selected African countries

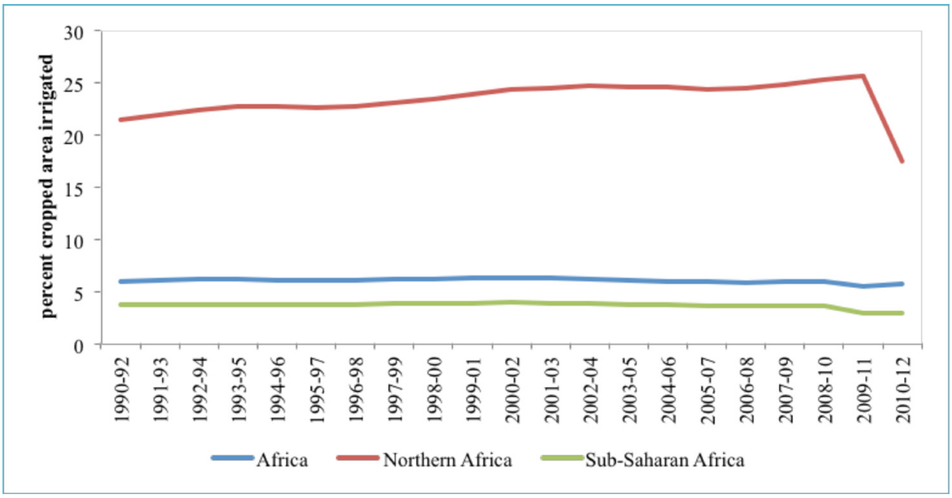


Source: CIA, World Factbook (2013).

Crop production and livestock rearing activities in Africa are significantly influenced by climatic variability because they are predominantly rain-fed. The Intergovernmental Panel on Climate Change 2007 Report predicts that, up to 250 million people in Africa will experience problems in accessing sufficient water by 2020 because of climate change, and that agricultural production could be halved in certain instances during the same period (IFPRI, 2012). In the report, it is predicted that, without adaptation, the impact of climate change on agriculture and food security will be high, with the number of malnourished children possibly increasing to an extra 10 million to a total of 52 million by 2050. Over the last three decades the frequency of droughts and floods in Africa caused primarily by El Nino Southern Oscillation (ENSO) has increased, resulting in crop failures and livestock losses.

About 60% of sub-Saharan Africa is exposed to drought, and 30% so extremely (Hodson et al., 2009), yet irrigation facilities are limited (Figure 13). Most of the existing irrigation facilities are ineffectively and inefficiently utilized because their construction have been fraught with problems such as generally insufficient farmer involvement in design, often formulated far removed from existing farming systems, inadequate land tenure systems development for irrigation, capital intensive investment requiring high input levels, and chronic institutional weaknesses.

Figure 13: Percentage of arable land equipped with irrigation

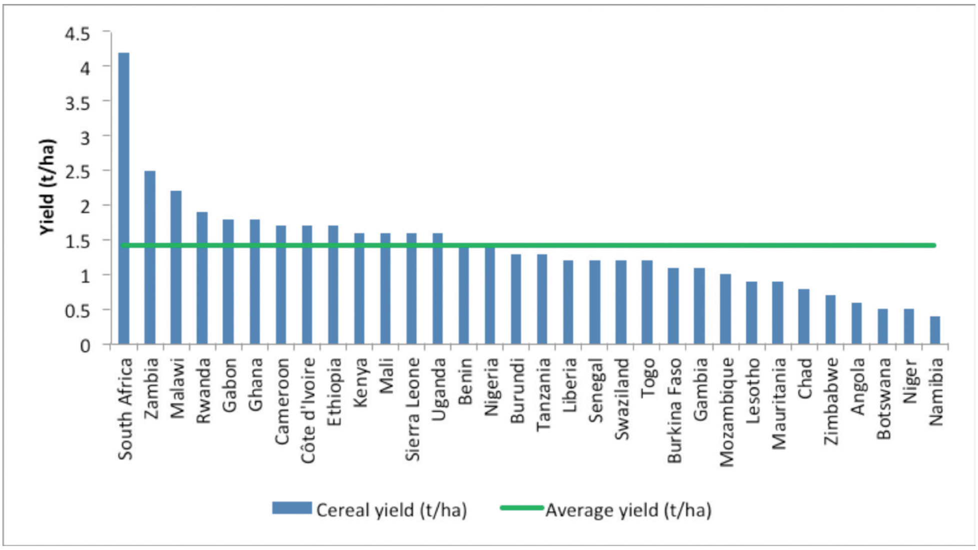


Source: FAOSTATS (2014).

The high frequency of drought in the absence of adequate effective irrigation systems, combined with the apparent lack of finance for seeds and fertilizers leading to low use of these important inputs, have significantly depressed cereal productivity on the continent. Figure 14 shows that average yields in SSA is 1.4t/ha for maize. A similar scenario can be said of other field crops. The extent to which African agriculture sufficiently adapts to climate change and climate variability will determine the continent's options for successful agricultural growth and economic transformation. This undoubtedly requires robust climate change adaptation policies; yet most African countries seem to be oblivious of the problem and do not have effective climate change adaptation policies in place.

Climate change also has a significant impact on livestock. Smallholder farmers keep livestock, comprising of cattle (25%), sheep (33%), goats (40%), and others (2%) (Mulumba et al., 2008). The contribution of livestock to agricultural GDP is about 30%, with a range of 5% in Côte d'Ivoire to 44% in Mali (World Bank, 2009). Evidence suggests that livestock products account for almost 30% of human protein consumption (Steinfield et al., 2006) and have important social functions by raising the social status of owners, and contribute to gender balance by affording women and children the opportunity to own livestock, especially small stock (Waters-Bayer and Letty, 2010). In marginal areas, with harsh environments, livestock provide a means of reducing the risks associated with crop failure and a diversification strategy for resource poor small-scale farmers and their communities (Freeman et al., 2007; Thornton et al., 2006; Vandamme et al., 2010). The contribution of livestock to crop production through the provision of draught animal power and manure cannot be overemphasized (Herrero et al., 2010). Through the use of animal manure to increase soil fertility, soil structure and water-holding capacity, livestock contributes to achieving more efficient and more sustainable resource use (Pell et al., 2010). Increased economic activity in livestock fosters forward linkages through growth in livestock processing and marketing, and backward linkages through increased demand for inputs and livestock services (van der Zijpp et al., 2010; McDermott et al., 2010).

Figure 14: Cereal yields in SSA countries (t/ha)



Source: FAOSTATS (2014).

The demand for animal protein continues to increase and outstrip supply in sub-Saharan Africa due to population growth and a rising middle class. By 2015, demand is estimated to reach 3.5 million tonnes for meat products (from cattle, small ruminants, poultry, and pigs) and 4.5 million tonnes for dairy products (McDermott et al., 2010). Output markets for livestock products in Africa are poorly organized and difficult to access for smallholder livestock producers. Increasing access to the needed range of quality services and technology, and providing easier access to markets would unlock the potential for livestock production in Africa. However, attention needs to be directed at improving the costs of doing business, resulting mainly from excessive regulatory burdens.

At the end of the production value-chain, farmers need markets to reward them for their sweat. Access to market is as important to agricultural productivity growth as technology and macro-economic policies (Barrett, 2011; Jayne et al., 2011). Farmers need efficient marketing chains to dispose of their products at competitive and stable prices. Poor transport and marketing infrastructure, poorly integrated markets and long marketing chains translate into high transaction costs for smallholder farmers. According to Platteau (2000) and Fafchamps (2004), the lack of vertical integration of markets adds considerable transaction costs associated with search, quality control and contract monitoring and enforcement.

Increasing the production of price-inelastic food crops in thin domestic markets, in the absence of regional trade outlets, due primarily to high tariff and non-tariff barriers ostensibly result in as much as 40% reduction of producer prices for farmers. More open intra-regional trade between African countries remains the option that offers important opportunities to exploit differences in comparative advantages, achieve greater scale economies in marketing and to help stabilize food supplies in the face of adverse weather events at country levels, apart from acting as a vent for surpluses which can help reduce the thinness of domestic markets and likelihood of price collapse from raising agricultural productivity.

At the global level, Africa accounts for less than 2% of global trade, mostly in primary products. United States, the European Union, and China cumulatively account for nearly 70% of African trade (Arieff et al., 2009). Total exports to the United States from all 41 countries eligible for trade benefits under the African Growth and Opportunity Act (AGOA) declined by 63% in the first half of 2009 following the economic crisis. Some analysts fear that policies aimed at encouraging trade with Africa—such as AGOA, the European Union's "Everything But Arms" programme, or the Doha Development Round of the World Trade Organization—could be threatened by political pressures to become more isolationist. The tightening of international credit markets is also expected to render it more difficult for African countries to access trade finance. In the following section, we discuss the key policy challenges of smallholder farmers in the agricultural production and marketing value-chain.

3. Policy and institutional constraints to agri-food production and trade in Africa

Smallholder farmers need good and consistent policies, as well as political support to provide them with the protection and assistance they need to invest in agricultural production. Good policies are also important in protecting the environment, restoring ecosystems, and tackling emerging issues like climate change.

Broadly speaking, a holistic legal framework should first specify the policy, followed by the law and finally regulations (Figure 15). The policy defines the government's objectives and institutional structure for the sector and outlines the mechanisms to achieve the objectives. Many countries rarely follow such a holistic approach. In some cases, laws are drafted without a policy, making it difficult to frame one later. In specifying the right policies for a country, care has to be taken to consider the entire value-chain. Some policies in agriculture are value-chain (production, value addition or marketing/trade) specific; while others, like climate change, agricultural finance and research, and development policies are crosscutting in nature (Table 5). If not well-crafted, policies, however well-intentioned they may have been thought to be, may end up stifling the performance of the agricultural sector.

In the 2008, World Development Report - Agriculture for Development - countries were classified into agriculture-based, transforming, and urbanized countries based on i) the proportion of a country's total GDP that is agricultural, and ii) the proportion of a country's workforce that is employed in the agriculture sector. This depiction of where countries are situated along the agriculture-based to urbanized continuum is illustrated in Figure 16. Notice that sub-Saharan African countries are clustered around agriculture and pre-transition phases and moving slowly to the transition phase. To speed up the agricultural transformation, various policy challenges must be addressed, some of which are discussed below.

Policy
Defines the government's objectives and institutional structure for the sector and outlines the mechanisms to achieve the objectives

Law/Act
The law is the legally binding basis for regulations. It identifies competent authorities and stipulates procedures and quality standards for operators

Regulations (Ministerial Orders or Circulars)
These operationalize the law

Figure 15: Illustration of a holistic sectorial policy framework

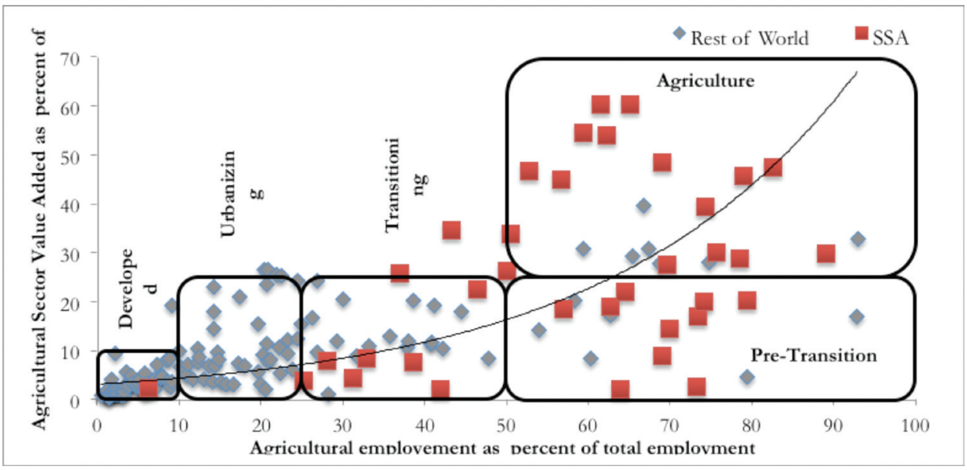
Production related policies

The optimal use of factors of production, namely land, seeds, agro-chemicals, etc., is often determined by various conditions, not least national and global policies. While recognizing the importance of pesticides and mechanization as agri-inputs, this section focuses on policies related to land, seeds, fertilizers, and finance.

Table 5: Policy dimensions affecting smallholder agri-food systems

	Agri-food value chain		
	Production	Value addition	Marketing/trade
Value-chain-specific policies	• Land reform • Seeds and bio-safety • Agro-chemicals (fertilizers & pesticides) • Mechanization • Water and irrigation	• Transportation • Agri-processing • Storage	• Domestic • Regional • International
Crosscutting policies	Agricultural finance Environmental and climate change Research and development policies		

Figure 16: Agricultural transformation and nine agribusiness indicators



Source: World Bank (2008a).

Land tenure, access rights and management policies

The combined cultivated land area in sub-Saharan Africa is 183 million hectares, while about 452 million hectares are uncultivated (FAOSTATS, 2014). This has prompted the acquisition of land in Africa to address global food shortages. Data suggest that, at least 8.84 million hectares have been acquired in Africa, with nearly 60% from Sudan and Zambia (Figure 17).

This apparent abundant land notwithstanding, smallholder farmers in Africa face limited access to land resources. Figure 18 suggests that land pressure is severe in Rwanda, Malawi, Kenya, and Uganda, with an average holding of barely a hectare compared to Burkina Faso, Mali, Niger, and Ghana where the average holding is more than three hectares.

Land tenure insecurity is still a major problem in many countries in Africa where the state continues to own large portions of valuable land, which are often mismanaged and underutilized. Another aspect of tenure insecurity is the manifestation of weak assurance of rights, such as faced by migrants in many areas of Africa and very often by women especially widows and short- term land borrowing, sharecropping, or renting arrangements. In Mali, Zambia, Malawi, Ghana, Burkina Faso, and Niger and in large parts of Sierra Leone, Liberia, Nigeria, Tanzania, and Mozambique, customary land tenure system is the predominant land ownership system, although tenure arrangements vary from country to country. Under such tenure arrangements, land tends to be held collectively by lineages or families and, in many cases, with complex systems of multiple and overlapping rights (Namubiru-Mwaura et al., 2012). Such systems do not provide any form of security to the user.

Women's rights to land in most parts of Africa are very limited to 1 - 2% of land and dependent on their marital status, although evidence suggests they contribute more than 70% of agricultural labour (Bennett, 2010). Despite some positive steps toward reforming land laws and policies in Africa, women's rights to land have yet to become fully realized and the reality for women in Africa is still strongly entrenched in patterns of exclusion. Recent studies show that in Uganda, Malawi, Zambia, Rwanda, Tanzania, and Mozambique, even though the land laws and policies mandate equality of men and women under statutory law, in principle, the institutions for land administration still discriminate against women, either explicitly or implicitly (Duncan, 2010; FAO, 2010). The apparent lack of tenure security is one of the main hindrances to increasing agricultural productivity because of limited investment in land and adoption of unsustainable agricultural, practices leading to poor family incomes and nutrition (UNECA, 2005). According to Kebede (2002), privatization of land would seem to be the most effective way to reduce insecurity associated with the tenure schemes and uncertainties created by state ownership. However, although short-term land rentals improve land productivity (Holden et al., 2008) they provide no incentives for either the landlord or the tenant to make long-term improvements (Place, 2009), thereby compromising on sustainability of production.

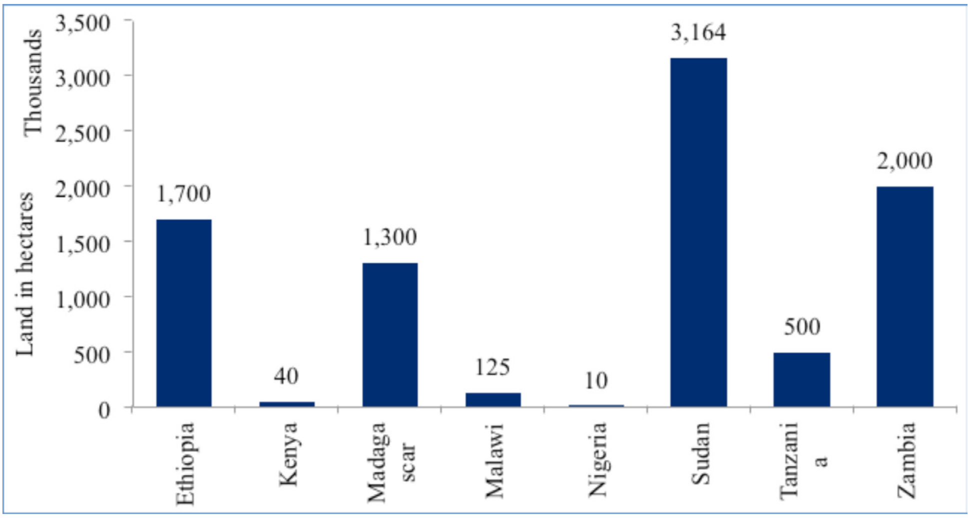


Figure 17: Land acquisitions in Africa to address global food needs
Source: Von Braun and Meinzen-Dick (2009).

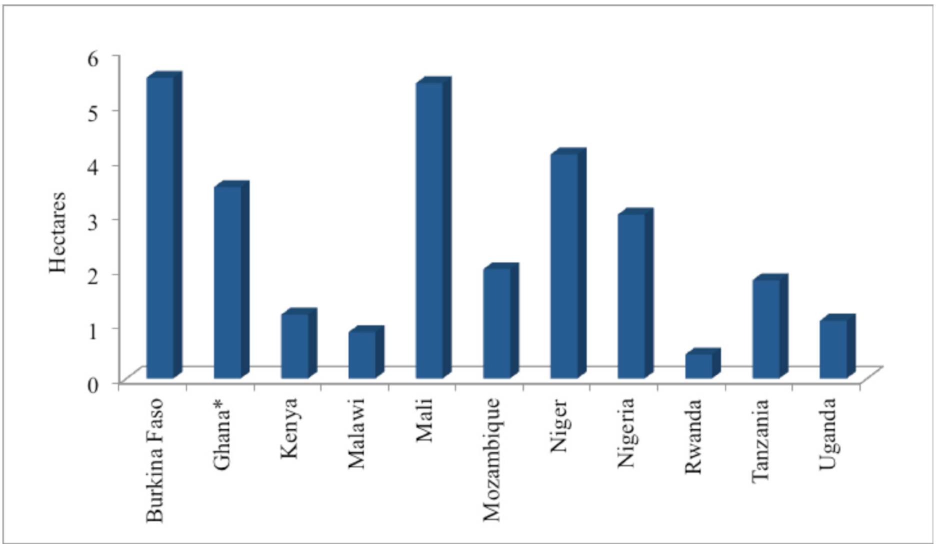


Figure 18: Average size of agricultural land per household (2009-2010)
Source: AGRA (2014).

Seed sector policies

The smooth functioning of the seed sector in Africa is undermined by lack of or poorly implemented seed policies, weak internal seed laws and regulations, and lack of effective harmonization of regional seed laws, regulations and standards. Properly designed seed policies provide a strategic direction for execution of seed laws and regulations, as well as investments in the seed sector. In the past two decades, seed policies allowed only the public sector to carry out research, produce foundation seed and certify seeds while inhibiting the participation of the private sector (Rusike and Smale, 1998; Tripp, 1998; Tripp and Rohrbach, 2001; Lemonius, 2005). In the 1980s and 1990s, many countries made significant progress in liberalizing and restructuring their seed sectors (Hassan et al., 2001). Countries such as Ethiopia, Rwanda and Tanzania are yet to fully liberalize the production of foundation seed. Many countries still operate dated seed policies or none at all, partly contributing to the incidence of fake seeds (Langyintuo, 2004). Where policies exist, they almost exclusively concentrate on the formal seed sector and fail to support the diversity of initiatives that farmers employ for their seed security (Louwaars and Engels, 2008). In the majority of cases, the emphasis is always on hybrids to the neglect of open pollinated varieties as observed in India by Spielman et al. (2009). In Ghana and Kenya, the seed policies were recently updated; while in Rwanda, for example, a review is currently going on.

The presence of comprehensive and functioning legislation (laws and regulations) in Kenya, South Africa, Zambia and Zimbabwe may have partly contributed to the better development of their seed sectors. In contrast, seed sectors in Angola, Malawi, Ethiopia, Tanzania, Uganda, and many West African countries have weak regulatory systems, either because the seed laws are outdated or the laws are not effectively implemented and enforced. In Kenya, and many other countries, the law does not provide for stiff punishment to culprits convicted of selling fake seeds. This makes it difficult for the seed regulatory authorities to ensure efficient functioning of the seed sectors (Goncalves, 2001; Langyintuo, 2004; Lemonius, 2005).

The implementation of seed regulations can be a source of restriction to the seed sector development. For example, varietal registration that ensures the genetic identity of a variety, and thereby enhances public welfare by discouraging the release of germplasm that is inappropriate, unproductive, or unsafe, is often problematic (Tripp, 1998). For example, as part of the release process, a new variety undergoes an official National Performance Trial (NPT) in several locations in the country for two to three years. In addition, it also undergoes a Distinctness, Uniformity and Stability (DUS) test conducted in parallel or subsequently with the NPT to certify that the new variety is not a duplicate of an existing one. Although, in theory, the two processes are expected to take up to a maximum of three years to complete, but in practice they may take more than three years (Table 6) for reasons such as failed NPT in a season or more because of bad weather, lack of sufficient breeder seed for the trials, or insufficient funds to pay for the trials. Depending on the country, a breeder may pay between US$1,000 and US$2,500 per entry per year for both NPT and DUS tests (Langyintuo et al., 2010; Mwala and Gisselquist, 2012).

This process poses a serious regulatory obstacle to the introduction of new varieties and lengthens the time it takes farmers to access a newly developed variety, especially that even after the release of the variety, it might still take up to 2-4 years for bulking of the basic seed to produce certified seed. To speed up the spill-overs of genetic improvements in seeds and facilitate regional seed trade, regional seed harmonization of protocols is critical. This is, however, problematic because the legislative frameworks of countries within the regional economic communities vary widely to facilitate harmonization (Table 7). For example, plant variety protection is not enforced in countries such as Angola, Malawi, Uganda, and all West African countries excluding Ghana.

Table 6: Length of seed release process in selected countries

Country	Actual time to seed release (years)			Time from release to time significant quantities of seed is available (years)		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Kenya	3.1	1.5	6.0	2.4	0.0	9.0
Malawi	3.0	2.0	7.0	1.9	0.5	3.0
Tanzania	2.2	1.0	3.0	2.0	1.0	3.5
Uganda	2.2	1.0	4.0	2.1	1.0	4.0
Zambia	2.1	1.0	3.5	2.5	2.0	3.0
Zimbabwe	2.2	1.0	3.0	2.4	1.5	4.0
South Africa	2.0	2.0	2.0	2.5	2.0	3.0

Source: Langyintuo et al. (2008).

Ghana recently developed a PVP law, which has been deposited with UPOV in Geneva. Ethiopia and Uganda are yet to update their seed Acts while ISTA and OECD (Organization for Economic Cooperation and Development) accreditation required for official seed shipment across boarders are available in Ghana, Kenya, Malawi, South Africa, Zambia and Zimbabwe. A country without an ISTA-accredited laboratory such as Angola, Ethiopia, Mozambique, Tanzania, and Uganda cannot sell seed across boarders since any cross boarder traded seed lots must bear the ISTA Seed Lot and Sample Certificates, to certify that the seed has met the requirements of the ISTA Rules. Differences in certification systems, standards and procedures have led to diminished trust among seed certification authorities in the different countries. To the extent that there seems to be an overemphasis on Orange International Seed Analysis Certificate (OISAC) without recognition of National Seed Analysis Certificates (NSAC) or Private Seed Analysis Certificates (PSAC) issued by government-accredited private seed testing laboratories for trade.

Table 7: Current status of seed control legislation in eastern and southern Africa

	Updated Seeds Act	Plant Variety Protection	Variety Registration	ISTA Accreditation	OECD accreditation
Eastern Africa					
Ethiopia	No	Yes	Yes	No	No
Kenya	Yes	Yes	Yes	Yes	Yes
Tanzania	Yes	Yes	Yes	No	No
Uganda	No	No	Yes	No	No
Southern Africa					
Angola	Yes	No	Yes	No	No
Malawi	Yes	No	Yes	Yes	Yes
Mozambique	Yes	Yes	Yes	No	No
South Africa	Yes	Yes	Yes	Yes	Yes
Zambia	Yes	Yes	Yes	Yes	Yes
Zimbabwe	Yes	Yes	Yes	Yes	Yes

Source: Langyintuo et al. (2008).

It is important to comment on the use of biotechnology in crop genetic improvement. For many years, biotechnology has been providing value added foods and medicines for mankind. Recent advances in genomics, including the ability to insert genes across species, have distinguished "modern biotechnology" from traditional methods. Resulting transgenic or genetically modified (GM) crops, forestry products, livestock, and fish have potentially favourable qualities such as pest and disease resistance, however, with possible risks to biodiversity and human health (Paarlberg, 2014). GM crops have been adopted at rates never seen before, from 1.7 million hectares in 1996 to 134 million hectares in 2009, both in the developed world, as well as in developing countries (De Groote et al., 2009, Brookes and Barfoot, 2006). As of 2012, GM crops were being grown in eight industrial countries, four African countries and 16 other developing countries and conferring beneficial traits such as herbicide tolerance, insect resistance, and nutritional enhancement (Clive, 2012). Table 8 shows the area planted to GM crops in Burkina Faso, Egypt, Sudan, and South Africa during the 2012 cropping year on an estimated 2.8 million hectares compared with 65.7millon hectares in nine countries in

South America and 18.7millon hectares from five Asian countries (Clive, 2012).

Table 8: Area planted to GM crops in Africa in 2012 (hectares)

Country	Crop planted			Total
	Cotton	Soybean	Maize	
Burkina Faso	300,000	0	0	300,000
Egypt	0	0	1,000	1,000
South Africa	15,000	362,000	1,873,000	2,300,000
Sudan	200,000	0	0	200,000
Total	515,000	382,000	1,874.000	2,801,000

Source: Compiled from Clive (2012).

However, the use of GM varieties remains controversial, largely driven by negative perceptions originating from western consumers and exported to Africa (De Groote et al., 2014; Paarlberg, 2008; Paarlberg, 2000; Paarlberg, 2002). It is important to point out that GM crops have been subject to more testing worldwide than any other new crops, and have been declared as safe as conventionally bred crops by scientific and food safety authorities worldwide (Paarlberg, 2014). A recent EU report concludes that more than 130 EU research projects, covering a period of more than 25 years of research and involving more than 500 independent research groups, concur that consuming foods containing ingredients derived from GM crops is no riskier than consuming the same foods containing ingredients from conventional crops. Such well-known organizations as the World Health Organization, the U.S. National Academy of Sciences and the European Food Safety Authority (EFSA) have come to the same conclusion (Paarlberg, 2014).

Fertilizer sector policies

Whereas high level of use of fertilizers creates environmental problems in developed countries and in few countries in Africa such as Egypt and Morocco, in most parts of Africa, it is the limited use of the input that creates environmental degradation leading to an estimated loss of 4–12% of GDP through soil mining and clearing of forest land to expand farms in an attempt to increase production (Olsen and Berry, 2003). In Africa, demand and supply-side policy failures have contributed to the limited use of this very important input. On the demand-side, the risk of fertilizer use and poor nitrogen to maize price ratio (Gregory and Bumb, 2006; Morris et al., 2011) are disincentives to fertilizer use. Between 1997and 2003, the ratio has trended downward by 0.9% (Heisey and Norton, 2007). Even when the world prices crash, prices of fertilizers in Africa continue to rise due to a combination of the removal of price subsidies (Kherallah et al., 2002; Heisey and Norton, 2007), the small fertilizer market size , high transport and handling costs from the port to consumption centres in the rural areas, and cost of finance.

At the present level of the African fertilizer markets, it is cost-effective to import until markets expand to support large-scale production locally (World Bank, 2006). Presently, over 90% of the fertilizer used in Africa is imported at very high sourcing costs, which ultimately reduce the profitability of distributing fertilizer and discourage increased supply. The scope for negotiating bulk purchases and arranging bulk shipments in order to save on freight charges is limited by the lack of port facilities capable of handling large volumes. Most of the fertilizer imported into Africa is shipped via 10,000-ton vessels because of limited capacities at the ports, especially those outside of South Africa. This limits the size of bulk orders and entails a shipping cost premium of between 10% and 15% over medium-size vessels. All these factors negatively affect farm gate prices, thereby constraining the use of fertilizers by smallholder farmers.

Poor road infrastructure, which represents a significant bottleneck to fertilizer supply, adds significantly to fertilizer trade. These, added to the many official and unofficial tolls, taxes, and security checks along the roads slow delivery and impose transaction costs. For example, a ton of fertilizer can be shipped 11,000 kilometres, from a manufacturing plant in the USA to Mombasa, Kenya, for about US$50. To transport that ton of fertilizer less than 1,000 kilometres inland, from Mombasa to Kampala, Uganda, would cost an additional US$80-90 per ton due mainly to poor road infrastructure and lack of cheap rail transport linking cities.

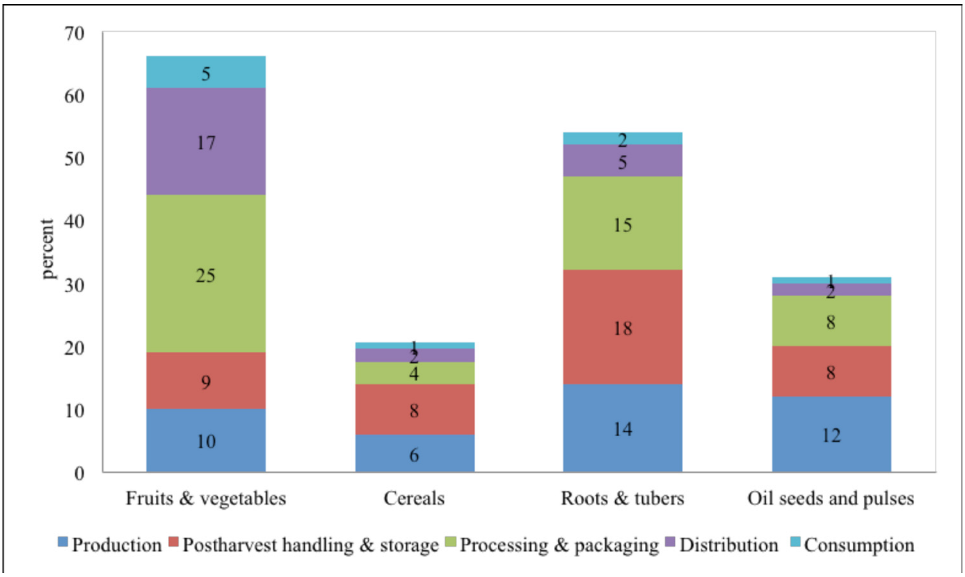
Fertilizer prices are also not competitive because of the slow emergence of the private sector, and consequently a lack of a vibrant market, which in turn is an artifact of unfavourable private sector policies: poorly defined rules of the game, weak regulatory enforcement, a proliferation of taxes and fees, cumbersome bureaucratic importation procedures, a general lack of security, and the widespread incidence of corruption (World Bank, 2006). These factors hamper the development of the fertilizer sector and hence productivity gains from increased fertilizer use.

Agricultural value addition, marketing and trade policies

A significant share of Africa's agricultural output is made up of bulky and perishable crops that are non-tradeable in unprocessed form (e.g., cassava). Good and efficient storage practice is a very important value addition activity among farmers because it ensures smooth consumption over time. While grains need warehouses and even common sheds, perishable products, such as fruits and vegetables, need efficient cold chain logistics soon after harvest in order to keep products at their optimum temperature to maintain quality, food safety and prevent waste and economic losses. For example, apples have a shelf life of up to 260 days if kept at a temperature of 0oC. Without good quality storage and processing facilities, large quantities of agricultural commodities produced by smallholder farmers rot away. Post-harvest storage loses are greatest for fruits and vegetables than other crops. Notice from Figure 19 that fruits and vegetables suffer up to 42% loses during processing, packaging and distribution. Roots and tubers are second to fruits and vegetables, with 33% handling and processing loses.
Processing reduces some of the post-harvest loses while transforming several of the crops produced into a wider range of products for which there is relatively high demand (e.g., processed cereals, processed foods targeted to growing ethnic food markets,

livestock feed, etc.) on the local, regional and international markets but the lack of electricity limits such value addition activities.

Figure 19: Post-harvest loss estimates in SSA



Source: FAO, 2011.

Infrastructural and logistical constraints are impediments to trading. Underdeveloped rural roads, and other key physical infrastructure, have led to high transport costs for agricultural products to the market as well as of farm inputs, reducing farmers' competitiveness. Trading in processed and raw products can be challenging in Africa because of several trade restrictions. A World Bank (2008) report indicated that Africa is the world's second most trade-restrictive region after South Asia as a result of numerous non-tariff barriers (Table 9). Learning how to unlock the intraregional trade potential and expand staple food markets as part of the broader strategy to rebuild food potential is Africa's biggest challenge. In addition to high transport costs, the bulky nature and perishability of many of Africa's staple food crops, institutional, regulatory, infrastructural and technological policies constrain inter-regional agri-food trade. Tariff and non-tariff barriers combined with some governments' conflicting goals of seeking greater economic integration while enacting divergent trade policies are often not conducive to favourable investment climate.

Table 9: Commonly identified non-tariff barriers in Africa

WTO classification for NTB	NTB commonly identified in Africa
Government participation in trade and restrictive practices tolerated by governments	• Varying trade regulations • Non-acceptance of certificates and trade documentation • Cumbersome visa requirements • Restrictions to enhance national food security • Restrictive transiting procedures, road blocks • Business registration and licensing constraints
Customs and administrative entry procedures (licensing)	• Non-standard customs documentation procedures • Cumbersome processing of export and import permit
Technical barriers to trade	• Duplicated functions of agencies involved in quality, quantity of dutiable import or export
Sanitary and phyto-sanitary measure	• Constraints in quality inspection procedures
Specific limitations	• Unnecessary import and export bans and quotas
Charges on exports	• Other restrictive charges that are non-export or import duties, e.g., charges in roads and boarder tolls
Other	• Incorrect tariff classification

Source: Anonymous.

High transport costs are arguably the most important impediment to intra-African trade. According to some estimates, an investment of US$32 billion to upgrade the main intra-African road network would result in trade expansion of about US$250 billion over 15 years (IFPRI, 2014). Freund and Rocha (2009) observed that, by reducing transit time by just a day, exports could increase by 7%. National concerns about food security constitute a constraint to inter-regional trade. To meet national food needs at all times, a government may restrict food exports in years when national production and stocks are low. As a result, governments sometimes backtrack on existing trade agreements by imposing trade bans. This partially explains why the size of the intra-regional trade in East and Central Africa is small, estimated at US$300 million or 1.5% of total value of trade. In contrast, trade with Europe and North America are about 40% and 60%, respectively.

But trading externally may be hampered by value addition. For example, processing fruits and vegetables sometimes attract tariff escalation when sold on the USA and EU markets. Tomato paste attract twice as much Most Favoured Nations (MFN) tax compared to unprocessed tomato while apple juice attracts six times the MFN tax compared to unprocessed apples (Table 10).

Table 10: Most favoured nations tariffs on fruits/vegetables imported into EU

Primary product	percent tariff	Processed product	% tariff
Apple fresh	3.0	Apple juice	18.0
Apple dry	3.2	Apple paste	24.0
Pineapple	5.8	Pineapple juice	15.2
Strawberry	12.8	Strawberry juice	24.0
Tomatoes	8.8	Tomato paste	16.0

Source: WTO (2013).

Flowers, fruits and vegetables with relatively short chains, experience very little state interference. The success story of horticulture exports from Kenya to the EU is a case in point. Fruit, flower and vegetable exports have increased by 70% since 1995, and are now the country's number two hard currency earner (McCulloch and Ota, 2002). An estimated 95% of fresh produce exports go to Europe via airfreighting. In Africa, air freight, handling and insurance charges sometimes account for nearly 50% of the total cost of producing, packing and delivering vegetables to Europe. This poses a huge barrier to the international markets by smallholder farmers (UNCTAD/WTO, 2007). Beyond freight is the cost of compliance with agreed standards. There are compliance standards which are legally mandated and those which are a commercial requirement, both of which determine the level of trade in horticultural crops (Jaffee, 2003). Broadly speaking, adherence to maximum residue levels (MRLs) of pesticides in food and the possession of a phyto-sanitary certificate are legal requirements for any exporter while traceability, adherence to good agricultural practice (GAP) and the possession of a hazard analysis and critical control point (HACCP) system may be imposed by the buyer.

The estimated annual costs of food safety management demanded by the end-users in the importing markets are high, particularly at the top end of the market, averaging about 3% of turnover, while compliance costs for the "high-care" end of the business is 5% (Jaffee, 2003). Reardon et al. (2002) claim that, increasingly tough grades and standards, and the capital investment needed to meet them, have driven many small firms and farms out of business in developing countries and accelerated the process of concentration. Similarly, farmers are also unable to be linked into the supermarket chains due to high quality and safety demands as well as delivery schedules that supermarket value chains require, preventing them to compete in such markets.

Crosscutting policies

Financing agriculture and access to credit

Investors along the agricultural value-chain need financing. Farmers need finance for their production, while other small- to medium-scale enterprises need to finance value addition activities including agro-processing. As noted earlier, financing to agriculture is low, relative to manufacturing, trade, and other services sectors, hampering expansion and technology adoption. In Kenya, the lack of capital and access to affordable credit is cited by smallholders as the main factor behind the low productivity in agriculture. Access to formal credit in Tanzania and Ethiopia is mainly confined to large urban centres, where collateral requirements are high. In Uganda, high interest rates inhibit agricultural investments.

Frequently cited reasons for the limited financing of agriculture include lack of usable collateral, high transaction costs for services provided because of the remoteness of the clients and heterogeneity among communities and farms, dispersed demand for financial services, small size of farms and individual transaction, the lag between investment needs and expected revenues, lack of irrigation facilities contributing to high covariate risks due to rainfall variability, underdeveloped communication and transportation infrastructure, and price risks (Adesina et al., 2012).

Other challenges include poorly developed agro-foods value-chains which significantly increase risks and exposure for the bank and general lack of understanding about the agricultural sector and the opportunities among the financial institutions. To close the financing gap in agriculture created by the commercial banks, innovative financing approaches, such as interlocked markets for finance, credit guarantees, etc., are being piloted over the past few years. These innovative financing approaches focus on facilitating access to financial capital for investment in the agriculture sector and reducing risk associated with the sector to attract private investors.

Microfinance, saving, and credit associations: The unsatisfied demand for financial services by smallholder farmers and SMEs can be met by Microfinance Institutions (MFIs). These institutions have emerged to provide credit facilities and deposits but have not succeeded in expanding financing for agriculture due to a number of reasons, including limited capital bases, high interest rate, small size of disbursement insufficient for investment, and being located in urban centres but the bulk of farmers are in the rural areas. Moreover, the repayment schedules for microfinance loans often do not synchronize with the seasonality of agriculture and the timing of cash flows of farmers. Poulton et al. (2006) noted some of the challenges faced by MFIs to include: (1) very small outreach compared to the demand, (2) inadequate capacity to properly conduct credit analysis and loan appraisals, (3) inadequate risk management and control systems, (4) small shares of total deposits and loans compared to commercial banks, (5) public policy, the regulatory framework and non-performing collateral laws limiting the effectiveness of the MFIs, and (6) inadequate capitalization limits the level particularly in assessing the possibilities of default by a prospective borrower.

Due to weak linkages with banks, Savings and Credit Cooperatives (SACCOs) in the rural areas have not been able to expand lending to agriculture (Poulton et al., 2006). In Kenya, for example, SACCOs are well-developed but they account for only US$30 million or 0.5% of the total asset of the banking system and give loans that average US$180, too low for farmers. Strengthening the links between SACCOs and commercial banks can increase their capital base and afford them the flexibility to increase their lending to smallholder farmers who are their savings mobilization base.

Interlocked markets for credit and value-chain financing: One way of overcoming missing markets in the supply of credit to farmers for purchasing improved seeds and fertilizers is to use value-chain or interlocked markets for inputs, outputs and credit (Poulton et al., 1998).] Traditionally, value-chain financing has been done through government-controlled parastatal agencies (Poulton et al., 1998), often viewed as the major sources of credit for farmers (IFAD, 2003). In recent times, value-chain financing, such as contract farming, vertically integrated operations, or out-grower schemes led by private sector and dominated by agro-processors, agribusinesses, traders, and food-processing companies, either local or international, operating under international markets have emerged (Swinnen and Maertens, 2010). These value-chain financing arrangements are increasingly becoming important for farmers, especially in export-oriented value-chains such as horticulture as a source of finance for inputs and markets for the output. For example, farmers growing cash crops (such as cotton) sometimes receive fertilizers for these crops but also use the inputs on their food crops inevitably raising and sustaining the cash and food crop production (Dione, 1991).

There are many advantages to interlocked credit market arrangements, not least the risk of default, which is low because the cost of inputs is deducted before the farmers receive payments for their delivered produce. It also offers assured markets, guaranteed prices, reduced marketing risks, and sharing of lending risks with positive spill-over effects on other crops (Swinnen and Maertens, 2010). Monitoring and supervision costs are also reduced since the input loan is delivered in kind to farmers to be applied on their crops except when farmers engage in side-selling of the produce. This practice is particularly difficult to curb where there are no appropriate legal frameworks to enforce contracts. Credit guarantee schemes: One of the reasons why commercial banks are reluctant to lend to agriculture, as noted earlier, are the perception of high risk and lack of collateral. To encourage banks to lend to agriculture, credit guarantees have been used to cover part of the default risk ensuring secure repayment of all or part of the loan in case of default (Levitsky, 1997). Besides covering the default risk, credit guarantees are useful in addressing the issue of lack of collateral and poor credit history faced by farmers and hence improve loan terms. Additionally, by allowing loans to be made to borrowers that otherwise would have been excluded from the lending market, farmers and SMEs are able to establish a repayment reputation in future (De Gobbi, 2002) and allow them to benefit from lower transaction costs and help raise productivity (Ruiz Navajas, 2001; Green, 2003).

There is a strong role for the use of credit guarantees to expand access to finance for farmers (World Bank, 2008b), but their use must be guided by best practices, some of which are discussed here. Firstly, whether or not the scheme should focus on individual or portfolio loans is important. In an individual loan arrangement, the application is approved by the guarantor and the application is assessed on case-by-case basis, thereby establishing a direct link between the borrower and the lender. An estimated 72% of credit guarantee schemes use this selective or individual loan approach (World Bank, 2008b). While allowing for a more careful risk management and likely reduces the probability of moral hazard, this approach introduces high cost of loan management. To increase guarantee and credit volume, a loan portfolio model might be a better approach. This approach allows the guarantor to negotiate the criteria of the portfolio.

Secondly, the fees charged for use of credit guarantees have a direct impact on the incentives lenders and borrowers have in participating in the scheme, as well as the financial sustainability of the fund. Although it is not realistic to expect credit guarantees to cover its full costs through fees, the fees must be high enough to cover administrative costs, but low enough to ensure adequate lender and borrower participation.
Thirdly, the default rate is an important indication of the sustainability of a guarantee scheme. A sustainable scheme should aim to have a default rate of between 2% and 3% through a critical assessment of the application and effective monitoring. However, newly established schemes in developing countries might consider a higher default rate (i.e., over 5%) in their early years of operation but should aim at lower rates at the shortest possible time. In general, guarantee pay-outs should only be used if all efforts by the guarantors (or lenders) to reschedule payments have failed.

Fourthly, the risk sharing arrangement between guarantor, the lender and the borrower defines the efficiency and effectiveness of the guarantee scheme. An improperly designed guarantee scheme can increase moral hazards among borrowers by reducing the default risk they otherwise would face. While a properly designed guarantee scheme can limit moral hazard, the guarantor should accept enough risk to be able to persuade banks to participate in the scheme, while reducing scope for moral hazards or adverse selection. The level of risk sharing depends on which part of the agricultural value-chain the scheme intends to focus on. For lending towards the upper part of the agricultural value-chain, agro-processors, agro-dealers, fertilizer and seed companies, etc., a direct risk sharing at 50:50 would be sufficient, as the risk of lending is lower. For lending to the lower part of the agricultural value-chain, especially to poor smallholder farmers, higher levels of risk sharing arrangements such as first loss arrangements will be required. In general, a risk sharing rate below 50% reduces the potential for moral hazard but tends to reduce the incentives for banks to participate in the guarantee scheme because of high loan administration costs (World Bank, 2008b).

Lastly, guarantee schemes should consider using risk management mechanisms such as reinsurance, loan sales, or portfolio securitizations in order to reduce the exposure to default and diversify risk. Globally, about 76% of credit guarantee schemes use risk management tools, 20% loan insurance, 10% securitized loans portfolio, and 5% risk management strategies (World Bank, 2008b). It should, however, be noted that these mechanisms require relatively well-developed local capital and financial markets.

Other financial instruments: Warehouse receipts system (WRS) is becoming an important instrument for accessing financing from commercial banks. As noted earlier, one of the reasons why banks are reluctant to lend to agriculture is the lack of collateral for loans. The absence of land titles and other encumbered fixed assets that could be used as collateral as well as the lack of indemnity for product quality deterioration and storage losses diminish banks' willingness to lend to the agricultural sector. A WRS can potentially be used to unlock the collateral value of inventories that farmers, traders and processors manage through warehouse receipt financing and help relieve part of the existing access to credit constraints.

A producer, farmer group, trader, exporter, processor or indeed any individual or body corporate may deposit grains or other commodity into a registered warehouse and the warehouse operator issues the depositor with a warehouse receipt (WR) , which stipulates the quality, quantity, type of commodity, date deposited, and the date up to which storage costs have been paid (SPORE, 2013). The warehouse operator holds the stored commodity by way of safe custody, implying he is legally liable to make good any value lost through theft or damage by fire and other catastrophes but has no legal or beneficial interest in it.

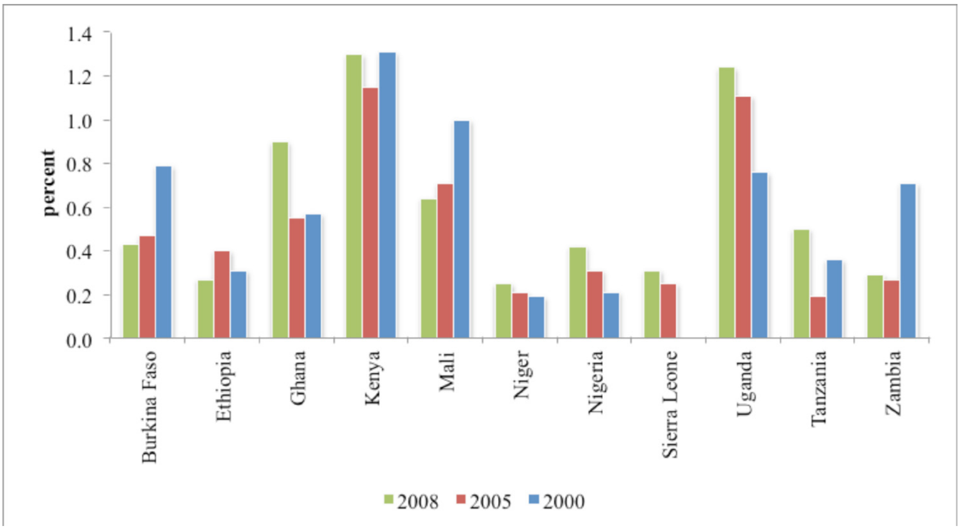
There are many benefits of the WRS, including easing rural finance, reducing storage loses, improving grades and standards, facilitating trade, enhancing market efficiency, mitigating price risks, and enabling cost-effective management of public food reserves (Coulter and Onumah, 2002). Focusing on the easing of rural finance, the depositor can take the warehouse receipt to a bank or other financial institution as collateral for a short-term loan, usually up to 60-70% of the value of the crop. Availability risk associated with movable collateral is reduced by the warehouse operator's guarantee of delivery from a stated location, and foreclosure can be simple and low cost, without any resort to the courts, depending on the legal regime (Coulter and Onumah, 2002). The risk of loss of value of the collateral can be minimized by monitoring movements in its market value and using margining and price risk management instruments. Lenders no longer need to monitor a large number of small borrowers, but few warehouse operators to assure loan performance. This ultimately reduces monitoring costs and encourages commercial lending to the rural sector, helping to capitalize the rural trade.

Research and development

Building productive capacities in agriculture, and identifying linkages between agriculture and other sectors, is critical in transforming agriculture in Africa from subsistence-oriented to commercial agriculture. This requires technological change. It is commonly observed that throughout the developing world, where input technology has made less dramatic changes in agricultural productivity, the incidence of rural poverty and food insecurity is pervasive (Rosegrant and Hazell, 2000; Renkow, 2000). While pursuing agricultural transformation, it is important to pay attention to price risks that may render the input use unprofitable and hence cause the technology to by-pass some rural populations (Kelly et al., 2003).

Many countries are investing in improved agricultural techniques, developing centres of science and technology, and attempting to move up the value-chain in terms of the quality and certification of such products as cocoa, coffee, tea, and cashew in a quest to capture part of the international market of these tradeable commodities. But the levels of investments vary significantly between countries, just as staffing. Although agriculture is the backbone of most economies on the continent, investment in agricultural research and development (R&D) is relatively very small, ranging from 0.25% in Niger to 1.31% of agricultural GDP in Kenya in 2008 (Figure 20). Except in Kenya, there has been generally a marginal increase in spending between 2000 and 2008.

Figure 20: Public agricultural R&D expenditures as percentage of agricultural GDP



Source: ASTI/IFPRI (n.d.).

In terms of actual spending, Uganda appears to be the leading country among the selected countries (Table 11), with an average expenditure of US$0.3 million between 2005 and 2008, compared to US$600,000 by Niger. As observed by Kosura (2013) agricultural R&D spending per researcher is generally low, between US$0.12 million and US$0.14 million and very low on per capita basis. Crop production being an important economic activity in the region, attracts nearly 50% of the R&D expenditure, especially in Ethiopia, Ghana, Uganda and Zambia (Figure 21). In general, there has been a slight increase in many countries between 2000/2001 and 2008 except in Nigeria, Niger, and

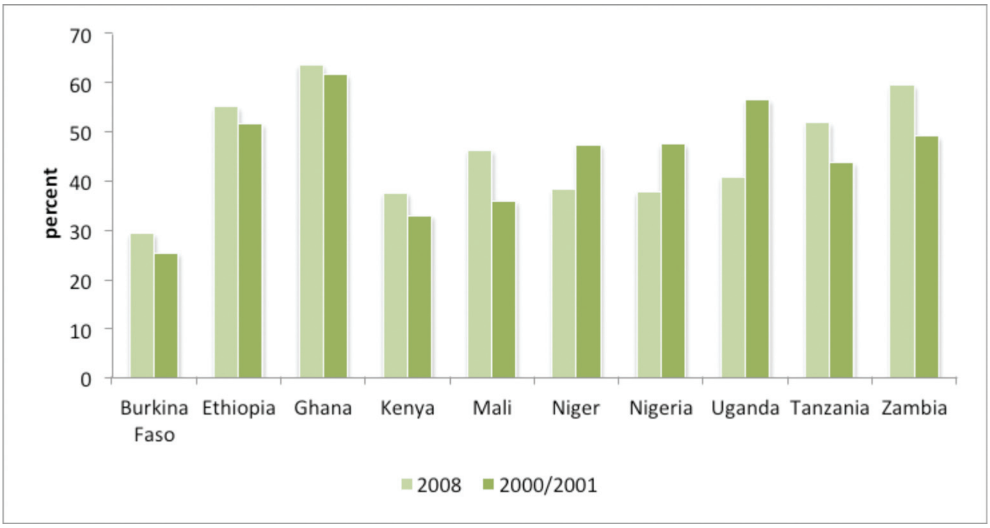
Uganda.

Table 11: Agricultural R&D spending per researcher (US$ million)

Country	2000	2005	2008
Uganda	0.16	0.30	0.29
Nigeria	0.15	0.16	0.20
Ghana	0.09	0.11	0.18
Kenya	0.17	0.14	0.17
Tanzania	0.08	0.04	0.11
Sierra Leone	-	0.09	0.09
Burkina Faso	0.11	0.09	0.08
Ethiopia	0.07	0.07	0.08
Mali	0.14	0.10	0.08
Niger	0.05	0.06	0.07
Mozambique	-	0.11	0.07
Zambia	0.09	0.05	0.04

Source: ASTI/IFPRI (n.d.).

Figure 21: Share of crop research in total agricultural research expenditure



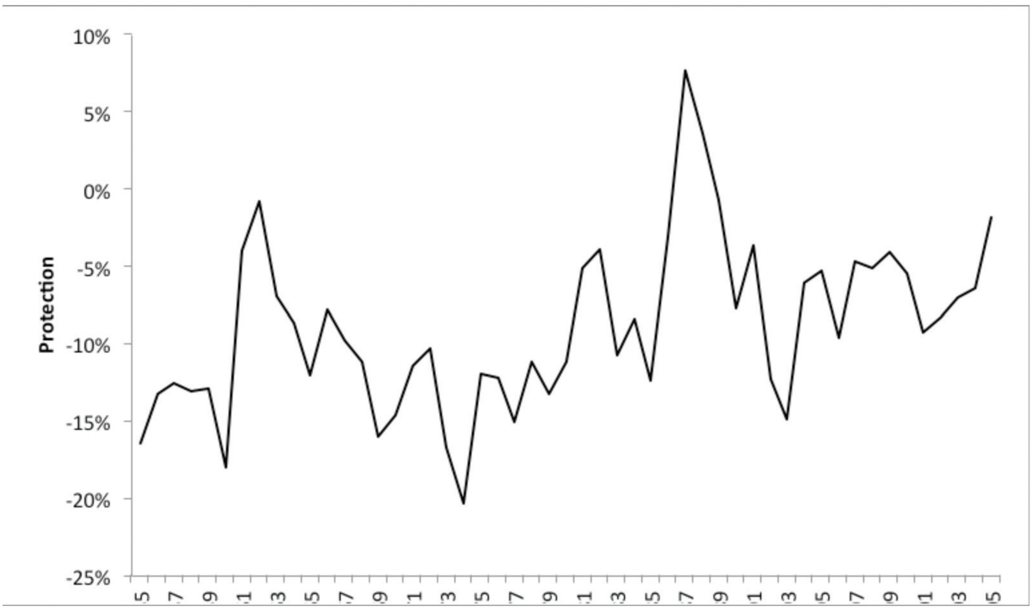
Source: ASTI/IFPRI (n.d.).

Institutional support services

The inability of African farmers to increase productivity over the decades reflects a mix of underlying challenges of binding capital constraints, deep poverty, lack of access to new technologies, and poor infrastructure. At the heart of this is the lack of provision of support to smallholder farmers. An aspect of support to farmers is protection, including measures such as import tariffs and quotas, state agencies buying in the market to raise prices, and payment of grants and subsidies on capital investments and inputs, output prices, exports and even direct payments to farmers. These have been known to distort trade and potentially lead to inefficiencies. For example, if a country protects its farmers with high tariffs on imported agricultural produce and generous subsidies on inputs, the tariffs push domestic prices above the levels they would otherwise be. Apart from distorting resource use domestically, by redirecting capital into agriculture at the expense of other sectors, agricultural production tends to be more competitive than their non-subsidized counterparts. Besides the trade distortion effects of protection, it is costly to taxpayers and consumers (Anderson et al., 2006).

To guard against such unfairness and promote international competition, the Uruguay Round of trade negotiations, in 1994, included an Agreement on Agriculture, which sought to reduce levels of protection-farming across the world. Nevertheless, many rich countries provide heavy protection for their farmers. There is a broad correspondence between a country's wealth and the degree to which domestic farming is protected. For most of the last fifty years, farmers in Africa have been subjected to a negative net rate of assistance in the form of direct and indirect taxes especially on export crops of more than 10% (Figure 22).

Figure 22: Net rate of assistance to agriculture in Africa, 1955-2005



Source: Anderson and Valenzuela (2008).

Given the recent political dispensation, one could consider input subsidization as an appropriate measure of protection for African farmers. In the past, subsidies were proven to be beneficial in increasing crop productivity and consequently farm household welfare. Impressive improvements in maize productivity were demonstrated in Kenya, Zimbabwe, and Zambia during the 1980s when subsidies were available to farmers (Eicher & Byerlee , 1997).

Furthermore, results from the Millennium Villages project, implemented in Malawi under the MDG, which provided farmers with fertilizers, improved seed, technical support and markets and following a national 'smart' subsidy programme, showed average maize yields increased from 0.8 tonnes to 2.0 tonnes per hectare in two years (Denning et al., 2009). The fertilizer and improved seed required to produce an additional tonne of maize grain under the project cost an average of US$135 (at April 2008 prices), six times less than through food aid. Purchasing that same tonne of maize locally in an African country or neighbouring countries costs approximately US$320, but importing a tonne of maize under food aid from USA would cost US$815 (Denning et al., 2009) Several other studies have shown the potential of input subsidies in accelerating crop production (Crawford et al., 2003; Doward et al., 2008, Doward and Chirwa, 2009) although their sustainability has been questioned.

It is important not to lose sight of the institutional arrangements that make or break a well-designed subsidy programme. It is generally believed that poor targeting, delays in input distribution, limited private sector participation in procurement and distribution, poor utilization of inputs by small-scale farmers, and inconsistency of policy implementation are undermining the effectiveness of subsidy programmes. Therefore, in the design of input support programmes, there is the need for ensuring effective systems and institutions to predictably and competitively procure and distribute subsidized inputs to a large population of scattered smallholder farmers and minimize rent-seeking behaviours of stakeholders. Involving a wide range of firms in tender processes, and using (electronic or other forms of) vouchers that can be redeemed at local retail stores, rather than direct procurement and distribution by government, would improve and strengthen the capacity of the private sector input delivery systems. Government, on its part, should concentrate on investing in distribution infrastructure and networks, as well as building the technical and commercial capacities of smallholder farmer organizations to become credible partners to banks, traders, processors, and input distributors.

4. Concluding remarks and policy recommendations

Agriculture is the mainstay of the economies of African states, yet productivity has been disappointingly low, perpetuating hunger and poverty especially among the rural and urban poor. The main reasons for the poor performance of agricultural sector include a combination of unconducive private sector policies, binding capital constraints compounded by limited political and global support to smallholder farmers to access improved seed, fertilizers, and markets. Key policy recommendations are discussed under the various sub-policy areas of land, seeds, fertilizer, research and development, and institutional support to farmers.

Policy reforms to improve security of land access: In recent times, there has been some progress in the development of land policy frameworks in Africa; but recent FAO (2010) report showed that many of them are weak in addressing ethnic and gender issues, land information systems, and monitoring mechanisms. This is possibly because land under customary systems is usually accessed through complex social relations governed by local institutions (Knight, 2010) and hence national land policies and laws often have little relevance on it. Therefore, any policy reform must be tailored to the physical, social, and economic contexts, as well as take into consideration economic factors, issues of equity, and less-tangible concerns such as the social or religious beliefs that people attach to land. The framework should also consider the capacity of the country to implement such policies.

Improving seeds sector policies: Key reforms that governments should pursue should include, updating seed legislature consistent with the development of the sector and private sector friendly so as to crowd in private investment, complete liberalization of the foundation seed production□allowing the private sector to play that role, and streamlining variety registration. The public sector should demonstrate willingness to domesticate harmonized regional seed laws, regulations and standards to promote regional seed trade. Given the widespread faking of seeds in the region, legislations should provide for stiffer punishment for those convicted of the offense to serve as deterrent to others. At present, most countries lack the legislative framework to deal with culprits. Where such frameworks exist, they seem outdated and penalties imposed do not seem to be punitive enough to deter others.

On bio-safety, countries need a functional legislative framework encompassing the relevant policies, laws, regulations and requisite administrative structures and processes to safely harness GM technology. It is acknowledged that, most African countries are at various stages of creating enabling environments for GM crop commercialization. Five countries (Cameroon, Kenya, Malawi, Nigeria, and Uganda) are currently conducting field trials of biotech crops, the final step before full approval for commercialization.
Policies to promote fertilizer sector development: To encourage farmers to use fertilizers, research on crop's response to fertilizer and eventually profitability is essential. In the past, research on crop response has too often led to blanket recommendations for fertilizer management that may be sub-optimal for specific situations, and in many countries very dated and need re-establishing. These should focus on ecology/crop-specific rates rather than on blanket rates. Strategies that enhance fertilizer use such as micro-dosing, organic/inorganic fertilizer combinations, etc., should be emphasized. While appreciating the economic burden on governments and development partners, it is important to provide smart subsidies to farmers to promote fertilizer demand (Jayne and Jones, 1997; Kelly et al., 2003).

Policy interventions to increase fertilizer supply should address (1) sourcing costs, (2) distribution costs, (3) the availability and cost of business finance and risk management instruments, and (4) the adequacy of supply chain coordination mechanisms. Improving access to foreign exchange and credit, strengthening port infrastructure and pooling import orders could help reduce cost of sourcing. Expanding capacity in the main ports of entry to allow larger vessels to discharge helps reduce the landed cost of fertilizer.

Government regulation is required to ensure competitive supply chains, which at present are generally weak. Efforts should be made to prevent importers and wholesalers from collusive practices, including price fixing and market segmentation. Multi-country trading blocs could take advantage of common ports, rail networks, and road systems to consolidate import orders. This strategy might require some harmonization of fertilizer formulas and regulatory frameworks.

Trade-related interventions: Improving intra-regional trade in staple foods requires, among other things, approach and the need to align and harmonize policy across the countries of the region and greater effort at raising awareness of the true economic costs of intra-regional trade barriers. Policies, such as ad hoc interventions in grain markets, unpredictable export bans, waiver of import duties, and minimum price setting, significantly destabilize agricultural development in Africa, and should be stopped. In most cases, these interventions are driven by government food security objectives, especially when there is threat of a domestic grain supply deficit. To improve value addition, governments need to pay attention to investment in infrastructure (roads, electricity, communications, water, etc.) and support the establishment of rural processing zones in rural towns.

Agricultural financing: In order to enhance the effectiveness of value-chain financing, the following policy interventions, as noted by Swinnen and Maertens (2010), should be prioritized in addition to promoting a stable macroeconomic environment: Firstly, there is need to implement legal frameworks that enforce contracts in order to limit or completely eliminate side-selling, hence boost the confidence of agribusinesses. Secondly, government regulatory framework should be improved to support inclusive innovations in value-chain financing, especially for food crops grown by poorer farmers. Thirdly, steps must be taken to ensure greater competition to expand options for farmers, reduce opportunities for excessive rent-seeking by companies and to create greater equity in sharing of benefits within the value-chains. Thirdly, alternative approaches for accessing credit should be promoted in order not to lock farmers into monopsony arrangements that offer them limited flexibility in terms of financing.

Research and development: In order to increase and sustain agricultural productivity, it would be important to increase the levels of per capita spending. Budget allocation to R&D should be at least 1% of agricultural GDP to be able to make any meaningful impact on technological transformation within the agricultural sector.
Support to smallholder farmers: Re-prioritizing government expenditure in favour of agriculture can be the starting point of support to farmers. Under the Malawi input subsidy programme, the budgetary allocation, representing less than 7% of the 2005–2006 national budget (US$5/person/year), supplemented in 2006–2007 by donor support (less than US$1/person/year), is a remarkably small price to pay for achieving national food self-sufficiency and widespread household food security. By comparison, the cost of importing food in 2004–2005 was US$110 million (about US$8 per person). Donor aid to Malawi in 2005 was US$578 million or about US$44 per person (World Bank, 2008a).
A paradigm shift in development aid to Africa can be a panacea for support to African

farmers. Supporting inputs rather than output subsidies, such as food aid, makes economic sense although political will to take action would provide the foundation for change (Denning et al., 2009). This is well articulated by who suggested that development partners' policies should "shift from prioritizing food aid to providing poor farmers with access to training, markets and to farm inputs such as fertilizer and improved seed", arguing that such strategies are cheaper, allow farmers to grow food to feed themselves, sell the surplus and diversify into high-value crops, livestock and tree products. Additionally, they create sustainable exit from the poverty trap, thereby decreasing the requirement for aid.

In conclusion, it is important to mention, very broadly, that priority policy support in the agri-food value-chain should focus on implementing and enforcing predictable private sector friendly laws and regulations consistent with the day. Elimination of national and regional barriers to trade while ensuring the dissemination and transfer of information, including market signals to stimulate exchange and to improve quality and value, are vital. Governments and development partners should prioritize investments in the development and transfer of technologies, promoting private sector participation, reducing investment risks and promoting public-private partnerships. Opening up market opportunities for inputs and outputs, through the enforcement of regional harmonization, would increase the spill-over impacts of technologies. Additionally, priority areas to promote agricultural transformation in Africa should include developing financial policies that are coherent and private sector friendly, implementing and enforcing compliance to grades and standards, and comprehensive quality assurance and finally creating a healthy competitive environment in the domestic and regional business sector.

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Two

Institutional Innovations for Agricultural Transformation in Africa

by Suresh Chandra Babu

Introduction

The sustainable transformation of Africa relies on the transformation of the agricultural sector for a number of reasons. First, the agricultural sector contributes to more than one-third of gross domestic product (GDP) in nearly two-thirds of the countries in the region (Diao et al., 2010). Second, a majority of the population in Sub-Saharan Africa lives in rural areas where the challenges of poverty and hunger are most prevalent (FARA, 2006). Therefore, agricultural transformation is critical in order for African countries to meet development targets such as reduced poverty and increased food security, particularly for smallholders. Further, given the direct or indirect dependence of most rural households on agricultural production, agricultural growth plays a key role in overall economic development (Pauw and Thurlow, 2010; Diao et al., 2010).

Increased agricultural production and productivity are key to agricultural transformation (Timmer, 2014). Increasing the efficiency of agricultural production and related value chains can create employment, increase returns on the assets that the poor possess (e.g. labour and land), and reduce food prices (Hazell et al., 2007). Smallholders form a majority of the agricultural producers in Africa. In addition to technological advancements and policy support, institutional innovations play a central role in the transformation of agriculture in Africa (Ragasa et al., 2014). Institutional innovations help to transform institutions so that they can more effectively contribute to agricultural transformation. Institutional improvements are sorely needed to transform African institutions to become more innovative and integrated. Innovations can help to align institutions with development priorities at the regional, national, and sub-national level. In addition, improvements in the capacities of institutions can enable them to facilitate the post-2015 development agenda (UNDP, 2015).

Innovation is defined by the Organization for Economic Co-operation and Development (OECD, 2006) as the application of "new ideas, knowledge, or practices that are new to a particular context with the purpose of creating a positive change that will provide a way to meet needs, take on challenges, or seize opportunities." Although several definitions of innovations exist, innovations can be broadly defined as new ways of doing things. Innovations are often needed to meet new demands, address new challenges, or to improve conditions or alleviate the suffering of a specific group of individuals (IICA, 2014). Innovations can come in the form of major breakthroughs or gradual change in various aspects of a process cumulatively, both of which can produce similar results or outcomes (World Bank, 2012). New approaches can be applied in any of the following spheres: technology, organization, institutions, and policy. At the institutional level, innovations can include a change in the policies, processes, regulations, system of organizing, or practices of an institution in an effort to encourage improvement and increase its impact (IICA, 2014).

Advancing the transformation of the African agricultural sector requires that each sub-sector be comprised of highly capacitated and well-functioning institutions from the national level to the farm level. Institutional innovations at all levels can help institutions become more responsive to programme and policy needs in the short and the long run, and speed up the process of overall agricultural transformation. Understanding the challenges and opportunities of institutional innovations, drawing out lessons learned, and identifying knowledge gaps and research priorities can further facilitate African agricultural transformation.

This paper takes stock of institutional innovations attempted in the African agricultural sector. Through this examination, we draw out lessons learned and identify knowledge gaps and research priorities. The paper reviews a select number of institutional innovation efforts that have been implemented within the process of agricultural transformation in Africa in the last thirty years. We place this review in the context of higher levels of growth in several African economies in the last decade as well as the continent-wide agenda-setting through institutional mechanisms such as the New Partnership for Africa's Development (NEPAD), Comprehensive Africa Agriculture Development Programme (CAADP), and the African Union (AU).

This review is timely as the structure of African food systems continues to change rapidly. The recent global food crisis brought the reality of interconnected regional and global food markets to the forefront of development and policy discussions (Pinstrup-Andersen, 2015). This interconnectedness provides both challenges and opportunities for African countries. Achieving African economic transformation requires the diversification of production and exports, increasing the competitiveness of locally-produced goods and services, the uptake of technology use in all sectors, and increasing the productivity of labour (ACET, 2014).

To enable agricultural transformation, African leaders recently redesigned the goals and objectives of CAADP, a key strategy agreed upon by all countries in the region. The Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods highlights the critical role of institutions in facilitating and supporting successful implementation programmes such as agricultural transformation, as well as specific targets such as those set forth by CAADP (AU, 2014).

In order to further inform the process of Africa's agricultural transformation and its contribution to agricultural development in Africa, this paper seeks to answer the following questions:

- What institutional innovations are needed to support agricultural transformation?
- What conceptual and analytical frameworks can help in understanding the institutional reforms needed in public, private, and non-governmental organization (NGO) sectors in order to embrace new approaches to the design and implementation of programme and policy interventions?
- What challenges do smallholders in Africa face and what capacities do they and other actors and players require in the institutional innovation process?
- What lessons do the on-going institutional innovations provide for scaling up implementation?
- And finally, what are the knowledge gaps and research priorities that must be addressed to enhance the role of institutional innovation in the process of agricultural transformation?
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The rest of the paper is organized as follows. The next section reviews the global institutional innovation literature in the context of agricultural transformation in order to develop a conceptual framework that guides the contents of the rest of the paper. Section three identifies specific challenges that inhibit the development of smallholders, and which thereby slow the process of Africa's agricultural transformation. Section four reviews selected on-going institutional innovations and addresses the questions of why, where, and what type of institutional innovations are needed for agricultural transformation. Section five of this paper identifies the challenges and constraints that hinder the implementation of institutional innovations to transform these innovations into action and impact. Concluding remarks, knowledge gaps, and research priorities make up the last section.

2. Literature Review and Conceptual Framework

In order to inform institutional innovations to support transformation, we must first understand the need for these innovations in the context of the agricultural sector. This section will review the unique environment of the agricultural sector, the conditions needed for institutional innovation, where innovations are needed, and the drivers of institutional innovation specific to Africa.

As a region, Africa has seen some success in organizing agricultural transformation. The efforts of African countries to transform their agricultural sectors have been organized through the two CAADP targets set by the Maputo Declaration in 2003: 10% budget allocation to agriculture and 6% growth in agriculture. The CAADP targets help African countries to think strategically about the role of agricultural development in economic growth (CAADP, 2008). However, ten years after the initial implementation of CAADP, several countries have faced significant challenges in mainstreaming and operationalizing programme implementation. In many countries, the allocation of government funds to agricultural programmes has not been sufficient. Even in cases when sufficient funds have been allocated towards agricultural programmes, these funds have not been fully and effectively used due to several institutional challenges and constraints. Institutional innovations are needed to overcome these common constraints and meet the established targets.

The success of institutional innovations is determined by a number of conditions. In the short term, innovations should align with broader national strategies to work towards established sectoral goals. Institutional innovations can help and can benefit from well-functioning legal and regulatory frameworks as well as existing policies that support innovation (World Bank, 2012). Along the same line, it is important for the sector to have systems in place that encourage and reward innovation. In the long term, a large base of high quality human resources as well as functioning infrastructure is critical for institutional innovation (Rosegrant and Hazell, 2000).

The institutional innovations needed for agricultural transformation in Africa are distinct due in part to the unique nature of the sector itself. A majority of agricultural producers in Africa are resource poor, face a diverse set of challenges, and have specific needs that must be addressed in order to increase the efficiency of their agricultural enterprise. Innovations within the agricultural sector must be both context- and location-specific due to the large variations in agro-ecology across the continent (Babu and Asenso-Okyere, 2010). Kenya alone has an extremely diverse agro-ecology, whereas in Asia large areas are cultivated under a single crop such as rice or wheat (Timmer and Dawe, 2007). The annual variation of natural resources and weather also create a unique climate for innovation, as well as market failures in the allocation of technical resources.

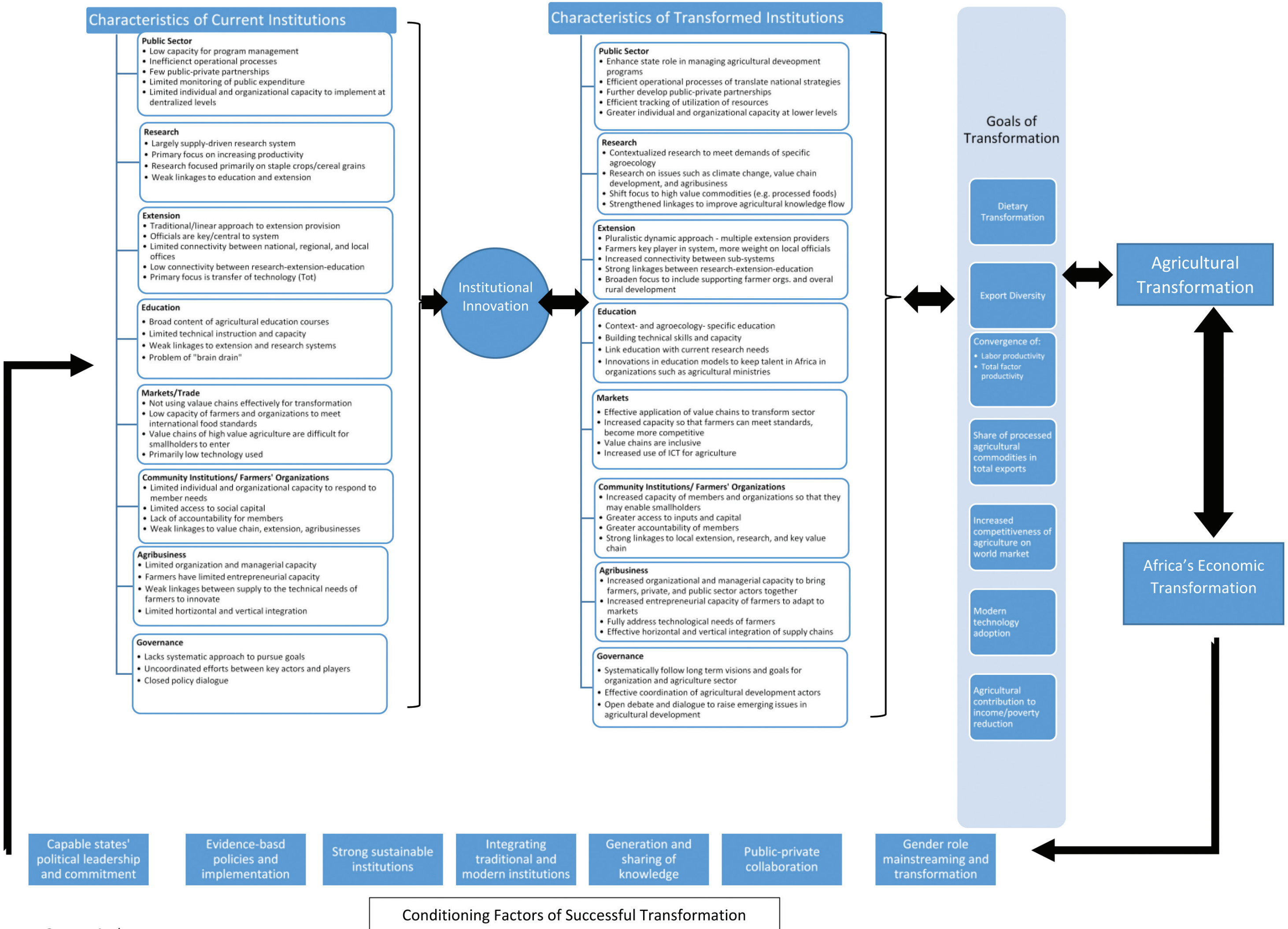
The role of the state in the agricultural sector is of significant importance as it sets the stage for institutional innovation. African states have made considerable progress towards democratic institutions in the last thirty years (ACET, 2014). Organized and stable governments provide an enabling environment for institutional innovations and help to ensure that the transformation agenda aligns with national and regional development goals (Fukuyama, 2004). At the national level, the push for openness in debate and dialogue increases the need for evidence on what institutional and policy changes work and why (Resnick et al., 2015). The rapidly changing institutional environment within the agricultural policy process of African governments not only makes institutional challenges unique but also calls for context-specific institutional solutions for managing such processes (Badiane et al., 2014). This is true from the national level down to the farm level.

Institutional innovations are needed at all levels in order to achieve agricultural transformation in Africa. At the farm level, there is need for further engagement with the knowledge and market systems to improve the productivity and incomes of farmers (Birner and Anderson, 2007). Engaging farmers is of particular importance for smallholders because they rely heavily on income derived from agriculture. As an individual farmer cannot invest in his or her own research and development, innovation at the farm and community levels is more challenging. The importance of innovation at the household level further emphasizes the unique nature of the agricultural sector (Birner et al., 2009). The emergence of farmer-based organizations (FBO) is an innovation in itself, but we do not yet fully understand the nature of these institutions (Ekboir, 2012). Farmers' groups need to be nurtured and developed further in order to achieve agricultural transformation in Africa. At the national and sub-national levels, institutional innovations are needed to facilitate the agricultural policy process and increase the effectiveness of programme implementation.

A number of drivers hasten the need for institutional innovation in African agriculture. Increased globalization and trade have expanded competition and demand that agricultural producers maximize their true comparative advantage (World Bank, 2013). Institutional innovations are increasingly needed to support the decentralization of many African governments, and further the distribution of responsibilities and resources down to the local level (Diao and Thurlow, 2010). Although decentralization has occurred in some countries in Africa, the capacity necessary to allocate and use resources effectively for strategic programme implementation is low, particularly at the lower levels of government (World Bank, 2012). However, capacity challenges affect the private sector as well, where progress is slow due to low human and institutional capacity (Ivanova and Roseboom, 2006; You and Johnson, 2008; World Bank, 2013a).

Understanding institutional innovation in the context of African agriculture requires a deeper analysis of the historical trends and enabling environment within the policy process (Babu and Asenso-Okyere, 2010; Resnick et al., 2015). An evaluation of the outcomes and successes of reformed agricultural organizations is also needed in order to identify the constraints and challenges inhibiting the implementations of institutional innovations. An assessment of the institutional processes that facilitate the translation of policies into programmes, and programmes to action, will inform the implementation of future institutional innovations. An assessment of the conditions necessary to improve the relevance, effectiveness, and operational sustainability of agricultural interventions will increase our understanding of the institutional innovations needed in agriculture (Babu, 2013). Finally, an analysis of the factors affecting institutional reforms and the refinements needed within agricultural organizations will help to streamline the process of institutional innovation (Yumkella et al., 2012; World Bank, 2013a). We bring together the constraints and opportunities discussed above to form the conceptual framework below.

The conceptual framework developed below illustrates the institutional innovation pathways that can facilitate agricultural transformation, which can further lead to Africa's transformation. At the bottom of Figure 1, the horizontal bar highlights the underlying conditional factors required for Africa's transformation (ACET, 2014). To begin with, the political leadership of a country must be committed to the goals and priorities of agricultural and overall transformation. It is critical that the national government has the capacity to design, implement, and monitor policies and programmes. It is of equal importance that government policy and programmes are aligned with national agricultural development goals. To this end, African governments should generate evidence and apply this in the policy making process to design and implement informed policies and programmes. Further, governments must ensure that implementation of programmes is monitored regularly to provide feedback to the policy process and improve the impact of future programmes. Key institutions at the national, regional, and community levels require innovation in order to support and facilitate the complex process of transformation. The transformation of institutions should include the integration of traditional and modern institutions. This could include merging modern thinking with traditional approaches. In addition, the role of public-private partnerships is crucial to the facilitation, implementation, and sustainability of agricultural transformation. Finally, gender roles and issues should be mainstreamed throughout all institutions and processes.



Source: Author.

In order to highlight the transformative power of institutional innovations, we compare the current characteristics of institutions (i.e. prior to innovation) with their characteristics following innovation. This paper reviews the challenges and opportunities associated with eight broad types of institutions that are critical to agricultural transformation. The types of institutions reviewed are: public sector, research, extension, education, markets, community, agribusiness, and governance institutions. The first column illustrates the institutional challenges of the current organizational architecture that must be addressed in order to guide the process of transformation. In order to facilitate transformation, institutional innovations in various organizations and at various levels are needed to lead us to improved development outcomes. While this process is ideal, we do not yet fully know what institutions need innovations and how these innovations help in the process of transformation. This paper attempts to identify specific types of institutional innovations essential for Africa's agricultural transformation.

Public sector institutions are central to agricultural transformation in Africa as they are responsible for the design, implementation, and monitoring of food and agriculture policies. It is critical that food and agricultural policies are informed by contextualized evidence as is generated by public research institutions. Currently, public expenditure on agricultural programmes is relatively low in most African countries (Badiane et al., 2014). In many cases, public funds allocated for agricultural programming are not effectively managed (World Bank, 2013a). Most public sector institutions suffer from low levels of capacity, especially the capacity needed to turn policies into action and impact on the ground (World Bank, 2012). In addition, most public sector institutions lack a regulatory framework or a system to monitor and evaluate their own programmes. An effective monitoring system is needed to ensure the effective implementation of policies and programmes (Babu and Blom, 2014).

A majority of research institutions in Africa are primarily focused on increasing the production of staple crops by improving the efficiency and productivity of traditional agricultural practices (Lynam et al., 2012). However, despite these efforts, the productivity of crops is relatively low (FARA, 2006; Diao et al., 2010). There is limited research focused on value chains, agribusiness development, and high-value agricultural commodities, although the agribusiness sector is growing rapidly (Juma, 2011). The narrow focus of agricultural research in Africa presents many challenges, and limits the impact of the agricultural sector on poverty reduction, improved nutrition, and increased food security.

A majority of agricultural extension systems in Africa use a linear approach to the delivery of rural advisory services (World Bank, 2012). In most countries in Sub-Saharan Africa, the government and parastatals are the dominant institutions delivering agricultural extension services, with public officials as key players. There is a low level of connectivity between extension and other sub-systems of the agricultural delivery services at the national, regional, and local levels in many countries (Davis et al., 2012). Further, the linkages between agricultural extension, research, and education institutions (all of which can inform and improve the quality of extension services) are weak and under-utilized (Lynam et al., 2014). The transfer of technology (ToT) to farmers is the main priority of extension programmes. This approach places very little emphasis on helping smallholders to become more entrepreneurial. However, the integration of training in business skills or the support of the creation of farmers' organizations would build this capacity in smallholders (Babu and Pinstrup-Andersen, 2009).

Agricultural education institutions in Africa have a vital role to play in building the capacity for agricultural transformation. In order for successful transformation to occur, agricultural education should build the capacities of individuals and organizations to transfer new technology and practices to smallholder farmers as well as the capacity to innovate (Mosher, 1966; Eicher, 1994). However, the course content of many agricultural education programmes in Africa is too broad and lacks technical or agro-ecological specificity (Eicher and Haggblade, 2013; Saints, 2006). This lack of technical instruction makes the education system unable to provide technically and professionally qualified graduates to produce research to drive agricultural transformation forward (Davis et al., 2007).

Market and trade institutions are crucial to the transformation of agricultural sectors in Africa. The ability of market institutions to connect smallholders to information and markets can increase their competitiveness (Jafee et al., 2003). However, there are a limited number of market-based institutions working specifically to increase market access to the vast number of resource poor producers (Quandzie, 2013). Furthermore, very few market and trade institutions focus their efforts specifically on the development of smallholders (Larsen et al., 2012). The majority of agricultural markets in Africa still rely on traditional storage and distribution centres, which continue to suffer from significant post-harvest losses. In addition, limited public and private investments into fundamental rural infrastructure (e.g. roads, bridges, communication infrastructure, and physical markets) also inhibit smallholders' access to prices and information on market conditions. The aforementioned challenges highlight the need for market institutions to innovate in order to increase the participation of smallholders (Mabaya et al., 2010). Community institutions and FBOs have the ability to help smallholders overcome challenges by giving them more bargaining power on the market (Babu and Asenso-Okyere, 2010). Community institutions can empower smallholders by linking them to extension services and agricultural inputs and strengthening individual capacity (Salifu et al., 2012). However, the existing FBOs in Africa lack the individual and organization capacities needed to effectively respond to member needs (GFRAS, 2015). In addition, community institutions lack adequate access to social and financial capital, and their organizational structure lacks the mechanisms needed to enhance accountability among their members (Juma, 2011). These challenges inhibit African community organizations from being able to fully serve the distinct needs of smallholders.

Smallholders have the potential to become more entrepreneurial and expand their enterprises into other nodes of the value chain if properly supported by agribusiness institutions (Babu and Pinstrup-Andersen, 2010; Ekboir, 2012). However, the linkages between agribusiness institutions and the value chains of agricultural commodities, especially those of higher value crops, are weak. Agribusiness institutions in Africa are focused on providing inputs for the production of staple crops, and few focus on high-value agriculture (GIMPA, 2013). In addition, the use of information and communication technology (ICT) in Africa by agribusinesses is low, although there is increased use of mobile phones in the rural financial sector. The low application of ICTs in assessing technical and market information impedes smallholder farmers' access to relevant and timely information (Aker et al., 2012). Agribusiness institutions have a central role to play in the promotion of communication technologies for agricultural production and marketing. The promotion of use of ICT will require that agribusiness institutions become more innovative in their structure and approaches.

Effective governance is central to the success of agricultural transformation in Africa (Resnick, 2015). One can apply the need for institutional innovations in governance to all of the aforementioned types of institutions. Within the institutions above, effective governance will increase the ability of the institution's programming to support agricultural transformation across Africa. A majority of agricultural institutions in Africa conduct little to no monitoring and evaluation to assess the effectiveness of their own programmes and policies. Innovations to implement and streamline the monitoring and evaluation process would help to increase impact across all types of institutions. Across all institutions, innovative mechanisms and policies are needed to increase transparency and accountability in order to strengthen the commitment of the leaders of institutions to the goals of transformation (Fukuyama, 2004).

As shown on the right side of Figure 1, successful agricultural transformation supports overall economic transformation. African transformation aims to reach a diverse set of goals beyond just increased agricultural production and productivity. Listed on the right, the goals of Africa's transformation include the following agricultural, economic, and social objectives, among others: dietary transformation, export diversity, increased labour and total factor productivity, an increased share of processed agricultural commodities as exports, increased competitiveness on global agricultural market, modern technology adoption, and a major contribution of agriculture to reducing poverty. Africa's transformation will enable the continent to improve human welfare and meet development targets such as the ones depicted by sustainable development goals (UN, 2014; FAO, 2014).

The institutional challenges identified above must be addressed to ensure the success and sustainability of Africa's agricultural transformation. Innovations in the structure, policies, and approaches have the power to transform these institutions so that they may facilitate and drive the transformation process. The literature review and conceptual framework in this section provide a foundation for identifying and analyzing the institutional innovations necessary to achieve African agricultural transformation. In order to put these issues more concretely in the context of the impact of institutional innovation on smallholder farmers, the next section highlights the specific challenges smallholders face and why institutional innovations have an important role to play in the process of transformation.

3. What are the Smallholder Challenges in Africa for Agricultural Transformation?{A}

Transformation of the traditional agricultural sector into a modern system of agriculture has been demonstrated to be an engine of growth and a catalyst for overall economic development (Mosher, 1966; Timmer, 2014; Adelman, 2001). Rosegrant and Hazell (2000) found that in the case of the agricultural revolution in Asia, the positive impact of agricultural growth on rural development was strongest in countries where smallholders made up the major share of agricultural production. With regard to the goals of increased food security and poverty reduction, small farms are preferable to large farms as they stimulate the rural economy by spending their income primarily on locally produced goods and services (Hazell et al., 2007).

It is important to note that smallholders are not a homogenous group, however; some have the potential to engage in more entrepreneurial and commercial activities to scale up their enterprises and increase production and income, while others could benefit from the development of off-farm opportunities to support their livelihood (Fan et al., 2013). A large body of literature exists, which examines the socio-economic challenges that smallholders face (Hazell et al., 2007). Past studies have also investigated the challenges that affect smallholder farmers' participation in agricultural transformation (Babu et al., 2007; Fan et al., 2013). Primary challenges specific to smallholders include food price volatility, limited access to production inputs and capital, limited knowledge, and climate change. The volatility of food prices has a greater effect on smallholders, and therefore makes them more vulnerable to negative impacts on welfare from these changes. With limited access to financial and physical capital, smallholders have fewer opportunities to increase the efficiency and output of their agricultural enterprises, putting them at a disadvantage to large farms. Similarly, smallholders are typically more remote and, therefore, have less access to information and services that could help to increase their productivity. Given the already limited resource base smallholder, they are particularly vulnerable to changes in climate, such as changing precipitation patterns, rising temperatures, and increased frequency of extreme weather events. Any or all of these can harm smallholder livelihood significantly due to crop failure (Morton, 2007). As outlined by Fan et al. (2013), the challenges faced by smallholders can be classified into both soft and hard constraints. Soft constraints include limited access to financial and/or human capital, or disparity in access to markets and information as compared to larger farmers. Hard constraints include limited land holdings, long distance from markets, and low environmental resources (e.g. low soil quality limited rainfall). Due to the diversity of farm and household characteristics within the smallholder sub-sector, it is important that policies are in place to support them. Policies must be put in place to promote the expansion of pro-smallholder value chains, increase smallholder-oriented financing, and increase investments that support efficient agricultural operations by smallholders (Fan et al., 2013). The unique situation of smallholders creates a pressing

need to innovate the numerous institutions that support their development.
There is a pressing need to apply institutional innovations in order to support agricultural transformation. Institutional innovations can help to merge modern thinking with traditional approaches and integrate both traditional and modern institutions to support the common goal of transformation. The successful implementation of policies and programmes that support agricultural transformation requires that the institutions involved be innovative in their organization and management of such programmes.
It is important that institutional innovations are contextualized to address the specific needs of the institution and its targeted beneficiaries in order for implementation to be sustainable. The challenges and opportunities associated with the implementation of institutional innovations will be discussed in a later section.
A wide range of institutions can support and guide the development and transformation of smallholders into more effective producers. The next section discusses specific institutional innovations needed in the eight types of institutions previously outlined, and suggests indicators that illustrate the impact of these innovations.

4. Institutional Innovations for Agricultural Transformation in Africa

It is becoming increasingly clear that technological and policy innovations, while necessary, are not sufficient on their own for effective transformation (IICA, 2014). Institutional innovations are essential in order to make effective use of other forms of innovations. The type of institutional innovations needed for a country depends on several factors, including the state of development of the country, the natural resource base, the development path the country embarks on for the next decade, and the level and nature of institutional and organizational capacities that prevail in the country. In this section, we review selected on-going institutional innovations and identify the areas where further innovations are needed for African agricultural transformation.

Public Sector Institutions

In many African countries, insufficient levels of capacity in the public sector inhibit effective agricultural policy design and implementation, and thereby constrain broader economic transformation. Improving the capacity of the public sector requires not only individual capacity, but also organizational and institutional reforms (Resnick, 2015). There are many examples of public sector institutions that have been designed to address the need for agricultural transformation through various schemes. We include below some recent examples from Africa.

The Agricultural Transformation Agency in Ethiopia was established in 2010 to promote agricultural growth and development through the transformation and modernization of the sector, and was modeled after several preceding institutions, including: the Economic Planning Unit of South Korea, Taiwan's Joint Commission on Rural Reconstruction, and Malaysia's Economic Planning Unit (Resnick, 2015). The mandate of the Agricultural Transformation Agency requires that institutions, at both the national and geographic or regional level, work to address systemic bottlenecks by setting policy priorities, identifying solutions, and supporting local organizations in designing and implementing

identified solutions (Minot and Sawyer, 2013).
The transformation of the agricultural sector has become a development imperative in Nigeria in recent years. The Agricultural Transformation Agenda (ATA) was put forth by the Nigeria Federal Ministry of Agriculture and Rural Development (FMARD), and strives to increase agricultural productivity and value addition in agriculture to combat high food prices and reduce Nigeria's current reliance on food imports (Babu et al., 2014). Recent research suggests that Nigeria will need to support the strengthening of capacity at the individual, organizational, and policy process (system) levels in order for the ATA to be successfully implemented (Babu et al., 2014; Resnick, 2015).
Innovations within public sector institutions take a variety of forms and have been used to overcome organizational and institutional challenges that prevent the effective planning and implementation of policies. In order to improve agricultural planning and policy processes in the Democratic Republic of Congo, the government launched an innovative reform, as detailed in Box 1 below.

Ragasa et al. (2014) highlight some of the key institutional reforms needed in the public sector. In the context of agricultural transformation, ministries of agriculture and other allied sectors such as food, rural development, and irrigation take centre stage in the design and implementation of national strategies, policies, and programmes for agricultural development. The actual responsibility for implementation of policies and programme, however, falls on the regional and district level counterparts of the national units within these ministries. Major institutional innovations in public sector organizations should include the transformation of the operational processes that translate national strategies into specific policies and programmes, and the subsequent implementation of these policies. Associated with this goal is the innovation in the process of the allocation of resources to meet the strategic objectives set for the sector. Institutional innovations are also needed to track effective utilization of resources and develop reallocation plans to increase the effectiveness of the resource use. Staff performance, accountability, and incentives to excel in respective positions need innovation. In the wake of increased decentralization of the implementation of agricultural policies and programmes in many African countries, the improvement of processes that track progress made, evaluation of identified challenges and constraints, and improvements in future programming can all be achieved through various institutional innovations. Innovations are also needed in terms of the coordinating role that public sector institutions play, by improving the farmer-public sector- private sector interface, and by holding the public sector accountable to the farmers. Designing regulatory systems for land, product, input, and export markets through institutional innovations are among the essential roles the public sector could play to drive agricultural transformation.

Institutional innovation in the public sector

Agricultural and Rural Management Councils in the Democratic Republic of Congo

The lack of achievement towards expected development outcomes in many African countries has been largely blamed on the lack of involvement of grassroots organizations in the food and agriculture policy process (Badibanga et al., 2013). In response, the government of the Democratic Republic of Congo (DRC) formed multi-stakeholder platforms to support the agricultural sector, known as agricultural and rural management councils (CARGs). The CARGs are demand-side structures, which aim to provide support to community institutions by strengthening linkages with the local government, information and communication, advocacy, and dialogue with public and private extension providers. Multi-stakeholder platforms, such as CARGs, are institutional arrangements to facilitate learning, policy dialogue, and priority setting. Similar organizations have been set up in Senegal, such as the National Council for Rural Cooperation. The creation of these platforms aimed to decentralize agricultural policy making and strategy design through the participation of a large number of key actors and stakeholders from the sector. CARGs operate at the tertiary level and give stakeholders such as producer organizations, private sector, and women's groups the opportunity to be involved in the design and implementation of agricultural policy processes. A key feature of CARGs includes discussions and feedback on agricultural development projects and programmes in that territory.

However, a recent study found that the CARGs have been mostly ineffective. In the CARGs that were considered effective, the capacity to generate and maintain support for the CARG and the multi-stakeholder process was a large part of their success. This cites the need for capacity to be built at all levels in order for institutional innovations to be successful.

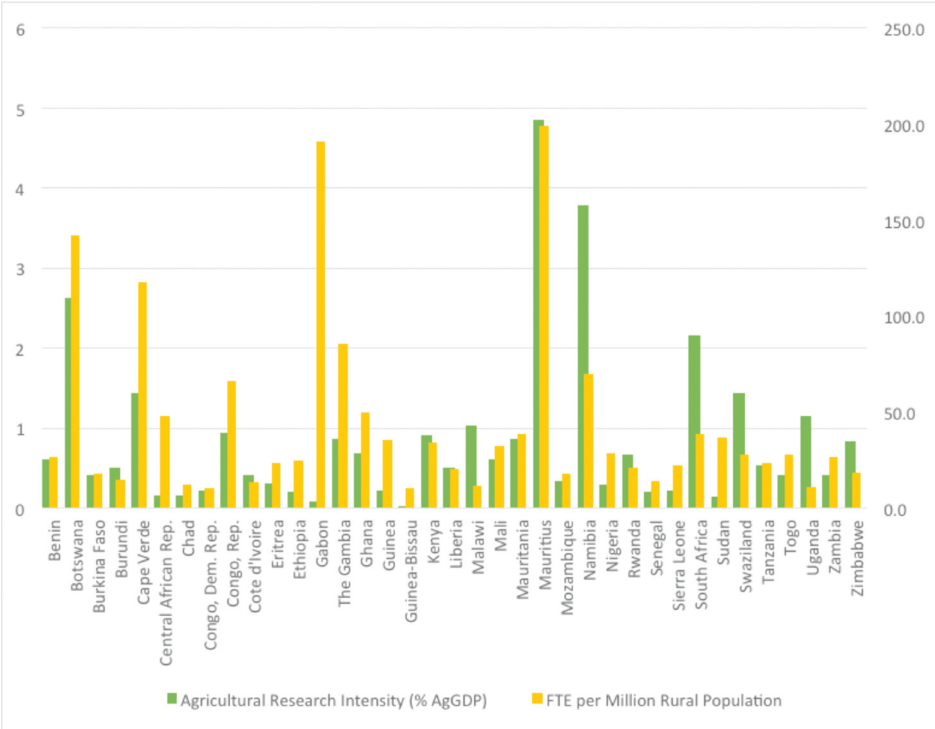
Source: Adapted from Badibanga et al. (2013)

Institutional Innovations in the Research System

Technological change in agriculture is critical to reducing poverty and catalyzing economic growth in Africa. Agricultural research systems in Africa are responsible for generating agricultural knowledge and technology that adds value to agricultural processes such as production, distribution and consumption (Spielman and Birner, 2008). The agricultural research systems in Africa support the transformation of the sector through the development and dissemination of advanced agricultural technologies and practices that increase productivity and efficiency. In order to enhance agricultural development, research institutions need to be strengthened at the individual and organizational levels. Although recent progress has been made in mobilizing African leadership under CAADP, achieving the specific CAADP targets will require a higher level of capacity for agricultural researchers to develop innovative ways to reduce poverty and increase food security (CAADP, 2008; Babu et al., 2014). The need for institutional capacity to translate national strategies into development outcomes has been emphasized by several regional and global initiatives (Juma, 2011). Unless the organizational capacity of research institutions is considered an integral part of the agricultural development process, the CAADP target of increasing agricultural productivity will not be met. Research system reforms have been used as a key strategy for increasing the productivity of research investments in several developing countries. In order to draw out what institutional innovations are needed in agricultural research, it is helpful to first examine the current status of agricultural research in Africa. Figure 2 and Table 1 below present basic indicators of agricultural research in Africa. Figure 2 below illustrates the relationship between the number of agricultural researchers and the intensity of agricultural research across 38 Sub-Saharan African countries in 2011. The yellow columns illustrate the number of full-time equivalent researchers in the country per million rural population. The green columns show total agricultural research and development spending as a share of AgGDP, or agricultural research intensity. In order to drive agricultural transformation, agricultural research must increase in intensity, and a greater share of agricultural spending should be allocated towards research. In addition, more highly trained agricultural researchers are needed in order for the sector to be transformed. We assume that as agricultural transformation progresses, the amount of government expenditure allocated towards agriculture will decrease.

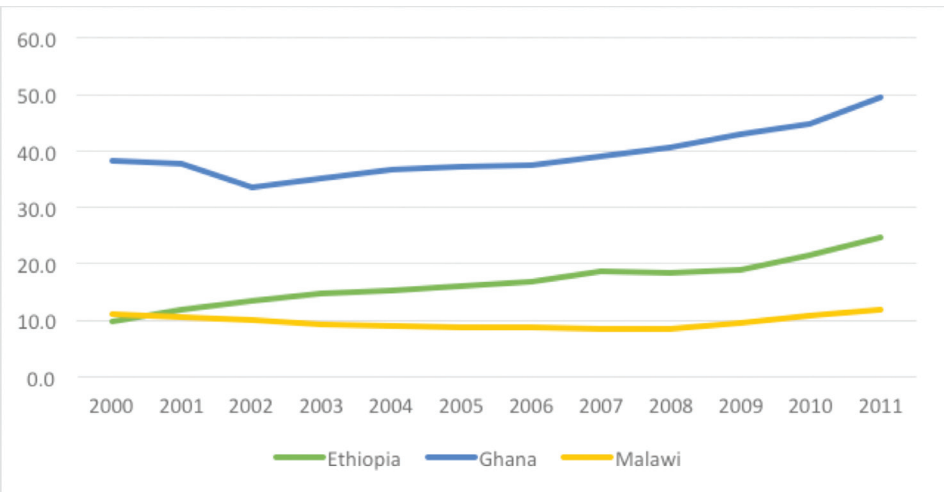
Figure 3 below illustrates the trend in the number of agricultural researchers in three Sub-Saharan African countries: Ethiopia, Ghana, and Malawi. Between 2000 and 2011, the number of researchers per million rural population increased. In Ethiopia and Ghana, the number of researchers increased every year. However, this growth was much slower in Malawi, and the number of researchers per rural million actually declined between 2003 and 2009.

Figure 2: African agricultural research indicators



Source: Authors' compilation based on ASTI data

Figure 3: Full-time equivalent (FTE) researchers per million rural people



Source: Authors' compilation from ASTI (2015); World Bank (2013b)

Table 1: Selected indicators of agricultural research in Africa, 2011

Country	**Research spending (% AgGDP)**	**FTE researchers**	**Rural population (millions)**	**FTE per million rural population**
Benin	0.61	155.7	5.9	26.5
Botswana	2.63	123.8	0.9	142.2
Burkina Faso	0.42	218.0	12.2	17.9
Burundi	0.50	132.3	9.0	14.7
Cape Verde	1.44	21.0	0.2	117.3
Central African Republic	0.16	134.0	2.8	48.0
Chad	0.15	123.3	10.0	12.4
Congo, Democratic Republic	0.21	417.6	39.5	10.6
Congo, Republic	0.94	104.0	1.6	65.9
Cote d'Ivoire	0.42	130.6	9.6	13.6
Eritrea	0.30	116.8	5.0	23.6
Ethiopia	0.20	1876.6	76.6	24.5
Gabon	0.08	42.6	0.2	191.0
The Gambia	0.86	65.9	0.8	85.6
Ghana	0.69	607.0	12.2	49.6
Guinea	0.21	265.0	7.5	35.4
Guinea-Bissau	0.02	9.0	0.9	10.1
Kenya	0.91	1147.2	33.4	34.4
Liberia	0.51	45.1	2.2	20.6
Malawi	1.03	162.3	13.8	11.8
Mali	0.61	307.0	9.4	32.6
Mauritania	0.86	61.8	1.6	38.4
Mauritius	4.86	150.7	0.8	199.5
Mozambique	0.34	313.6	17.7	17.8
Namibia	3.79	89.4	1.3	70.2
Nigeria	0.29	2687.6	93.6	28.7
Rwanda	0.67	180.4	8.6	20.9
Senegal	0.20	112.2	8.0	13.9
Sierra Leone	0.21	81.7	3.7	22.1
South Africa	2.16	746.3	19.2	38.8
Sudan	0.14	932.8	25.3	36.9
Swaziland	1.43	27.1	1.0	27.6

Country	Research spending (% AgGDP)	FTE researchers	Rural population (millions)	FTE per million rural population
Tanzania	0.54	814.8	34.4	23.7
Togo	0.42	114.7	4.2	27.6
Uganda	1.15	353.9	31.8	11.1
Zambia	0.42	233.1	8.7	26.7
Zimbabwe	0.84	176.7	9.5	18.5

Source: Authors compilation based on ASTI (2015)

Table 1 above gives a selected set of indicators related to agricultural research in Africa. As is illustrated, the majority of countries in Sub-Saharan Africa spend very little on public agricultural research, and all but 10 countries allocate less than one percent towards research. Table 2 below provides a comparison of the level of food policy research capacity across a number of countries around the globe. The headcount of food policy researchers highlights that, in comparison to Asian countries such as China, African countries fall far behind in food policy research capacity. South Africa, whose agricultural sector is the most transformed, has the greatest number of food policy researchers per rural million population of all African countries included below.

Table 2: Food policy research capacity indicators, 2013

Country	Analysts/ researchers (head count) in 2013	Full-time equivalent analysts/ researchers with PhD in 2013	International publications produced from 2009-2013	Full-time equivalent analysts/ researchers with PhD per million rural population in 2013	Publications by full-time equivalent researchers with PhD (over a five year period)
Afghanistan	43	2.975	3	0.131	1.008
Bangladesh	66	22.900	75	0.217	3.275
Benin	38	4.300	38	0.732	8.837
Burundi	39	5.125	3	0.570	0.585
China	2,000	1,332.530	1326	2.096	1.005
Colombia	85	6.450	54	0.553	8.372
Ethiopia	141	30.400	52	0.397	1.711
Ghana	153	23.300	79	1.903	3.391
Guatemala	45	11.900	7	1.559	0.588
Honduras	33	6.125	5	1.628	0.816

Country	Analysts/ researchers (head count) in 2013	Full-time equivalent analysts/ researchers with PhD in 2013	International publications produced from 2009-2013	Full-time equivalent analysts/ researchers with PhD per million rural population in 2013	Publications by full-time equivalent researchers with PhD (over a five year period)
Indonesia	146	42.375	44	0.355	1.038
Kenya	155	31.600	70	0.947	2.215
Laos	9	1.750	8	0.407	4.571
Liberia	34	3.075	0	1.402	0.000
Madagascar	187	11.525	11	0.760	0.954
Malawi	68	18.175	25	1.321	1.376
Mali	60	10.050	12	1.066	1.194
Mozambique	37	3.325	17	0.188	5.113
Nepal	27	3.650	16	0.160	4.384
Niger	29	8.825	6	0.605	0.680
Nigeria	349	77.400	41	0.827	0.530
Peru	54	7.150	22	1.068	3.077
Rwanda	64	5.500	7	0.639	1.273
Senegal	71	9.300	23	1.156	2.473
South Africa	198	50.325	305	2.623	6.061
Swaziland	32	2.850	2	2.900	0.702
Tanzania	91	20.750	30	0.604	1.446
Togo	81	6.825	9	1.641	1.319
Uganda	34	10.925	35	0.344	3.204
Vietnam	175	32.525	24	0.536	0.738
Zambia	29	5.300	18	0.608	3.396
Zimbabwe	42	8.875	22	0.931	2.479

Source: Babu and Dorosh (2015)

In order to achieve agricultural transformation in Africa, many of the national agricultural research systems need to move from a largely supply-driven research system characterized by poor capacity, unfocussed priorities, ineffective technology development, and poorly integrated agricultural innovation systems (You and Johnson, 2008). It is important to note that agricultural research operates within a wider innovation and knowledge system. Agricultural innovation and knowledge systems connect farmers and institutions to "promote learning and to generate, share, and use agriculture-related technology, knowledge, and information" (Rivera et al., 2001; Labarthe et al., 2013). This system includes farmers, extension agents, agricultural researchers, and educators, enabling them to harness knowledge and education from various sources to improve farming and livelihoods (Rivera et al., 2001; Labarthe et al., 2013).

Institutional innovations in the research system essentially relate to changes in the institutional arrangements of knowledge creators and managers. Historically, successful models of research system reforms include the United States Land Grant model, which India adopted in the 1960s and 1970s (Swaminathan, 2003). Innovations to improve the research system in African countries include innovations of individual elements as well as the system as a whole. Thus far, research system reforms have focused largely on research spending rather than systemic institutional issues related to how spending is effectively used (Lynam et al., 2012).

There are many challenges to reforming the agricultural research systems in Africa. The first and foremost concern is to ensure that research is relevant to the problems farmers are facing (Babu et al., 2007). The challenges of poverty and food security in Africa are complex and require multidisciplinary research. However, solutions developed often come from one discipline alone (Lynam et al., 2012). Similarly, in many countries, the research problems have been poorly defined, requiring innovations for a more systematic approach to priority setting (You and Johnson, 2008). Also, a majority of the agricultural research in Africa has been focused on a specific commodity, and there is a gap in research on farming systems. Finally, there is limited technological linkage and low level of coordination between national, state, and local research institutions. This inhibits the flow of knowledge from researchers to farmers. The lack of coordination between institutions undermines the impact of research on development goals such as poverty and hunger.

Multiple approaches can be applied to innovate the institutional architecture of agricultural research systems in Africa. First, individual and organizational capacities must be developed and oriented towards innovation in the entire research system. This must be coupled with a paradigm shift to reform research processes, including priority setting, planning research, implementation, monitoring and evaluation, and impact assessment. For example, currently, the priorities of agricultural research for the most part are driven by donors, who tend to address the research issues in a piecemeal fashion (Lynam et al, 2012). However, the varied interest of individual organizations must be adjusted and brought together so that the needs of farmers are reflected in research priorities and funding. Research institutions should also ensure that their own research priorities align with national agricultural development goals. Institutions should also ensure that their research is responsive to the changing demands of the sector. Ensuring the responsiveness of agricultural research will increase the impact of research on smallholders. In addition, cross-institutional collaboration among the entities of agricultural knowledge systems should be encouraged and incentivized (World Bank, 2012). This process will further require innovations in the budgeting process of both research and government entities (FARA, 2007).

Extension System Innovations

Many developing countries have recognized the role of agricultural extension in engaging agriculture as an engine of transformation (Davis and Heemskerk, 2012; Rivera and Sulaiman, 2009; Birner and Anderson, 2007). Agricultural transformation requires that smallholders shift from traditional production methods, thus increasing the need for a more diversified extension system (Birner et al., 2006; Hu et al., 2009; Umali and Schwartz, 1994). However, existing information on how to produce, process, and market commodities remains inaccessible to a large number of smallholder farmers in the developing world (Babu and Asenso-Okyere, 2010).

The reach and impact of innovations in agricultural extension systems has yet to be fully recognized in several African countries. Public sector extension has been unable to meet the needs of many farmers due to the scale and complexity of the system as well as the dependence on the policy environment for funding. In many countries, the extension system is often undermined by weak linkages between extension and research. Extension agencies are understaffed and, in addition, the staff duties include many other administrative activities unrelated to knowledge transfer. As opposed to systems where government officials are key, farmers should be central to the innovation of the extension system, as interactions with them create opportunities for innovation in designing and disseminating knowledge outputs (Davis et al., 2007).

Innovations to strengthen the extension system should include demand-driven or participatory approaches to address the unique knowledge needs of farmers. Reforms and innovations are needed in both the provision and financing of extension services. Innovations are needed to increase the connectivity of agricultural knowledge sub-systems in order to increase the flow and availability of information to farmers. The decentralization of the extension system would increase accountability throughout the system and give more weight to the local offices to provide context-specific services to farmers. In order for this innovation to be successful, it is important to build the capacity of local extension agents.

The current primary function of the extension system is technology transfer, with a focus on increasing cereal crop production. However, institutional innovations are needed to broaden the functions of extension to include post-harvest storage and marketing, facilitation of and building the capacity of farmer-based organizations, and general rural development to support agricultural enterprises (Babu and Asenso-Okyere, 2010). Changes should include a shift in focus to high value agriculture, in addition to the current focus on staple crops. For example, the United States Cooperative Extension System expanded their services beyond agriculture to rural development, and incorporated information on family, nutrition, and health as well (Rivera et al., 2001). In terms of innovations in the delivery of extension services, the role of private sector and NGO actors should be strengthened. The traditional pipeline approach has been questioned for its effectiveness in delivery, creating a gap that could be filled by the private or third sectors (Neuchâtel Group, 1999). Innovations should be implemented that use the ability of pluralistic extension systems to provide more contextualized services to farmers, particularly those in remote areas (Zhou and Babu, 2015). Such institutional arrangements create an opportunity for both public sector reforms and private sector development. Pluralistic systems require effective coordination among the various institutions involved, which can present a challenge and an opportunity for governments to be involved in the management of the system and may require further innovation. Finally, innovations are needed to develop and implement alternative models for financing extension, including fee for service and cost sharing models.

Innovations in Agricultural Education

It is well known that transforming traditional agricultural sectors requires adequate human capacity (Davis et al., 2007; Timmer, 2011). Yet, systematic efforts to develop a framework for designing, implementing, monitoring and evaluating agricultural education programmes in Africa have been limited. Translating national agricultural strategies into development outcomes requires capacity at all levels (Juma, 2011). Agricultural education institutions are the prime source of this capacity, and they are currently in need of serious institutional innovation (Saints, 2006). Some universities have reinvented themselves in the wake of the recent influx of private institutions in the education business. However, the quality of public agricultural education is of concern. Without adequate capacity to effectively engage in several aspects of agricultural innovation, transforming agriculture in Africa will be a long, drawn out process. The Asian experience in strengthening agricultural capacity during the Green Revolution process could be illustrative of the needed innovation in the African agricultural education system (Otsuka and Kijima, 2009; CAADP, 2004; Swaminathan, 2003) with qualifying differences in the challenges faced by African institutions (Timmer and Akkus, 2008; Eicher, 2006). Under the CAADP process, capacity for agricultural development has been given a higher level of thrust through the country investment plans (CAADP, 2008; FARA, 2006). Along with the country investment plans, there is need to strengthen capacity for implementation which, if pursued, could be developed through agricultural education curricula (FARA, 2006). The emphasis on implementation capacity comes from the recognition that unless capacity strengthening becomes an integral part of agricultural education and research process, the CAADP goal of increasing agricultural productivity by six percent per year cannot be fully realized (CAADP, 2008; AU, 2014). Development partners continue to face the dilemma of investing for current project implementation versus long term development of education institutions (Fukuyama, 2004). In this context, several local innovations to build agricultural research and education capacity have emerged in the last two decades, which could be considered successful institutional innovations at the regional level. Babu et al. (2011) review three such innovations for generating lessons for similar innovations.

The African Centre for Crop Improvement (ACCI) of the University of Kwazulu-Natal in South Africa works with national research institutions in eastern and southern Africa region to bring in young researchers to work with experienced plant breeders towards a

PhD degree. This is in response to a recognized demand for high-quality plant breeders. The students are supported through funding from the Alliance for Green Revolution in Africa (AGRA). The ACCI currently trains plant breeders from 10 countries in east and southern Africa, including South Africa, Mozambique, Malawi, Zambia, Tanzania, Uganda, Kenya, Ethiopia and Rwanda.

The ACCI predicts that a total of 440 breeders are currently needed for crop improvement research of 11 crops in the east and southern Africa region. Yet, with the completion of the programme by the current cohort of participants, ACCI would have trained only 84 breeders. Although other PhD programmes in breeding, such as the one run by RUFORUM and the MS level programmes in Makerere (Uganda), Sokoine (Tanzania), and Eduardo Mondlane (Mozambique) will add to this number, the demand for breeders in the region far exceeds the current supply. The programme takes the sandwich approach, where students undergo rigorous theoretical training to improve both technical and practical skills in plant breeding techniques by spending the first two years of the programme at Kwazulu-Natal University for course work. This is followed by practical implementation of their thesis research in the participant's native country on a local crop. This ensures that the capacity developed through the programme is readily usable for problem solving in the student's native country. Between 2002 and 2018, total programme funding is US$ 18 million. The cost per year of educating a student is US$ 10,483. This compares well with some of the North American university programmes, which would cost about twice per year of graduate education. The University of Ghana has a similar programme in plant breeding supported by the Rockefeller Foundation through the Alliance for Green Revolution in Africa (AGRA).

The Collaborative Master's Programme in Agriculture and Applied Economics (CMAAE) was established in 2000 as a network of 16 faculties of agricultural economics and agribusiness in 16 universities in eastern, central, and southern Africa to strengthen the capacity for agricultural economics and policy analysis. Since 2010, CMAAE has been run by the African Economic Research Consortium (AERC), a network of African universities and research organizations conducting economic research and analysis. The programme brings together the specialized capacities of the regional universities to study a particular subject area. The programme produces high quality MSc agricultural and applied economics graduates, and through them enhances the teaching and research capacity of departments currently in the programme; initiates planning for a system to scale out the programme to other regions of Sub-Saharan Africa; and strengthens a continental research network to promote agricultural development. Driven by demand from regional stakeholders, this programme combines the local capacity of educators who share the training facilities for developing the analytical capacity of young and mid-career professionals. The following universities participate in the programme and have been accredited to confer degrees: Lilongwe University of Agricultural Sciences (Malawi), University of Zimbabwe, University of Pretoria, University of Nairobi, Makerere University in Uganda, Sokoine University in Tanzania, and Egerton University in Kenya.

The major achievement of the programme has been its ability to reduce the cost of higher education compared to similar programmes in North America and European universities. The programme has been successful due to its demand-driven nature, and high quality, relevant capacity built for local conditions. Further, continuous support from the donors and the cost effectiveness of the model contribute to the programme's success. The cost per year for the two-year programme is about US$ 12,000 compared to about US$ 40,000 for a similar degree in the North.

Strengthening the Capacity of Agricultural Research and Development in Africa (SCARDA) is a programme of Forum for Agricultural Research in Africa (FARA), initiated in 2008 to strengthen the capacity of African agricultural research institutions (FARA, 2007). The SCARDA approach specifically targets the development of the capacity for institutional innovations needed in the agricultural research systems in Africa. The approach is used as a supportive process to strengthen the whole organization to bring about institutional change in learning and change management process. Institutional innovation in the implementation of SCARDA comes from the opportunity created for mentoring individuals and organizations to identify gaps in national research priorities and identify corresponding capacity strengthening needs. Innovation platforms developed at the national, regional, and sub-regional levels help to provide regular feedback on the organizational and management changes developed through SCARDA.

Through the foregoing approach, SCARDA tries to achieve improved agricultural research systems and specific demand-driven competencies in the selected countries. Pre-orienting institutions conducting research towards greater beneficial impact on the poor is an added objective of SCARDA. In addition, national agricultural research institutes and universities with better knowledge are connected to the national agriculture innovation systems, so that the capacity strengthened through university education is linked to the production of innovation in the country. SCARDA aims to achieve improved capacities of national agricultural research institute (NARI) scientists, researchers, and extension agents who transfer the technology to the farmers. The institutional innovations included in SCARDA improve agricultural research management systems and managerial capacities of its participants, with the intention of strengthening the quality of research of participating national agricultural research systems. SCARDA also increases the relevance of the participant's university education programme and the programme's ability to meet current market demands for agricultural researchers.

Several lessons can be derived from the above three cases. First, locally designed institutional innovations such as ACCI reduce the brain drain from African countries, while simultaneously addressing current research challenges. This innovation reduces the time lag between capacity development and its application, and uses local resources and methods. Second, regional innovations such as the CMAAE programme mobilize local talent for building regional capacities while also strengthening the capacity of local faculties. As an approach focused on a single discipline, the CMAAE programme is able to populate the profession in a short period of time. Finally, the institutional innovations promoted by the SCARDA programme help to provide on-the-job training and mentoring for existing professional agriculturalists. The programme also helps to retain staff and further increase their capacity for research and development. In all these programmes, a major challenge is the dependency on external sources of funding. Institutional innovations are further needed to make such programmes self-sustaining in the long run. Box 2 summarizes the main institutional innovation characteristics of the three successful higher education programmes in agriculture discussed above.

Box 2: Institutional innovations in agricultural research and education

Three Examples of Educational Institutional Innovation
Institutional innovations in agricultural education programmes exhibit specific characteristics. They include selected processes, indicators, and programmes. The demand-driven nature of the programme should be backed up by an assessment of the capacity needs. A learning and capacity delivery mechanism that is flexible needs to include a wide range of learners. The programme design should not only build local capacity but also keep in mind where the capacity can be effectively applied in the future. Such capacity has a high chance of being used effectively by local organizations. The sustainability and funding of the programmes decides their long term success. Below we highlight three selected programmes that are highly innovative. **African Centre for Crop Improvement (ACCI):** The programme was developed as a result of the high demand for high quality plant breeding capacity. The needs assessment revealed the critical need for breeders who could do adaptive research in various African crops. It combines both the teaching and rigorous training by the University of Kwazulu-Natal, along with practical training through mentors in the local institutions. This design helps to address local problems and ensure that the capacity developed is highly relevant for the participants' country. ACCI participants apply their knowledge to solving problems they faced in their own countries. The participants come from the research institutions in various countries, who go back to their jobs to conduct thesis research. Thus, the capacity developed is used effectively by host institutions. Sharing of knowledge on problems and solutions is facilitated by bringing students to Kwazulu-Natal for common training in methods of plant breeding. The programme depends on donor funding to support participation of the international students. However, the trained capacity is able to impart similar skills in their own countries on a mainstreamed manner.

Three Examples of Educational Institutional Innovation

Collaborative Master's Programme in Agriculture and Applied Economics (CMAAE): The programme emerged from several levels of consultations with the regional partners and the need to take advantage of scarce but widely dispersed teaching capacity. The needs assessment revealed the strengths and weaknesses of various faculties and how to bring the existing capacities together in order to generate quality capacity. The programme effectively applied African capacity, although additional external support was sought to fill the gaps in teaching. The shared facility approach was efficient in increasing the quality of the programme jointly. While the theoretical training was common to all the graduates in the applied areas of the programme, the participants applied their skills to address the socio-economic problems of their countries. While the capacity developed is of high quality, due to high demand for the applied economics capacity, the graduates have found placements that contribute to the agricultural development process in their countries. The shared facility approach brought students from various participating countries for specific learning goals. This helped in mutual learning among the participants. CMAAE depends on external sources of funding although, recently, several self-sponsoring students and government-sponsored students have joined the programme.

Strengthening the Capacity of Agricultural Research and Development in Africa (SCARDA): The programme is a result of an expressed need from the stakeholders of FARA through various consultations. The needs assessment indicated the need for the application of subsidiarity principles and for strengthening the institutional capacity in addition to individual capacity. SCARDA's approach to capacity development focused on strengthening the whole organization, giving emphasis on filling the gaps in the skills of the individuals. This is in line with the CAADP process needs for capacity development. Capacity developed under SCARDA is meant to directly influence the organization and management of the research organizations. Such a contextualized approach helps to give individual attention to the participating organizations. SCARDA strengthened the existing capacity without any adverse effect or capacity loss in the participant's organization. SCARDA programmes provide adequate opportunities for mutual learning. However, uncertainty in funding and the dependency on external resources for programme implementation remain challenges for long term planning.

Source: Adapted from Babu et al. (2011)

Market Institutions

The active and sustainable participation of smallholder farmers in the development of agricultural marketing and trading activities in Africa will drive agricultural transformation. Many market and trade institutions, such as contract farming, have been put in place in an effort to integrate smallholders into the growth and development of particular value chains (Barrett et al., 2012). For example, contract farming provides a mechanism of vertical coordination between agricultural producers and consumers,

which thereby creates some assurance in terms of price, quality, and other factors. However, the success of market and trade institutions in Africa varies.
Market innovation in African has been largely driven by the creation and growth of commodity exchanges. Box 3 below summarizes the role and success of the Ethiopian Commodity Exchange (ECX).

Box 3: The Ethiopian Commodity Exchange

The Ethiopian Commodity Exchange as an example of Institutional Innovation

An innovative and successful example of market institution innovation is the Ethiopian Commodity Exchange (ECX), which opened in 2008 to the trading of both staple grains wheat and maize, as well as high value commodities such as coffee. Previous market reforms in Ethiopia did not have the intended impact on agricultural growth and poverty reduction. As in many African countries, constraints such as high transaction costs limited smallholder access and the potential of the market to increase production and rural incomes. In Gabre-Mahdin and Groggin (2008), the following push and pull factors were identified that justified the critical need for a commodity exchange in Ethiopia.

Push factors:

1. Country's emphasis on the commercialization of smallholders
2. Large domestic grain market
3. Established large central market in Addis Ababa
4. Existence of grain brokers in this market with established regulations
5. Growing number of market-oriented cooperatives
6. Established national warehouse receipt system
7. Political will for change

Pull factors:

1. Potential for competitiveness of regional and international grain markets
2. Increased procurement of local food aid
3. Increased local demand for grains through safety net transfers
4. Growing demand for high quality products from domestic processing firms
5. Increased demand from growing livestock sector

In response to the above challenges and factors, the ECX was formed to generate market information; create integrity, order, and trust; increase the transparency of prices, grades, and qualities; and promote self-regulation of the system (Gabre-Mahdin and Groggin, 2008). The ECT coordinates training between multiple buyers and sellers, thereby increasing the efficiency of commodity trading. The success of the ECX has allowed more smallholders to participate effectively in markets, and has increased agribusiness development. It is planned that a similar commodity exchange will be implemented in Ghana, beginning with the trading of maize and soybeans in 2015.

Source: Based on Gabre-Mahdin and Groggin (2008)

Value chains are an important mechanism and pathway to drive agricultural transformation. The development of value chains increases the participation of African farmers in markets and external trade. The Agricultural Transformation Agenda of Nigeria is a good example of a large-scale effort to support national value chains (Babu et al., 2014). Yet, effective use of value chains as a tool for agricultural transformation has not been reached, therefore several institutional innovations are needed. Very little is known on the risks associated with value chains and the management of this risk in terms of commercial risks, financial risks, climate risks, and food safety risks. Value chains also require increasing the capacity and standards of producers to increase their competitiveness. Yet, much of the setting of standards is voluntary at this stage. Enforcing standards requires strengthening the individual capacity of farmers as well as the capacity of farmers' organizations. Steps in the value chain development, such as product aggregation and input delivery to farmers, require some type of contract to hold the seller and the buyer accountable. Innovations are needed to keep the value chains inclusive to achieve the goals of poverty reduction (Barrett et al., 2012). Efforts have been made to bring farmers together for productive activities and yet it is not clear how to organize farmers with different resource bases. Further, little is known about effective ways of scaling up the innovations in value chains. In addition, there is need for further study on modalities for financing agricultural transformation needs that are driven by value chains. Finally, connecting value chains to the components of larger food systems requires institutional innovations.

Land tenure systems impact on agricultural investment and productivity in African countries. Changes in land use associated with factors such as growth in demand for food, climate change, and urbanization have increased the demand for policies that guide land management (Deininger, Selod, and Burns, 2012). Persisting food insecurity in many parts of Africa prompted heads of state in the African Union to agree on a framework for land policy institutions in 2009. The security of land tenure is thought to have an impact on the level of farmer innovation, and thereby an impact on the speed of agricultural transformation. Innovative reforms have been put in place in a number of African countries. While some reforms have come to recognize customary land rights, others have implemented demand-driven land titling. Despite the success of some land reform efforts, emerging challenges inhibit the impact and efficiency of land governance in Africa. Therefore, institutional innovations within land institutions are needed to address the lack of capacity at the local level (Hagos, 2012). Innovations for land institutions should include those that increase the transparency of property rights and the tenure process. Innovations that enhance the role of the private sector and enhance the infrastructure and technology needed to increase the efficiency of the process are needed to promote agricultural transformation.

Market institutions such as insurance mechanisms can protect farmers from risk. Protecting farmers from yield risk increases their ability to be resilient in the face of weather and climate shocks. Recent innovations such as the weather index insurance mechanism can be efficient risk management tools for African farmers, particularly smallholders (Ceballos and Robles, 2014). Some examples of index insurance have been successfully implemented, such as the Horn of African Risk Transfer for Adaptation programme in Ethiopia and Senegal. Further innovations in this area are needed to reduce the complexity of the system and make it more responsible to farmers' varying risk profiles (Ceballos and Robles, 2014).

Community Institutions and Farmers' Organizations

Community institutions such as producer organizations and famer organizations play a critical part in agricultural transformation by empowering smallholders through increased access to production information, extension and other services, inputs, and markets (IICA, 2014). Local farmer organizations can provide crucial assistance in shaping more effective research and extension by highlighting local, context-specific challenges and helping to identify solutions (Ekboir, 2012). Asian and Latin American countries have seen some success in the past thirty years in organizing farmer organizations for collective purposes. One such example is the development of Farmer Managed Irrigation Systems (FMIS) in Nepal. Ostrom (1994) found that water resources are used more effectively when managed by a community-level institution and, often, farmers more efficiently manage the system than government officials. Previous to the initiation of FMIS, irrigation systems in Nepal had been managed by a central agency. Ostrom (1994) identified the success of FMIS citing improved conditions of the physical irrigation system, greater technical efficiency under FMIS, and most importantly, increased agricultural productivity. The central role of community institutions in affecting positive change implies that for agricultural policy to have an impact, the efforts of government officials should complement and support the collective efforts of individuals to organize and mobilize resources. It is important that policies provide an arrangement that includes positive incentives for farmers to operate and maintain collective action.

Institutional innovations should be implemented at the community level to better enable the capacity of farmers' organizations to support smallholders. Innovations should include those that increase the organizational and management capacity of community institutions. Also, those innovations that strengthen the linkages from community institutions to local research, extension, and markets would help to increase the benefits received by their members. If, for example, the community institution is resource-oriented and focused on the production of a specific commodity, institutional innovations that link the farmer organization to key value chain actors and agribusinesses would increase smallholders' competitiveness as well (Barrett et al., 2012). Box 4 below presents the role of farmer-oriented CSOs in agricultural policy processes from the Nigerian perspective, as reviewed in Babu et al. (2014). The summary is based on several consultations with officials from the Ministry of Agriculture with the CSO representatives in the process of developing ATA, and highlights the role and importance of community institutions to achieve transformation.

Box 4—Role of CSOs in Agricultural Policy Processes at Federal level in Nigeria

1. What would you consider as the role of CSOs in the agriculture sector in Nigeria?
    - CSOs have a major role to play in the agriculture sector in Nigeria because, by law, citizens have the right to participate in governance issues, especially the ones that affect them directly, such as the agriculture sector.
    - The sector provides opportunities for citizens to meet their right to food and livelihood, hence the need for engagement.
    - The CSOs have a strong role to play in the sector. These roles include, but are not limited to: (a) awareness raising, sensitization of smallholders and women participants in agricultural value chains; (b) mobilization and organization; (c) capacity building; (d) advocacy; and (e) monitoring and evaluation.
2. How do international CSOs assist local CSOs?
    - International CSOs help local CSOs by providing models of best practices, capacity support, technical and financial support, mentoring and coaching, and linkages.
3. How do the CSOs come together as a coalition? And with respect to CAADP?
    - CSOs recognize the need for building solidarities and alliances and the need to come together as coalitions to push for a common cause.
    - With respect to CAADP, CSOs were invited from the very beginning to take advantage of the opportunity created in the CAADP framework for participation of all stakeholders, especially the non-state actors, including CSOs.
    - FMARD recognizes the need to raise awareness and build the capacity of the non-state actors, especially the CSOs, on the concepts of CAADP for effective engagement and participation in the process as required. FMARD catalyzed the coming together of more than 35 CSOs under the platform of a CSO coalition on CAADP.
    - The coalition came into being in December 2010 following a stakeholder forum.
4. What were the initial sets of issues raised during the coalition formation?
    - There were not many issues with the formation of the coalition because at the time the need was inevitable. There were fears of whether there would be buy-in to the idea of coming together, issues of how the coalition would work, and funding. Nonetheless, the stakeholder forum created an opportunity for everyone to offer their views and come to an agreement.
5. What priorities did they set in the beginning?
    - Some of the key priorities set at the initial stage were mainly with regard to constant engagement in the CAADP process and strengthening the coalition structure. Ensuring that the group stayed focused on the issues was another priority.
6. How did these priorities change over time?
    - The priorities have not changed, but new issues have come up, such as

funding, as well as the change in government, which is interfering with the original approach to the process. This has to do with the seeming abandonment of the CAADP process by the government. Often, due to lack of funds, the coalition struggles to continue to strengthen the coalition in terms of mobilizing more voices and following up with processes and information provided.

7. How do CSOs obtain information from evidence and research for their plans, programmes, and projects?
    - Given that most CSOs work with stakeholders at the grassroots level, they have the opportunity to get first-hand experience on issues and impact of policies and programmes at the community level. They also conduct assessments, reviews, reflections, and other M& E activities that generate the basis for plans, programmes, and projects that would be beneficial to the stakeholders.
8. What lessons can we learn from strengthening NGOs to play a meaningful role in the policy process?
    - Strengthening NGOs for their roles in the policy process can never be overemphasized as the reward is enormous, given their reach, commitment, and the value they add to the policy process.
    - It would help in the effective planning, implementing, monitoring and evaluating of programmes, plans of government to make a greater impact on the lives of people especially the poor and the marginalized.

Source: Babu et al. (2014)

Agribusiness Institutions

Institutional innovation in the development of the agribusiness value chains can speed up the process of agricultural transformation in several ways (Badiane et al., 2014). First, the development of value chains for high value commodities takes advantage of the growing demand for these commodities. Increased demand is a result of increases in household incomes across Africa whose demand and preferences go beyond the staple food grains. Second, the increased external demand for processing and exporting specific tropical fruits and vegetables and cut flowers have shown considerable promise to a section of smallholder farmers who are able to take advantage of such opportunities. Third, the growing agribusiness sector in Africa is also an opportunity for foreign direct investment, which is needed to increase the competitiveness of African agricultural enterprises. Finally, institutional innovations in agribusinesses could bring about direct transformation benefits in terms of growth and poverty reduction among the farmers participating in such activities (World Bank, 2009; 2013a).

Institutional innovations are possible and are needed throughout the agribusiness value chains, including input supply, advisory services, output aggregation, processing, quality control, distribution, and marketing. Although isolated successes exist through Sub-Saharan Africa, progress in scaling up the benefits of agribusiness development has been thwarted by several factors (World Bank, 2013a; ACET, 2014). The conducive policy environment for attracting investments that is fundamental to the development of the agribusiness sector requires innovative institutional arrangements (World Bank, 2009). In addition, the organizational and managerial capacity to bring together the farmers, private sector and the public sector is low in several African countries (Babu et al., 2014). In addition, the production technology needed to move from subsistence farming systems towards high value agriculture is a challenge, especially with the technical advisory services having deteriorated over the last two decades. Farmers' ability to adapt to the internal and external market structures is limited, further reducing the competitiveness of smallholders on the global markets. (ACET, 2014; Groggin et al., 2003). Given the subsistence nature of farming in Africa, moving towards development of agribusinesses requires increasing the entrepreneurial ability of the farmers (Yumkella et al., 2011). In spite of the growing recognition of agribusiness as one of the key drivers of agricultural transformation in Africa, the linkage of farm level technological needs for promoting agribusiness to the agricultural innovation system is limited (Larsen et al., 2012). Institutional innovations are also necessary to improve horizontal and vertical coordination of the supply chains that are emerging in selected pockets of Africa (UNIDO, 2014).

The following three cases of agribusiness development or the lack thereof help to illustrate the needed institutional innovations in making African agribusinesses more competitive in the global markets. The development of the horticulture industry in Kenya with the support of the Dutch investments is one of the well documented success stories of agribusiness development in Africa (Leipold and Margante, 2012). Taking full advantage of the natural resources and climatic conditions that are favourable for the growth of horticultural crops, the relatively low cost of skilled labour, and the infrastructure needed for the export of fresh produce, the horticultural trade between the Netherlands and Kenya has grown in recent years. It is estimated that his sub-sector benefits about 60,000 people directly and another 2 million people through related supporting activities. Further, horticultural exports have become a major foreign exchange earner for the agricultural sector in Kenya. Yet, this agribusiness development has come under constant threat. Without institutional innovation, the horticultural value chain may face tough competition from neighbouring countries and may lose out the international markets it has developed over the years. Institutional innovations are also needed to circumvent several emerging challenges, including changing consumer preferences, increased and stringent food safety regulations imposed by international markets, and increasing wages of skilled labour. The ability of the local industry to respond to these challenges is limited, furthering the need for institutional innovation. Institutional innovations could help not only to link African farmers to international markets but also to prepare them to capture the local demand for high value commodities. As the demand for high value commodities has increased, many African countries have been unable to respond to emerging opportunities for import substitution. For example, urban food markets in Mozambique are flooded with imported poultry meat from Brazil, which in 2009 formed more than 80% of poultry consumption in Mozambique (Apex-Brasil, 2011). The cost of local production, coupled with the low quality of local poultry, reduce the competitiveness of poultry production

in Mozambique. Institutional innovations are needed to incorporate the smallholders who make up 70% of the chicken producers in Mozambique and mainstream this unorganized sector into formal value chains (Nicolau et al., 2011).
Several African countries face similar challenges in the development of their agribusiness sectors. Ghana's pineapple industry has been growing exponentially in the last 20 years (Banana Link, 2010). Foreign investors such as Dole and Del Monte have been active in the development of the pineapple industry in Ghana and making it a leading horticulture product. Yet, such investments and foreign technical assistance have not been effectively translated into the production and marketing of other fruits and vegetables, even in the local markets where demand has steadily increased. As a result, a majority of the vegetables consumed in Ghana are now imported. Ghana imported 398,000 tonnes of vegetables in 2011 (FAO, 2014). In addition, Ghana imports oranges, onions, tomatoes, garlic and cabbage from various countries, which has led to a major drain on the country's foreign exchange. Ghana's ability to become self-sufficient in fruits and vegetables will depend on institutional innovations in the horticultural sector, which can help balance the opportunity to export fruits and vegetable with growing domestic needs.

The above examples illustrate that in order for smallholders to compete effectively with the low cost producers of high value commodities, and to become international players in the agribusiness sector, serious efforts are need to build innovation capacity at all levels. There is a serious need to increase entrepreneurial and managerial skills in the region by improving agribusiness education opportunities in African universities (Mabaya et al., 2010). The content of traditional courses offered through agricultural universities focuses primarily on curriculum related to production (Maguire, 2000). Given the growth of agribusiness opportunities and Africa's proximity to Europe and the Middle East, there is need to strengthen local institutional and individual capacity for agribusiness development and management (Quandzie, 2013; GIMPA, 2013).

Governance

Institutional innovations in the form of governance provide a cross-cutting challenge as governance applies to any and all of the individual organizations analyzed above. Governance can also contribute to the improved performance of these institutions. Good governance is needed for the systematic pursuance of long term agricultural goals that African governments set for themselves. The leadership and commitment needed to achieve these goals also partially depends on increasing the quality of governance. Better governance in one sub-sector of agriculture leads to learning by other sub-sectors. Similarly, the overall outcome of the agricultural development process depends on the better governance of all the sub-sectors. Effective governance also involves innovations to improve coordination among the actors and players in the development process and the development of mechanisms that hold them accountable to their commitment to the sector's goals. The mutual accountability mechanisms and the joint sector reviews implemented by the CAADP process is a clear example of attempts to improve the governance process in agricultural development (Badiane et al., 2014). Improved governance also helps to promote openness in the policy and institutional systems for open debate and dialogue, which further helps in the design of future policies and programmes (Resnick et al., 2015; Babu, 2013). This can only be achieved through good governance across all involved institutions.

The speed and nature of agricultural transformation helps drive broader economic transformation. Table 2 below summarizes the possible institutional innovations necessary for African transformation in the eight types of institutions as discussed above. The second column highlights specific innovations needed in order for the institution to better support agricultural transformation. The third column identifies indicators that would show effective agricultural and institutional transformation. Although there has been progress in several spheres, further institutional innovations across many types of institutions are needed to push forward agricultural and overall transformation in Africa. In many cases, innovations in approaches and/or institutions are not translated into effective agricultural policies and programmes on the ground. It is important that these programmes are evidence-based and informed by effective monitoring, evaluation, and learning processes. The implementation of institutional innovations requires that the organizational and managerial capacities within the institution are strengthened. Innovations that help the institution to become more responsive to the changing needs of agriculture (e.g. competitive funding mechanisms in research) are important for successful implementation. The next section focuses on the challenges and opportunities of applying institutional innovations to the implementation and delivery of agricultural development policies and programmes.

Table 2: Institutional innovations needed for African agricultural transformation

System Components	Needed Institutional Innovation	Agricultural Transformation Indicators
• **Public Sector Institutions** • Ministry of Agriculture • Ministries of allied sectors • Multi-stakeholder platforms	• Transformation of operational processes • Innovations in process of allocation of resources • Innovations of staff evaluation and incentives to increase performance • Innovations in monitoring and evaluation of programmes • Innovations in regulatory systems for land, inputs, etc	• Streamlined, more effective and efficient processes • Effective allocation of resources for impact • Greater staff performance and accountability • Decentralized activities • Informed monitoring and evaluation for programme feedback • Effective regulatory systems

System Components	Needed Institutional Innovation	Agricultural Transformation Indicators
• **Research Institutions** • Public research systems • Private research systems • Research by NGOs / FBOs • Participatory research by farmers • (Lynam, Beintema, and Annor-Frempong, 2012)	• Innovations to match the national strategies • Innovations in management and delivery of research outputs • Innovations in funding mechanisms • Coordination and harmonizing the research efforts • Innovation in funding mechanisms	• Effective coordination of demand for and supply of research • Increased participation of farmers and other clients • Sustainable funding • Research effectively used by farmers • Effective coordination at the global, regional and national levels
• **Extension and Advisory Services** • Public extension system • Private extension • NGOs-based extension • Farmers field schools • ICT-based extension services (Davis and Heemskerk, 2012)	• Increased pluralistic activities • Improved public-private partnerships • Demand driven-farmer participatory programmes • Financial sustainability • Innovations in advisory approaches	• Decentralized activities • Farmer monitoring and accountability • Multiple actors competing • Knowledge accessibility through ICTs
• **Education** • Formal university education • Vocational and skill development program • On-line education of farmers • (Maguire, 2012)	• Working towards relevant, well managed institutions • Vocational training highly connected to the employers needs • Innovations in curriculum and methods of teaching • Increase the quality of teachers through innovation capacity development programmes	• Increased collaboration with public sector, research and extension • Dynamic curriculum to meet the changing needs • Sustainable funding • No political interference • Improved interaction with stakeholders • Gender sensitive and gender-balanced education

System Components	Needed Institutional Innovation	Agricultural Transformation Indicators
• **Markets and Trade Institutions** • Markets for inputs • Markets for outputs • Value chains	• Innovations to ensure that the value chains remain inclusive, particularly to smallholders • Strengthen individual farmer capacity to abide by value chain standards • Innovations for connecting value chain to larger food system • Innovations to organize farmers	• Increased participation in value chain, especially by smallholders • Improved connectivity within and beyond value chain • Effective farmers organizations for a specific value chain
• **Community and Farmers' Organizations:** • Commodity-based farmer organizations (traditional) • Market-oriented farmer organizations • Innovation-oriented farmer organizations • Service-oriented producer foundations • (Ekboir, 2012)	• Developing organizational capabilities for innovation • Increase innovative linkages with governments, donors, research, extension, and education • Brokering innovations, promoting coordination with members and the markets • Improved management of the farmer organizations	• Increased coordinating leadership • Capacity development- life-long learning of members • Better environment for organizational innovation • Improved financing of the farmer organizations • Improved structures to serve farmers/ members

System Components	Needed Institutional Innovation	Agricultural Transformation Indicators
• Agribusiness Institutions • Post-harvest/ processing agribusinesses • Marketing agribusinesses • Specialized agribusiness value chains • Input supply • Advisory services	• Help organize smallholders into formal value chains for high value crops • Build innovation capacity at all levels to scale up isolated efforts • Lack of agribusiness curriculum in agricultural universities	• Increased innovative, managerial, and entrepreneurial capacity at all levels • Increased individual and organizational capacity for agribusiness development and management
• Governance Institutions • *Applies to all individual organizations listed above	• Innovations to increase accountability and commitment of key players • Lack of transparency • Closed off policy dialogue • Innovations for evidence-based programming and decision making	• Systematic pursuance of long term vision and goals • High level commitment of leaders • Better inter-sectoral – macro coordination • Effective coordination and mobilization of key players and entities • Openness for debate and dialogue • Policy and programme continuity • Monitoring, evaluation, and learning

Source: Authors' compilation

5. Translating Institutional Innovations into Agricultural Transformation Outcomes

As seen from the above sections of this paper, there have been a number of attempts to generate and test several institutional innovations in various spheres of agricultural transformation. A major innovation at the African regional level has been the development, conceptualization, and initiation of the CAADP programme. Under the auspicious direction of NEPAD, and the leadership of the AU, the CAADP programme

has provided the needed regional agenda for the transformation of agriculture, with specific goals of increasing budgetary allocation of 10% to agriculture and reaching agricultural growth of 6%. For the past decade, the implementation of the CAADP agenda in African countries resulted in a series of innovations in the institutional architecture of African agricultural transformation (CAADP, 2008; AU, 2014).
Three major factors drive the institutional innovation in the CAADP process (Badiane et al., 2014). First, the leadership at the AU level and at the country level were willing to rally the national systems in African countries towards a common set of goals that were fully understood and agreed upon. Second, leaders at the national levels were able to use this as a strategy to mobilize resources through joint action of the government and development partners. This organized the efforts of many development donors who, previous to CAADP, were funding agriculture but in a rather uncoordinated manner. Finally, the goals set at the national level provided strategic direction for the implementation of policies and programmes in the agricultural sector. The recent Malabo Declaration continues this momentum for the next 10 years (AU, 2014). Yet, several challenges remain in the full implementation of CAADP and other institutional initiatives across multiple African countries.

Table 3 at the end of this section identifies a typology of the institutional innovations required for agricultural transformation in different timeframes and at different levels. Understanding the need for institutional innovation based on the changes needed at various levels provides a framework to study why certain innovations succeed while others fail. Institutional innovation requires innovative capacity in order to design and implement strategies. Agricultural transformation requires capacity for conceiving the agricultural strategy needed in the context of country's agro-ecological potentials, market opportunities, and natural resource constraints (Diao et al., 2010). Yet, such analytical capacity is weak in several African countries.

The successful institutional experiments, which are few and far between, are yet to be scaled up even in countries where they were first introduced. This is mainly because what works in one set of institutions does not work well in another set of institutions even in the same sector. This can be partially attributed to the differences in the composition of the actors, the level and nature of incentives to various actors, and their capacity to innovate. Public sector innovations that may work well in research enterprises may not succeed to the same level in the education to extension sectors (Ragasa et al., 2014). Further, institutional innovations that were borrowed from external sources and introduced through the technical assistance of the donor-funded project typically end following the conclusion of the project. The time span of most of the foreign technical assistance is about three years (Linn, 2012). An institutional innovation will be more sustainable in the long term if it is aligned with the specific needs and goals of the institution in which it is being implemented. Regular monitoring and evaluation are needed to ensure that the innovation is being implemented effectively. The evaluation of institutional innovations will also help to inform future innovations and increase the success of scaling up.

Institutional innovations that are successful in one country do not get adopted in other countries due to very limited cross-country knowledge sharing. In addition, due to differences in the nature of the policy environment, organizational cultures, and the capacity of the individuals to innovate, the opportunity to scale out successful innovations has been limited. Further, the scaling out of innovations depends on external assistance (Babu et al., 2011). Compounding this problem, in most cases external organizations attempt to apply the success they have in one country to another with very little understanding of the contexts and constraints of the new country where they attempting to scale out the innovation (Birner et al., 2006). Institutional innovation requires an appropriate level of funding at various levels for successful implementation. Since in most cases the innovations are funded through donor funded initiatives, the implementation on a larger scale becomes highly challenging.

In most cases, institutional innovations are not implemented well due to lack of good governance. While better governance is a broad developmental prerequisite, specific characteristics of governance could be quickly improved for making effective use of and providing opportunities for institutional innovations. For example, the institutional innovators must be recognized and helped to play legitimate roles in the process of agricultural transformation. Also, capable leadership is needed to provide strategic direction to the sector with a high level of commitment exhibited and promoted. The Agricultural Transformation Agenda in Nigeria was able to establish its goals and vision within a short period despite a high level of resistance from entrenched bureaucracy (Babu et al., 2014). Specific improvements are needed in terms of the coordination of innovations within various spheres of agricultural sector so that innovations can be brought together to ensure that they cohesively align with the broader policy goals of the sector. Improved governance is also needed in providing stability to the organizations and the institutional architecture so that they may pursue institutional innovations. At the same time, adequate autonomy is needed for the organizations to adapt according to evolving institutional innovations. The current tension between the institutional innovations in Ethiopia and in Nigeria are good examples of non-flexible bureaucracy becoming irrelevant due to their inability to adapt to new institutional innovations (Babu et al., 2014).

Linked to overall governance for institutional innovation are the political economy factors in a country (Birner and Resnick, 2010). Most often, even in democracies, as government leadership changes the policy goals and the approaches to implementation also change. This shift can have both positive and negative consequences depending on the context and the nature of the current policies that are implemented. Yet, there is a need for recognizing the political economy issues that often constrain the implementation of specific institutional reforms. The plan for modernization of agriculture in Uganda stands in stark contrast with the Agricultural Transformation Agency of Ethiopia. Both were aimed at pushing agricultural transformation with directives from the highest level of leadership in the country, with hopes of creating a legacy. However, political economy factors affected the two programmes differently in terms of their outcomes and opportunity to innovate. For example, the Plan for the

Modernization of Agriculture (PMA) in Uganda could not be sustained after donor funding had ended, partly due to its inability to innovate, adapt, and mainstream due to its presence within the government structures, whereas ATA of Ethiopia was able to innovate, expand, and adjust to the needs of the government, at least in the initial stages of its operation (Resnick, 2015).

Countries in Africa have come a long way from frequent internal and external conflict. Conflict, both internal and external, affects the stability of institutions and their ability to innovate and implement such innovations. Conflicts also contribute to the erosion of the capacity to innovate and to replace such capacity even after conflict. Conflicts in Uganda in the 1980s and the early 1990s resulted in complete destruction of existing institutional capacity within the agricultural research system. It took more than a decade to bring back the needed capacity and re-establish the National Agricultural Research Organization (NARO) as a respectable research institution (Eicher, 2006; Babu et al., 2007). Current conflicts in Nigeria, South Sudan, Chad and Mali are some of the examples of loss of internal stability to innovate and implement such innovations. Natural disasters and disease outbreaks (e.g. drought/flood in short term or long term climate change) often slow processes needed for innovations and their long term implementation. The recent debacle with the outbreak of Ebola in West Africa presents a clear case. This is partly due to the reallocation of resources needed to address the emergency situation. Yet, adequate capacity could be developed over time to address the recurring natural disasters and combine them with long term development goals. This requires stability in the institutional structures and the long term institutional memory of the actors and players, which is often shortened by the mobility of human capital in the response to such natural disasters (Kim, 2014).

Capacity constraints to implementation of institutional innovation prevail at all levels. For example, at the policy making levels, there is need to strengthen the capacity of the policy makers and the leaders of the sectorial ministries to anticipate, recognize, and respond to institutional challenges. In addition, there is need for the establishment of coordination mechanisms such as specific taskforces and committees to guide the agricultural transformation process. These organizations help to set policy and institutional priorities and are held accountable to ensure that involved institutions follow up and follow through (Badiane et al., 2014; Babu and Blom, 2014).
At the decentralized levels, the capacity to effectively implement agricultural development programmes and policies needs to be strengthened. Individual capacities must be strengthened so that staff can develop work plans, raise resources, and execute and monitor programming. In addition, at the lower levels, the capacity to collect data from the field and analyze and apply that information to inform programme decision making must be strengthened. These individual capacities can lead to institutional innovation if nurtured over a period with enough autonomy to operate (Babu and Chaura, 1997; Babu and Mthindi, 1994).

Regulatory system innovations are needed to make agriculture sectors in Africa become competitive on the world market, an essential element of agricultural transformation (Jafee, 2003; World Bank, 2009). Yet, the capacity of the country to set up regulatory systems for the food safety regulation, regulation of animal and plant health, biosafety regulation related to the quality of the outputs, and environmental regulations remains weak. Innovations in such regulatory systems to meet the changing needs of the market and trade environment require institutional and human capacity. While some African countries are beginning to invest in this area, progress has been in isolated projects and programmes. The scaling up of the successes seen in specific industries such as vegetable exports from Kenya, beef exports in Botswana, or Mango exports in Mali require continued investment in the advancement of the regulatory systems (Chandra, 2006). Regional harmonization of policies and programme provides opportunities for institutional innovations at the regional and sub-regional levels. Policy and programme design and implementation in African countries is significantly influenced by regional challenges and the solutions that have been identified by countries jointly either at the regional level or at the continental levels. For example, regional communities such as the Southern Africa Development Community (SADC), the Economic Community of West African States (ECOWAS), and the Common Market for Eastern and Southern Africa (COMESA) aid in the process of setting priorities and identifying regional challenges that must be addressed through collective action (AU, 2014; Badiane et al., 2014). Yet the translation of polices at the country level depends on the policy systems and the individual commitment to follow up and follow though. Further, policies may be designed at the country level depending on the broad principles agreed upon at the regional level. However, some of the policies are not followed through either due to resource constraints or due to capacity constraints. At the continental level, once again, there are opportunities to agree on the common goals for the sector and relate them to the specific commitments. The CAADP process that is continuing for the second decade is a clear example of regional cooperation (AU, 2014). Yet, a better understanding of the constraints and challenges countries face in the implementation of these various programmes is needed.

Table 3: A typology of institutional innovations at different levels and timeframes

Levels/ Timeframe	Immediate/ Emergency Response (<1 year)	Short Run Response (2-5 years)	Long-term Response (5-15 years)
Macro Level (national)	Innovations in response to emergencies such as: • Drought and floods • Food emergencies • Disease outbreaks • Local and external conflicts	Institutional innovations in: • Public sector reforms • Governance reforms in specific organizations – research , extension, education • Reforms in the resource allocation and tracking • Developing new funding mechanisms	Institutional Innovations in: • Restructuring national agricultural innovation systems and their components • Privatization of extension systems
Meso Level (market)	Institutional innovations in responding to: • Food market and prices emergences • Food stock management • Food distribution/ price stabilization • Seed /input delivery following emergencies • Food safety issues – outbreak of food-borne diseases	Institutional innovations in: • Opening up internal markets • Liberalization of external markets • Regulatory system • ICT enabled market information systems • Export market development	Institutional innovations in: • Research system development for new and non-traditional crops • Develop market infrastructure for processing and value addition • Road and transport infrastructure

Levels/ Timeframe	Immediate/ Emergency Response (<1 year)	Short Run Response (2-5 years)	Long-term Response (5-15 years)
Micro Level (community/ household)	Institutional innovations in: • Forming farmers organizations • Safety net for farmers affected by droughts and flood • Farm extension for developing resilience • Relocation and migration • Preparing farming community to meet shocks and making them resilience	Institutional innovations in: • Collective action at the community level natural resource management – soil and water conservation programmes • Adoption of new technologies / innovations • Developing input supply and output aggregation system.	Institutional innovations in: • Designing sustainable farming systems • Poverty and hunger reduction through agriculture • Linking agriculture-nutrition and health • Healthy diets and lifestyles

6. Conclusion

In this paper, we have analytically reviewed the institutional innovations needed for agricultural transformation in Africa. The transformation of the agricultural sector requires innovations within the key institutions that contribute to sector-level transformation. We have applied a conceptual framework to identify the factors that contribute to the transformation of a select group of institutions and how institutional innovation can facilitate this process. We reviewed the literature for specific examples of institutional innovations in various spheres of agriculture and identified the factors that contribute to successful transformation of the subsectors.

Through the review above, we have identified a number of existing knowledge gaps surrounding the concept of institutional innovation for agricultural transformation. Several key policy issues for agricultural transformation still remain to be researched further in the context of institutional innovation. African agriculture has been growing at a rapid rate over the last decade. Crop yields across Africa have been growing at the rate of 2.1% per year and land expansion has been growing at the rate of 1.9%. Trends in agricultural yields create opportunities for African countries to prioritize specific areas of research. However, further research is needed to determine what institutional innovations are needed to take advantage of these trends in order to benefit rural Africa. Additional research is also needed to fully understand the role of agriculture in reducing poverty and hunger. Finally, the sub-sectors of agribusiness and agro-processing are currently experiencing increased growth, creating many employment opportunities for rural youth. In order to increase the participation of rural youth in agricultural value chains, further research is needed to determine what factors draw young people in and out of agriculture. The knowledge gaps listed above must be addressed in order for institutional innovations to have the greatest impact.

In addition to knowledge gaps, this review has helped to draw out policy priorities to support African transformation. African governments face a number of challenges in achieving agricultural transformation. As countries in Africa continue to grow, there will be increased emphasis on moving from taxing agriculture towards subsidizing agriculture sectors. Future government policy design and programming must balance increases in demand for agricultural production in order to effectively allocate resources to intervention programmes for various value chains. Institutional innovations are needed to ensure the sustainable use of natural resources, which is key for the long term growth of the agricultural sector. When implementing institutional innovations, political economy challenges will need to be fully understood.

Although there has been a shift in consumption from cereal grains to high value crops, policy and research priorities continue to focus on staple crops. The disconnect between consumer demand and research must be addressed in order to achieve agricultural transformation. Policy and institutional innovations are needed in order for Africa's food system to be able to meet the increasing demand for food and diversified dietary patterns. Recent projections of the impact of climate change on the productivity of agriculture require the realignment of the composition of agricultural production, in addition to the adoption of climate resilient food and agricultural production practices. Addressing the increasing concerns of micronutrient deficiencies and increasing obesity in African countries warrants immediate attention. There is need to develop an institutional innovation framework that identifies the priorities for innovation depending on the initial conditions of that country and its agricultural policy environment.

The implementation of institutional innovations continues to suffer due to lack of knowledge sharing on best practices in specific sectors and among the countries. While some progress has been made in selected areas such as agricultural innovation systems (World Bank, 2012) and in extension and advisory systems (Birner et al., 2006), evidence on what works and why in different contexts need to be documented and shared widely. Further, development partners have a crucial role to play in the development and nurturing of institutional innovations at the policy and programme levels by harmonizing their interventions to support transformation in the agricultural sector.

In this process, increasing the role of evidence-based knowledge sharing and strategic planning with the help of local think tanks by strengthening their capacity cannot be over-emphasized (McGann et al., 2014). In order to achieve transformation in Africa, we need to learn why some institutional innovations succeed and last longer while others fail in agriculture. Continuous learning and sharing of information is key for the effective use of institutional innovations in agricultural transformation in Africa.

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Three

Improving Smallholder Farmer Productivity and Wellbeing through Guaranteed Market: The Case of P4P in Ghana.

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Abstract
Smallholder farmers in sub-Sahara African countries and developing countries elsewhere face a number of critical constraints, including low and uncertain prices, culminating in low crop yields and high yield volatility. In a bid to primarily address the demand-side constraints facing smallholder farmers, the World Food Programme (WFP) embarked on a five-year pilot project called Purchase for Progress (P4P) in twenty countries to offer competitive and predetermined minimum prices to farmers, as well as facilitate their access to credit and training through partner-support initiatives. In this study, we verify the hypothesis that farmers who participated in the project obtained higher yields than their counterparts who did not, using data on Ghana (one of the case study countries). The data supports our hypothesis. However, females who participated in the programme experienced lower percentage change in yield than their male counterparts. In addition,

we found that the decision to sell to a Farmer Organization (FOs), which is the link between the farmers and WFP, is explained by several factors, including availability of alternative markets, urban/rural location of the farmer, access to input credits, and the proportion of output that the farmer sell immediately after harvest.
Keywords: Purchase for Progress (P4P); Smallholder Farmers; Ghana

1. Introduction

Currently there are over 500 million small farms in the world, employing about 2.5 billion people on full-time and part-time basis (FAO, 2008). It is estimated that within sub-Saharan Africa (SSA) and Asia, smallholder farmers produced over 80% of food for consumption (IFAD, 2011).[2011a OR 2011b?] The corresponding figure for SSA alone is 70% (IAASTD, 2009). A number of studies have found that smallholder farms, on average, generate higher yields than large-scale plantations and are also more resource-efficient (see, e.g., Feder, 1985; Barrett, 1993; Rosset, 1999; Borras et al., 2007; and Altieri and Koohafkan, 2008). In addition, smallholder farmers tend to spend their income within the local economy and thereby promoting small-scale enterprises and creating jobs locally (Diao et al., 2007; Wiggins, 2011). Notwithstanding the benefits that accrue to smallholder farming, including the benefit of addressing nutritional aspect of human wellbeing, smallholder farmers remain largely in poverty and are undernourished (IFAD, 2011a). This is because the farmers face a number of critical constraints such as limited access to markets, coupled with low and unpredictable prices of their produce, which inhibits their ability to invest in productivity-enhancing activities (see, e.g., Wenhold et al., 2007; Murphy, 2010;
and FAO, 2011). Moreover, studies have found that women typically face additional constraints rooted in cultural norms in both agricultural input and output markets, which further limit their farm investments resulting in lower yields than those obtained by their male counterparts (see, e.g., Holden et al., 2001; Razavi, 2007; and Holden and Bezabih, 2008).

The need to meet immediate financial obligations lead farmers to sell their produce at low prices at the farm gate or within the local community (Deaton, 1991). There is a growing consensus in the development economics literature that smallholder farmer's investment decisions are predicated upon perceived market opportunities for their produce, among other factors (see, e.g., Diao et al., 2003; and Poulton et al., 2006). As a result, smallholder farmers could be incentivized to increase farm investments, and consequently yield, if price uncertainties are removed or minimized. A cross-sectional study by Irz et al. (2001) found a significant positive relationship between crop yield and the number of people living in poverty, implying that increased yield improves livelihoods. The corresponding elasticity coefficient (poverty elasticity of crop yield) for Africa was estimated to be higher than that of Asia, indicating that, compared to Asia, Africa could experience a larger reduction in poverty if it promotes policies that increase crop yields.

Recognizing the fact that crop yield, and subsequently livelihood, of smallholder farmers could be enhanced by providing them guaranteed market (and improved supply-side conditions such as provision of training and increased access to input credit through partner-support initiatives), in September 2008, the World Food Programme (WFP) launched a pilot programme known as Purchase for Progress (P4P). It aims at providing forward market opportunities (i.e., assured market) to smallholder farmers through farmer organizations (FOs), as well as indirectly assists the farmers to obtain technical support and access credit through P4P partner-support initiatives. The programme is being piloted in 20 countries in SSA (including Ghana), Asia and Latin America. The P4P pilot initiative came to an end in December 2013 and was followed by one-year evaluation, which relies on both quantitative and qualitative data generated in 17 of the 20 countries under the P4P pilot programme. In this study, we test the overarching hypothesis that the programme, which primarily aims at providing assured market to participating farmers, all else being equal, has led to increased crop yield (and hence improved livelihood) of participating farmers using Ghana as a case study. In addition, we have also verified whether or not the P4P programme resulted in decreased yield volatility, which could implicitly result from better farm management practices. To the best of our knowledge, this is the first study that seeks to evaluate a quasi-field experiment on the impact of guaranteed market, among other factors, on crop yield among smallholder farmers participating in the P4P programme in Ghana.

As hypothesized, we found that farmers who were members of the P4P programme obtained higher yield than their counterparts who did not participate in the programme. Consistent with the literature on crop yield differentials across gender, we found that females had lower yield than their male counterparts. Further, the decision to sell through FOs is explained by availability of alternative markets, urban/rural location of the farmer , access to input credits, and the proportion of output that the farmer sell immediately after harvest. Moreover, we found evidence that P4P farmers had lower yield volatility than non-P4P farmers, and males have lower yield volatility than their female counterparts.

The rest of the paper is organized as follows. The next section provides a brief overview of the P4P project, with specific emphasis on Ghana. This is followed by specification of the empirical model in section 3. Section 4 discusses the data for the empirical estimations. The penultimate section (i.e., section 5) presents and discusses the empirical results, and section 6 contains concluding remarks.

2. P4P in Ghana

The P4P programme in Ghana started in late 2010, two years after it was initiated in other countries. The late start gave Ghana an opportunity to learn from the experience of other countries that started earlier. As a result, it is not surprising that the country has a better monitoring and evaluation (M&E) system than most of her counterparts. The pilot programme in Ghana is being implemented in two regions: i) Ashanti region and ii) Northern region. The dominant cereal cultivated in the Ashanti and Northern regions are maize and rice, respectively. Nevertheless, a significant number of smallholder farmers in the Northern region cultivate maize. In order to have a common reference cereal for our analysis, we decided to analyse maize production. It is worth mentioning that the WFP's procurement activities are extremely low in the Northern region, and the maize prices offered within the region are not locally competitive.

Like other countries, the P4P programme in Ghana aims at improving smallholder farmers' livelihoods by assisting them through partnership with technical institutions to increase crop yield. In addition to offering the farmers competitive forward markets for their produce, the programme has supported capacity-building efforts through P4P partners, including good agricultural practices, agricultural marketing and post-harvest technologies, in addition to technical, business and organizational development skills. Regarding the improvement of market infrastructure, P4P works with partners to rehabilitate and improve market infrastructure and enhance access to market information.

In a nutshell, the vision of the P4P programme entails the establishment of efficient post-harvest food storage modalities and marketing, embedded within increased capacity of farmer groups, which will help raise the income of smallholder farmers and provide an incentive for increased production through increase of productivity as a result of partners' capacity-building efforts.

3. The empirical model

As indicated earlier, two empirical models are considered. The first is a Probit model that investigates farmers' decision to sell through the FOs; and the second are two Ordinary Least Square (OLS) equations that explore the determinants of percentage change in yield. The models are explained in turns.

The Probit model

To clarify the Probit model, consider a situation where a farmer could sell through the FOs or not. Let be a latent variable capturing the expected net benefits from selling

$$A_i^* = \mathbf{z}_i\beta + \eta_i \text{ with } A_i = \begin{cases} 1 & \textit{if } A_i^* > 0 \\ 0 & \textit{otherwise,} \end{cases} \qquad (1)$$

where Ai is a binary variable which takes the value of 1 if the farmers choose to sell through the FOs and 0 otherwise; is a vector of factors influencing decision to sell; is a vector of unknown parameters; and is an error term with mean zero and variance of . The maximum likelihood estimation method is employed to estimate the parameters of Equation 1. The potential variables that could influence the decision to sell through FOs include the farm size, crop yield, labour usage, usage of indigenous and improved seed, whether or not the farmer access market information through FOs, whether the farmer resides in a rural or urban area, per capita household expenditure, whether or not the farmer has access to a better market, access to input credit, and whether or not the farmer treated his/her crop with chemicals during storage to control insect pests. Local market prices are common knowledge. Since prices offered by WFP in the Northern

region are not locally competitive, a farmer who obtains price information from an FO may be less likely to sell through it.
{B}Yield difference equation
The first OLS equation regresses percentage change in crop yield ( ) between the baseline and follow-up periods for farmer on percentage in a number of inputs and other

explanatory variables, including membership of P4P and the gender of the smallholder

$$\Delta y_i = \hat{\beta}\Delta \mathbf{X}_i + \hat{\alpha}T_i + \hat{\eta}F_i + \varepsilon_i \qquad (2)$$

where denotes percentage change in the corresponding variable; is a vector of inputs (labour, local seed and improved seed); is a dummy variable for membership of P4P (1/0); is a dummy variable for female (1/0), is a vector of the coefficients of the input variables; and are coefficients of the corresponding variables; and is an independent and identically distributed error term (i.e.,). The primal hypothesis here is . The equation is estimated using the pooled data on the Ashanti and Northern regions, as well as for the separate regions.

Statistical volatility and stochastic dominance analysis

In order to verify differences in yield volatility between the P4P and non-P4P farmers, statistical volatility index is computed for male and female farmers in each of the two

$$V(z_a) = \sqrt{\sum_{i=1}^{n_a}(z_{ai} - \bar{z}_a) \Big/ (n_a - 1)}, \qquad (3)$$

where signify yield volatility; is percentage change in yield of farmer in the relevant group ; and is the number of farmers in the group of interest.
Furthermore, the Stochastic Dominance Analysis (SDA) is employed to compare volatility of yield between the P4P and non-P4P farmers. The technique presents a way of comparing different distributions of outcomes. First or second order stochastic dominance analysis is considered in this paper. To define the first order, let and be stochastic yields with cumulative distribution functions of and , respectively. Then first order stochastically dominates if for all . Thus, everyone will prefer to if the levels of the former occur with lower relative frequencies or probabilities. On the other hand, second order stochastically dominates if for all . The graphical illustrations of the first order stochastic dominance (FOSD) and second order stochastic dominance (SOSD) are presented in Figure A1 at the appendix.

4. Data types and sources

The data employed for the empirical analysis is from the P4P Farmer Livelihood and Agricultural Production Baseline Survey (2011) and a Follow-up (mid-term) Survey (2013) conducted by the World Food Programme (WFP) in Ghana. The choice of Ghana as a case study for this paper is motivated primarily by the existence of high quality data.

Two regions (Ashanti and Northern) were randomly selected for the P4P initiative: one from the southern and the other from the northern part of Ghana. A number of active FOs were then randomly selected in one district in the Ashanti region (Ejura District), and from four districts within the Northern region (i.e., Tamale Metro, Kumbungu, Tolon, and Sagnarigu). A sample of the FOs were treated (i.e., P4P FOs) and the remainder were made the control group (i.e., non-P4P FOs). A number of farmers were selected from each of the two groups of FOs. The selection of the respondents (farmers) is conditional on being an active member of selected FOs, and must be a smallholder surplus-producing farmer, cultivating at most 2 hectares of plot. At both the FO and farmer levels, participation in the survey was voluntary. The Ghana country office has commissioned the data collection to the Kwame Nkrumah University of Science and Technology of Ghana, and the data for smallholder farmers was collected in 2011 and 2013.

The total number of respondents from the two surveyed regions is 760, i.e., Ashanti region with 465 respondents and Northern region with 295 respondents. The two regions belong to two diverse agro-ecological zones. The former (Northern) belongs to the Guinea-Savanna zone and has a single wet season between May and October. On the other hand, the Ashanti region is part of the semi□deciduous rainforest and has two wet seasons, one in March to July, and a shorter wet season in September to November. The variables considered include farm size, output (i.e., quantity harvested), usage of all types of inputs, access to credit, access to market and market information, post-harvest practices, and socio-demographic characteristics of each farmer.

5. The results

Descriptive statistics

Table 1 presents the descriptive statistics of the variables used in the regression analysis. The table contains the descriptive statistics of the pooled data for Ashanti and Northern regions, as well as the statistics for each of the two regions. From the data collected on the smallholder maize producers, the proportion of the farmers from Ashanti and Northern regions are 39% and 61%, respectively. The overall average maize yield (per acre) within the follow-up year is 638kg, while that of Ashanti and Northern regions are 730kg and 497kg, respectively. In all cases, the standard deviations are lower than the mean values, implying the data is not too spread out. The average farm sizes cultivated in the two regions (Ashanti and Northern regions) are 3.5 and 2.9 acres, respectively; implying farmers in the Ashanti region generally cultivate slightly bigger plots than their counterparts in the Northern region.

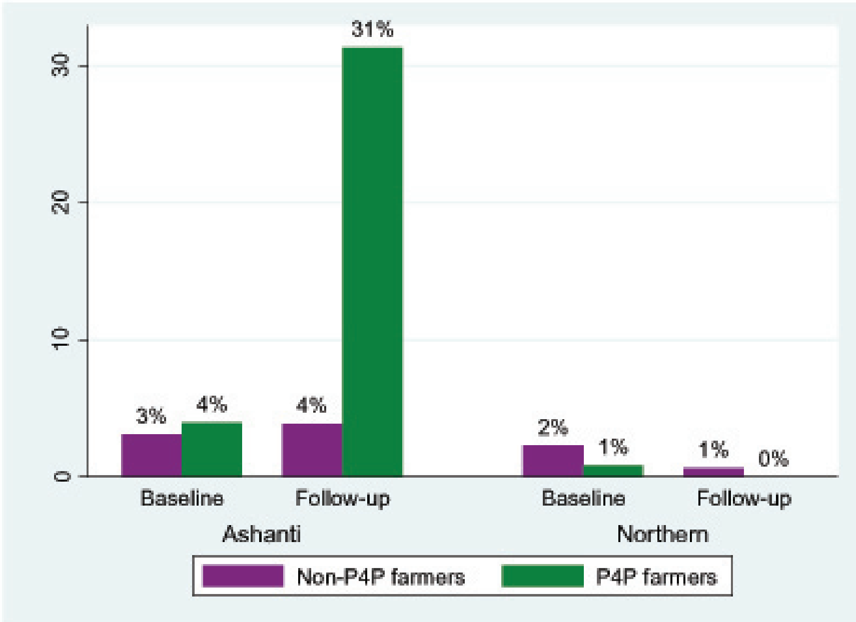
Table 1: Descriptive statistics of variables used in investigating determinants of purchase for progress (P4P) farmers sales to FOs in Ghana

		Pooled		Ashanti		Northern	
Explanatory Variables	**Variables Description**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Sale through FOs	Whether farmer sold to FOs	0.433	0.496	0.357	0.479	0.550	0.498
Per Capita HH Exp	Per capita household expenditure	205.040	474.448	304.202	609.910	124.974	121.974
Proportion sold	Proportion of crop sold immediately after harvest	34.434	31.980	44.348	32.489	16.44	21.525
Chemical storage (1/0)	Whether crop was treated with chemicals during storage to control insect pests	0.573	0.495	0.622	0.486	0.494	0.501
Alternative better market(1/0)	Whether there was a market for better quality produce crop than what was on offer	0.210	0.407	0.138	0.346	0.321	0.468
Farm size (in acres)	Total farm size planted to crop during the season	3.240	2.296	3.464	2.452	2.887	1.982
Yield per acre (in kg)	Total maize yield per acre cultivated	638.460	368.277	729.632	358.038	497.180	338.705
Rural (1/0)	Whether farmer resides in rural area	0.811	0.392	0.746	0.436	0.912	0.284
Labour cost (in GHC)	Cost of hired labour	27.736	35.914	37.455	38.607	12.674	24.674
Indigenous seed (in kg)	Kilogrammes of indigenous seeds planted	1.096	4.348	0.897	3.143	1.403	5.730
Improved seed (in kg)	Kilogrammes of improved seeds planted	0.949	4.961	0.712	2.864	1.404	7.068
Price information from FOs (1/0)	Whether price Information was sourced from FOs	0.261	0.439	0.309	0.463	0.187	0.391
Northern (1/0)	Region of planting	0.392	0.489	-	-	-	-
Input _credit (1/0)	Whether farmer had to pay for input credit	0.094	0.292	0.059	0.236	0.149	0.375

Further analysis of the data reveals that, in Ashanti region, average yields were slightly higher in absolute values for P4P farmers than non-P4P farmers during the baseline year (2011) and the follow-up year (2013) (see Figure A2 at appendix). Within the Northern region, however, the average yield was marginally lower for P4P farmers during the baseline year and much lower for the P4P farmers during the follow-up year. Furthermore, average yields are higher for Ashanti region than the Northern region for both groups and within the baseline and follow-up years. Paired t-tests, however, indicate no statistical difference between the yields of P4P and non-P4P farmers in the baseline period for both the Ashanti and Northern regions.

With regard to percentage changes in yield in Ashanti region between the two periods, the data revealed that, for non-P4P farmers, average yield had declined by 11% between the two periods, while that of P4P farmers had increased by 1% (see Figure 1). On the other hand, the yields for both P4P and non-P4P farmers in the Northern region declined by 15% within the baseline and the follow-up periods, respectively.

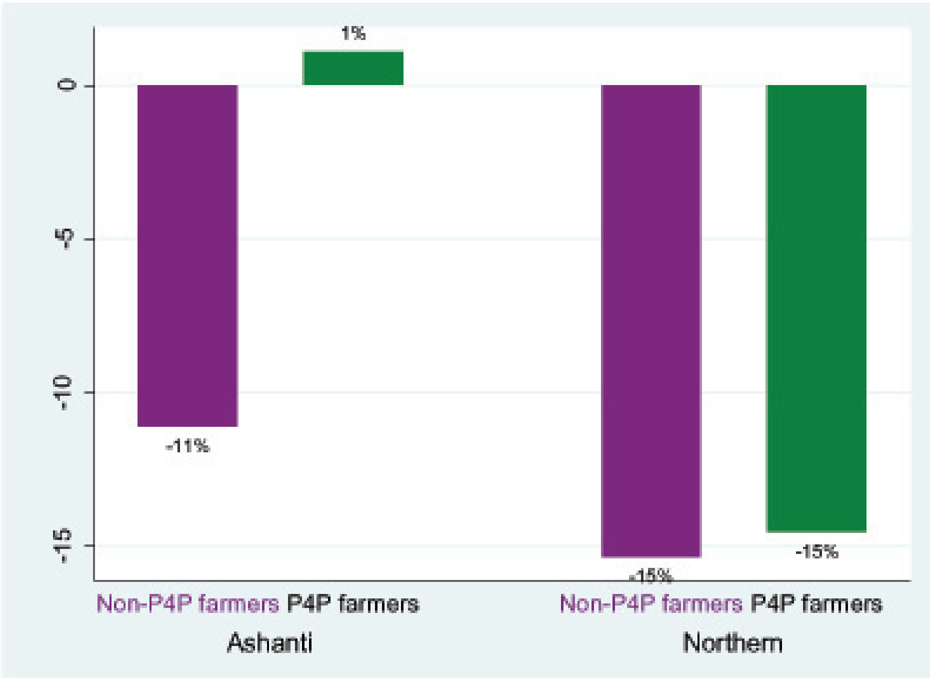
Figure 1: Average yield during the baseline and follow-up period for purchase for progress (P4P) and non-P4P farmers in Ashanti and Northern regions



Source:Author

Next, the data collected reveals that, within Ashanti region, 36% of the P4P farmers sell through their FOs (see Table 1). The corresponding figure for the Northern region and the pooled data are 55% and 43%, respectively. Concerning the proportion of produce sold through FOs, the data (depicted in Figure 2) reveals that, within the Ashanti region, where WFP has been procuring from FOs, 31% of the produce of P4P farmers were sold through the FOs during the follow-up year compared to 4% within the baseline year (see Figure 2). The corresponding figures for the non-P4P farmers were 3% and 4% for the baseline and the follow-up years, respectively. Within the Northern region, the proportion of produce sold through the FOs remained very low (at most 2%) for both P4P and non-P4P farmers.

Figure 2: Proportion of output sold through farmer organizations (FOs)



Source: Author

Table 1 also shows that about 14% and 32% of the farmers in Ashanti and Northern regions, respectively, indicated they have alternative better market than what was offered by their farmer organizations. In addition, about a third (31%) of the farmers in the Ashanti region and 19% in the Northern region obtain their price information from their FOs.

Furthermore, we found that a higher proportion of the farmers interviewed in the Northern region reside in rural areas (91%), compared to the number interviewed in the Ashanti region (74%). However, the cost of labour employed per acre was three times higher within the Ashanti region. Also, farmers in the Northern region planted higher quantities of both improved and indigenous seeds per acre on the average (1.403kg and 1.404kg, respectively) than their counterparts in Ashanti region (0.9kg and 0.71kg, respectively). The higher average yield obtained in Ashanti region, in spite of the lower quantities of improved seed planted, could stem from more efficient use of other complementary inputs such as soil quality and quantity of water/precipitation.
The descriptive statistics revealed that, farmers within the Ashanti region sold 44% of their produce, on the average, immediately after harvest. The corresponding figure for the Northern region is 16%. Also, about 6% and 15% of the farmers in Ashanti and Northern regions, respectively, acquired and paid for inputs on credit.

Regression results

I. Decision to sell through the FOs

Table 2 shows the results of the determinants of farmers' decision to sell through their farmer organizations (FOs). A Chow-test revealed that separate models for each of the two regions fits the data better than a single model from pooled data.

Table 2: Probit regression of determinants of purchase for progress (P4P) farmer's decision to sell through farmer organizations (FOs) in Ashanti and Northern regions of Ghana

	Ashanti	**Northern**		
Explanatory Variables	**Coefficients**	**Marginal Effect**	**Coefficients**	**Marginal Effect**
Per Capita Household Exp	0.0003(0.0002)		0.0003(0.0009)	
Proportion sold (%)	-0.007(0.003)***	-0.002	-0.032(0.012)***	-0.010
Chemical storage (1/0)	-0.200(0.159)		-0.189(0.215)	
Alternative better market (1/0)				
-0.906(0.261)***				
-0.271				
-0.162(0.281)				
Farm size (in acres)	0.052(0.030)*	0.016	0.010(0.049)	
Yield per acre (in kg)	0.0001(0.0003)		-0.0005(0.0004)	
Rural (1/0)	0.332(0.179)*	0.099	-0.242(0.519)	
Labour cost (in GHC)	-0.005(0.002)**	-0.002	-0.006(0.004)	
Indigenous seed (in kg)	0.008(0.021)		0.025(0.013)*	0.008
Improved seed (in kg)	0.022(0.026)		0.023(0.012)	
Price information from FOs (1/0)				
Input _credit (1/0)	0.771(0.160)***	0.230	-0.429(0.250)*	-0.129
Constant	0.706(0.323)**	0.212	0.679(0.338)**	0.204
N	-1.354(0.323)		1.130(1.560)	
Prob > chi2	356		176	
Pseudo R2	69.27***		28.70***	
	0.1647		0.192	

ExplSource: Own computation.

Ashanti region

The results shows that, in Ashanti region, where procurement activities are effective, the set of explanatory variables included in the model explain about 16% of the variability of the probability to sell through the FOs. In addition, the Chi-square statistic indicates that the regression line is a good fit at 1% significance level. The variables that have statistically significant coefficients include the proportion of the produce sold immediately after harvest, whether or not a farmer has an alternative market, farm size, whether or not the farmer resides in a rural area, the total cost of labour, whether or not the farmer obtains price information through the FOs, and whether or not the farmer has access to input credit. These variables are discussed in turns.

It has been found that, all else being equal, P4P farmers who sold a greater proportion of their produce immediately after harvest were less likely to sell through their FOs compared to their counterparts who sold lesser proportion of their output. The coefficient of the variable is significant at 1% level and the marginal effect indicates that a unit increase in the proportion sold immediately decreases the probability of selling through the FOs by 0.002. The negative relationship between the variables is likely due to alternative marketing channels available to farmers who desire to sale larger proportions of their farm produce quickly rather than store it. This is likely due to the fact that smallholder farmers are generally poor and need cash soon after harvest to meet immediate needs, including payment for inputs.

Compared to their counterparts who do not have alternative better markets, P4P farmers who have such markets for their produce were less likely to sell through their FOs. From the size of the coefficient, the probability of selling through the FOs is lower by 0.3% for farmers who have the alternative better markets. It is worth noting that this variable has the strongest impact on the decision to sell through the FOs.

We found that farmers with larger farm sizes were more likely to sell through their FOs. The coefficient of the variable, which is significant at 10% level, revealed that the probability of selling though the FOs increases by 0.02 if the farm size is an acre larger, all else being equal. This finding is logically consistent with the presumption that farmers who cultivate bigger plots are more likely to sell through their FOs because they have the capacity to aggregate, store, and meet the quantity and quality requirements from WFP. Next, the P4P farmers residing in rural areas within Ashanti region had 10% higher probability of selling through their FOs. This result is quite expected since farmers in rural areas have limited market options. However, farmers who used more labour per acre were less likely to sell through their FOs, compared to their counterparts who used less labour. A plausible explanation is that, farmers who have the capacity to hire labour are better endowed economically to access and compete in alternative markets.

Furthermore, we found that the farmers within Ashanti region who obtain their price information through the FOs are more likely to sell through them, all other things being equal. The coefficient of this variable is significant at 1% level and the size of the coefficient indicates that those who obtain their price information from the FOs have 23% higher probability of selling through the FOs. The likely explanation is that some of the farmers may not be aware of the competitive prices being offered by the FOs.
Finally, farmers within the Ashanti region who obtain input credit are more likely to sell their produce through their FOs, all else being equal. The marginal effect shows that such farmers had 21% higher probability of selling through the FOs. As a result, it is expected that farmers who benefit from such an arrangement should be more likely to honour

their commitment of selling through the FOs.

Northern region

It is important to note that the results are entirely different for the Northern region where procurement activities have been very low and WFP prices are not locally competitive. The pseudo R-squared indicates that the set of explanatory variables used in the model explain about 19% of the variability of the probability to sell through the FOs. The variables with statistically significant coefficients within the Northern region include the proportion of produce sold through the FOs, the quantity of indigenous seeds cultivated, whether or not the farmer obtains price information through their FOs, and whether or not the farmer obtains input credit. Like their counterparts within the Ashanti region, the P4P farmers in the Northern region who sold larger proportions of their produce had alternative markets. As a result, they were less likely to sell through their FOs. Also, the farmers who obtained input credit were 20% more likely to sell through the FOs than their counterparts who did not obtain the input credit. Paradoxically, farmers who obtain price information from the FOs were less likely to sell through them. This is perhaps not surprising since the WFP prices offered by the FOs were not competitive within the region. Furthermore, the P4P farmers who cultivated greater quantities of indigenous seeds were more likely to sell through their FOs.

II. Change in crop yield

As noted earlier, by providing a forward market, facilitating access to credit and providing farmers with training, the P4P initiative is hypothesized to lead to increased yield and subsequently improved farmers' welfare. In order to validate our main hypothesis, percentage change in yield (between the base year and the follow-up period) was regressed on a number of variables, including membership of P4P. The results are presented in Table 3.

Table 3: Ordinary least square regression of determinants of percentage change in yield among purchase for progress (P4P) and non-P4P farmers sampled in Ashanti and Northern regions of Ghana

	Ashanti	**Northern**
Explanatory Variable	**Coefficient**	**Coefficient**
Percentage change in labour cost	0.120(0.057)**	0.073(0.027)***
Ln (Age)	-8.11(13.410)	-57.548(22.008)***
Female (1/0)	-16.412(9.69)*	-9.289(12.930)
Percentage change in indigenous seed (in kg)	-0.032(0.089)	-0.042(0.180)
Percentage change in certified seed (in kg)	0.121(0.161)	0.191(0.108)*
P4P farmer(1/0)	15.680(8.350)*	-3.363(11.809)
Northern		

Constant	25.546(50.425)	206.559(80.805)**
N	386	264
R2	0.045	0.054
F-stat	2.05*	3.76*

Note: The robust standard errors are in parentheses.**,*** significant at 5% and 1%, respectively.
Source: Aauthor

Regarding the results for Ashanti region, the R-square shows that about 5% of the variability in the percentage change in yield is explained by the regressors and the F-test indicates the line is a good fit at 90% confident level. The variables explaining the percentage change in yield include percentage change in labour cost, gender, and membership of P4P. The coefficient of the variables 'percentage change in labour cost' is positive. The corresponding elasticity coefficient indicates that one percentage increase in labour cost results in 0.12% increase in yield. This implies that, there is decreasing returns to labour among the farmers interviewed. Furthermore, female farmers had 16% less yield than their male counterparts. This finding is consistent with earlier studies and stems from the fact that women generally face several cultural constraints in agricultural input and output markets that impede their efficiency. A recent report (SEND-Ghana, 2014) has noted that, relative to their male counterparts, only a small proportion of women smallholder farmers in Ghana own the land they cultivate, which limits their cropping decisions and access to input credit. These negatively impact their capacity to increase farm productivity. Also, poverty coupled with the task of providing food for the home may force women to sell at low farm gate prices rather than take advantage of the higher prices offered by the P4P initiative. Perhaps the most striking result is the significant and positive relationship between memberships of P4P and yield. The coefficient of the variable illustrates that P4P members have 16% higher yield than non-P4P members.

The results for the Northern region are interesting, although the coefficient of the membership of P4P is not statistically significant. Since procurement activities were very low and the WFP prices are not competitive in the Northern region, it is not surprising that we did not find a significant relationship between the two variables within the region. This result points to the fact that smallholder farmers are rational and respond to price incentives. Improving supply-side conditions, such as farmer training programmes and access to input credit, without providing guaranteed and efficient market for farm produce may not be an effective policy.

Like farmers in the Ashanti region, we found that higher labour cost correlates with increased yield in the Northern region. In addition, in both regions, there is decreasing returns to scale in labour usage. However, unlike the Ashanti region, older farmers experience lower percentage change in yield than their younger counterparts. Furthermore, farmers who cultivated higher quantities of improved seeds per acre experienced increased yields in the Northern region.

III. Volatility of crop yield

Finally, we explore the spread of yield by comparing the baseline and the follow-up periods. The results of the statistical volatility analysis, shown in Table 4, shows that male P4P farmers registered much lower yield volatility than their counterparts who did not belong to the P4P. The standard deviations of the percentage changes in yield for Ashanti region are 56.38 for the P4P and 90.47 for the non-P4P male farmers, respectively. The corresponding figures for northern region are 70.21 and 95.81, respectively. On the other hand, among the female farmers, belongingness to P4P did not impact yield volatility in Ashanti region. There was some impact in the Northern region, but it was marginal. Moreover, in both the Ashanti and Northern regions, males experienced lower yield volatility than their female counterparts, irrespective of whether or not they belong to P4P.

Table 4: Yield volatility among male and female farmers participating in purchase for progress (P4P) in Northern and Ashanti regions of Ghana

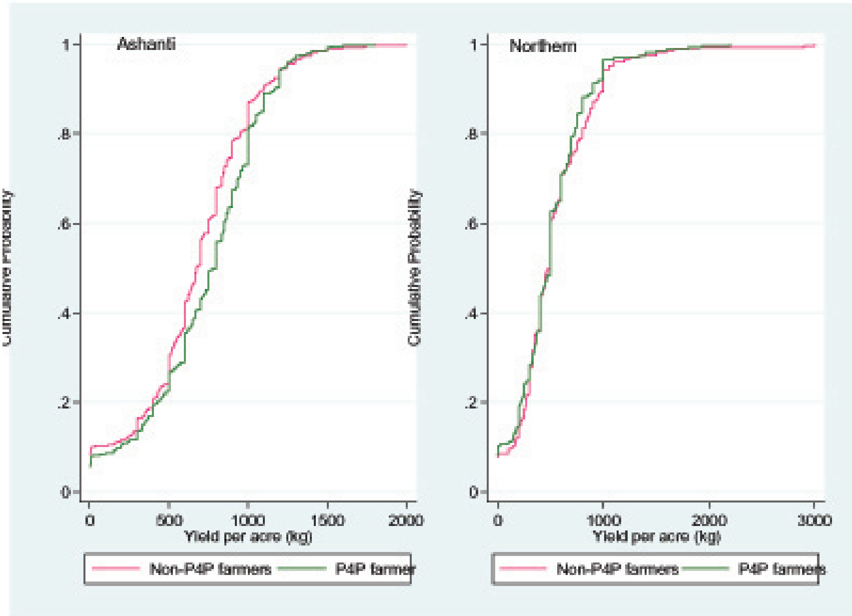
Ashanti Region			
P4P Farmers		NON-P4P Farmers	
Male	Female	Male	Female
56.381	95.894	90.473	93.583
Northern Region			
P4P Famers		NON-P4P Farmers	
Male	Female	Male	Female
70.209	97.437	95.819	119.036

Note: Volatility is computed as the standard deviation of the percentage change in yield between a baseline and a follow-up period.
Source: XXXX

IV. Stochastic dominance analysis

Stochastic dominance analyses was carried out to determine the extent to which yield could be predicted within each of the regions, and for P4P and non-P4P farmers. As illustrated in Figure 3, within the Ashanti region, the maize yield of the P4P farmers' first order stochastically dominate that of the non-P4P farmers. Thus, we can predict yields with higher degrees of certainty (i.e., lower cumulative probability levels) for P4P farmers in Ashanti region, compared to the non-P4P farmers within the same region. The analysis for the Northern region (also presented in Figure 3) did not show any clear evidence of stochastic dominance, implying the yield volatility appear similar across the two groups.

Figure 3: Stochastic dominance analysis of yield volatility



Source: Author

6. Concluding remarks

In spite of the overwhelming evidence that smallholder farmers make significant contributions to nutritional wellbeing of several people in developing countries, the farmers continue to suffer several setbacks that limit their productive capacity. The low and volatile price of crops and lack of guaranteed market for produce, remain critical constraints, resulting in low investment, poor yield, and low levels of livelihood. The Purchase for Progress (P4P) programme by the World Food Programme (WFP) offers the smallholder famers a way out of these predicaments by providing them guaranteed markets for their produce as well as provide them with training through partner's capacity-building efforts, and facilitate their access to credit.

The empirical results, based on Ghana data, appear to support the claim that the P4P programme is achieving the intended outcome of increasing crop yield, all else being equal. A complementary report based on the same data has shown that, the increased yield precedes increased household expenditure on food and nutritional aspect of welfare. Conversely, if forward markets are guaranteed, but uncompetitive, farmers may not sell through their FOs. It is also noteworthy that females, on the average, had lower yields than their male counterparts a finding that is consistent with the literature. Thus, in addition to offering competitive prices that must not lag behind local market prices, guaranteed markets for produce and capacity-building, the programme should also address the cultural factors that limit the potentials of females in agriculture. Furthermore, P4P initiative has led to a decline in yield volatility, which is achieved through better farm management. These added advantages of assured market for produce lend support for the need for agricultural market integration and price stabilization policy.

Finally, our findings, that farmers who sell through the farmer organizations (FOs) do not have alternative better markets, reside in rural areas, have access to input credits, and are not in a hurry to sale a larger proportion of produce immediately after harvest, is intuitive. These variables could effectively be targeted to encourage more farmers to take advantage of the competitive prices and guaranteed market offered by the initiative. It is noteworthy that our findings, though interesting, could only be cautiously generalized due to the following data limitations. The survey was restricted to surplus producing areas within the two regions where WFP has the programme. Thus, only a farmer meeting the criteria of producing a surplus is included in the survey. As a result the findings cannot be extended to subsistent farmers. Moreover, our analysis is done at the household level (not at the level of farmer organizations) due to the limited number of FOs.

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Appendix A

Figure A1: First order stochastic dominance (FOSD) and second order stochastic dominance (SOSD)

From Figure A1, FOSD requires that , and the SOSD necessitates the area is larger than .

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Figure A2: Average yields for P4P and non-P4P farmers in the baseline and follow-up Periods

Four

Smallholders' Access to Markets: Old Issues in a Changing Policy Environment

Janvier D. Nkurunziza and Komi Tsowou

1. Introduction

The contributions of family farmers and small holder farmers to food security, poverty reduction and sustainable development were specifically recognized in 2014 and led to the United Nations General Assembly to declare declaring the that year the "International Year of Family Farming"." In Africa, the African Union branded 2014 the "Africa Year of Food Security"." Building on this momentum, the United Nations Conference on Trade and Development (UNCTAD) carried the topic of smallholders forward into 2015 by devoting its Commodities and Development Report to the theme of small-holder farmers. This paper is a chapter of this Report. It discusses issues that are important to key debates expected to take place in 2015 in the following events: the UN Finance for Development Conference in July; the World Trade Organization (WTO) meeting for the establishment of a post-Bali Work Programme; Beijing+20 meetings; the Heads of States Summit to adopt the new set of Sustainable Development Goals (SDGs) in September; and the Climate Summit in December.

The paper argues that smallholder farmers are not acknowledged as important economic agents despite their contribution to food security, poverty reduction, environmental conservation, job creation and agricultural as well as overall economic development. Indeed, smallholders provide around 80 percent% of the food consumed in both Asia and Subsub-Saharan Africa (SSA) and produce the bulk of their countries' main agricultural exports. They account for a large share of agricultural production which in turn represents an important proportion of the gross domestic product (GDP) of African countries' GDP. Yet, smallholders have suffered from benign neglect from national policy makers and until recently from the international donor community.

The development of agriculture in general and smallholder farming in particular being first and foremost the result of a policy choice (Xiaoyun, 2013), the poor state of agriculture and smallholder farming in many developing countries shows the extent to which development policy has failed smallholders in these countries. As a result, global poverty remains a predominantly rural phenomenon; : 70 per cent% of the developing world's 1.4 billion extremely poor people live in rural areas particularly in South Asia and sub-Saharan AfricaSSA. At the eve of the adoption of the Sustainable Development Goals (SDGs), developing countries and their partners have the opportunity to remedy this situation by making sure that SDGs accord smallholders the importance they deserve. This requires governments to adopt a coherent strategy for the development of the agricultural agriculture sector and rural economy through a policy mix at the national, regional and international levels.

Who are the smallholder farmers? How many are they? And where do they live? Though there is no universal definition of smallholders, in much of the literature, they are generally defined as those farming a landholding of less than or about 2 ha of land holding. There are, however, inter- country and regional differences with farm sizes ranging from less than 2 ha in sub-Saharan Africa SSA to about 50 ha in Brazil. Notwithstanding this diversity and data constraints, according to IFAD and UNEP (2013), about 2.5 billion people are engaged partially or entirely, in 500 million small farms worldwide. With regard to geographic distribution, of those owning less than 2 ha, FAO data from the Food and Agriculture Organization of the United Nations (FAO) covering the 2001–-2004 period estimate that about 87 percent% of small farms globally are in the Asia and the Pacific regions, 8 percent% in Africa, 4 percent% in Europe and less than 1 percent% in Latin America. There are, for example, about 45 million smallholder farmers in Africa, many of whom are subsistence farmers who rely entirely or partially on family labour, mostly female.

It should be clear from the outset that To clarify, the focus on smallholders does not mean that large farms are not unimportant. In a number of several countries, large farms coexist with smallholdings and they play different economic roles. Large farms already function as businesses with the same access to resources and markets as comparable businesses in other sectors. Moreover, in countries with large agricultural businesses, they large farms usually have strong lobbies that they use to advocate for their interests. As a result, this paper focuses on small-scale farmers simply because they represent a large proportion of populations in developing countries populations and they generally are not accorded the attention they deserve.

The need to devote more attention to smallholders is economically justified. Given the opportunity, smallholder farmers can be efficient economic agents deriving decent livelihoods from their activities. A number of Several studies have consistently suggested that small farms have higher land productivity than large farms by virtue of the so-called inverse relationship between farm size and productivity (Byiringiro and Reardon, 1996; Heltberg, 1998). This is explained by the low transaction costs of small farms related to labour supervision and the flexibility of family labour which can be adjusted to seasonal needs and variability of production. This particularly holds for family-operated small farms. On these farms, labour monitoring and moral hazard are better handled or negligible (Lipton, 2013; Deininger and Byerlee, 2011; Lipton, 2013). This comparative advantage is particularly high in labour surplus contexts, which is the case in many rural areas in Africa and Asia. In other circumstances, constrained access to input and output markets makes smallholders inefficient, as discussed belowin the following paragraphs. Putting in place incentives that allow smallholders to participate more fully in input and output markets would not only improve their welfare but also increase their contribution to economic growth, benefitting society at large. For instanceexample, participating in well-functioning agricultural inputs markets provides the opportunity for farmers to increase yields and hence produce marketable surpluses, contributing to economic growth. If sold in competitive output markets, these surpluses permit smallholders to attract better prices and increase their incomes. Higher incomes in turn enhance the welfare of rural populations and help these farmers to strengthen their capacity to cope with risks, shocks and other related agricultural market problems (IFAD, 2011). A better linkage to markets, therefore, could induce rural populations to consider farming as a profitable and thus, a viable livelihood choice. Furthermore, successful linkage of farmers with markets and overall agricultural development are argued to be preconditions for the development of manufacturing and services in most developing countries (Wiggins et al., 2011). Ultimately, a better integration of smallholders in markets contributes to a more inclusive and sustainable economic development process.

However, across developing countries, smallholders' access to markets has been frustrated by various impediments including market failures and barriers to trade. For example, frequent difficulties in accessing land, credit, seeds and other agricultural inputs have prevented smallholders from producing significant marketable surpluses. Meanwhile, their access to output markets has been distorted by poor transport infrastructure, lack of market information, and low bargaining power, among other factors. As a result, many of them are locked up in subsistence production.

This paper discusses some of the constraints and opportunities associated with smallholders' smallholders' participation in markets in developing and least-developed countries. Although most of these issues are not new, it is relevant to revisit them given the changing policy environment at the national, regional and international levels as already discussed above. Moreover, these constraints are recurrent and need to be brought to the attention of policy makers who have the power to address them. Understanding the nature of the interaction between smallholders and markets helps to shape adequate policies that would assist these economic actors to increase the benefits they derive from their activities. This paper has five sections. The second section discusses why markets matter for smallholders.? Section 3 examines in some detail the key issues smallholders face in input and output markets. Section 4 analyses the impact of trade and economic policy reforms on smallholders producing for international markets, using econometric analysis. Section 5 concludes with some policy suggestions.

2. Why do markets matter for smallholders?

Where well-functioning markets exist, they facilitate trade and help to allocate resources to the most efficient uses. Trading enables smallholders to transform their production into monetary income, which in turn allows them to acquire goods and services that they do not produce, improving their welfare. Through their participation in trade, smallholders become part of an inclusive development process since trading fosters specialization, which in turn leads to higher productivity and competitiveness. As a result, stronger linkages with markets could prompt rural populations to consider the farming business as profitable and thus a viable livelihood choice, helping to stem rural to urban migration, particularly among the youth. As men usually control household resources and potential gains from production and commercialisation of crops (FAO, ILO and IFAD et al., 2010), offering market opportunities to rural populations, in particular women, is a way of reducing gender inequalities. Otherwise, commercialisation commercialization might exacerbate gender differences as market opportunities and resources including better linkages to traders and processors, access to land, capital and information, are more accessible to men than to women.

Smallholders in many low-income developing countries might be prevented from participating in markets due to market failures or missing markets. Generally, markets may exist, but fail for some small farmers while working for others. For example, a given smallholder would sell his production of maize on the market if the price he gets is higher than the cost of production, plus all transaction costs associated with market participation (e.g., transport to and from the market, ; the opportunity cost of time spent selling the produce and searching for the best price, ; risk associated with market prices, ; as well as and other possible costs that vary across from farm to farmsmall farmers). In Uganda, for example, coffee producers will most likely sell to markets—-instead of the farm-gate—- when quantities are large and markets are close. With small quantities to sell, poorer farmers tend to sell to markets more than richer farmers, probably as a result of their low opportunity cost of time (Fafchamps and Hill, 2005). Therefore, transaction costs are a key determinant of the extent to which smallholders participate in input and output markets. This participation influences production costs which in turn determine whether a smallholder makes a profit or not when he sells his produce. Hence, analysing the nature and structure of input and output markets helps to understand the interaction between smallholders and markets.

Relative to farm-gate and informal village markets, formal national and regional markets offer more opportunities to smallholders. These markets may sometimes be larger than export markets for many products of interest to smallholders with high growth potential. In Côte d'Ivoired'Ivoire, for example, transactions on local urban markets for staple food in 2009 represented about $1.1 billion against $0.63 billion of export revenue. The corresponding amounts for Senegal were $0.74 billion against $0.03 billion, respectively (Elbehri et al., 2013). In China, the domestic market for fresh produce was estimated to be 40 to 50 times larger than the export market in the early 2000s (IFAD, 2011). In several Latin American countries including Venezuela, Bolivia, Mexico, Peru and Venezuela Peru, the domestic market share of agricultural and agro- industrial products exceeded 70 per cent% in 2002 (Berdegué and Ricardo, 2011). Furthermore, the emergence of super marketsupermarkets in several developing countries gives smallholders access to middle and high income market segments, generating higher value with less volume, compared to local or village markets. Even though these markets have higher standard requirements, they offer new opportunities to smallholders who are able to comply with these standards. International markets also play an important role in smallholders' smallholders' growth. A number of Several smallholders source a large part of their revenues from cash crop exports. For example, cocoa, an important export crop, is typically grown by smallholders, who are responsible for about 80% to 90 per cent% of the world's world's production. For most of these farmers, cocoa constitutes the main, or only, source of cash income.

Whether or not smallholders are able to access larger more lucrative national or regional markets depends on many factors including the physical connectivity with these markets as well as and market information flows. Hence, smallholders' smallholders' participation in markets varies across regions and countries. In Burundi, for example, only 20 per cent% of smallholders' smallholders' production reached markets in 2008 (IFAD, 2008). In Uganda, only 4.3 per cent% of rural households were considered as commercial farmers in the country's country's 2009/ 2010 national household survey (UBOS, 2010).

It is relevant to distinguish between the sale of staple crops and non-staple products. Staple crops are mainly produced for domestic and regional markets whereas non-staple crops are mostly produced for export markets. With the exception of Except those who are integrated in supply chains, smallholders are usually only indirectly related to international export markets. They sell to intermediaries who in turn supply wholesalers who exporting the crops. Hence, most smallholders producing cash crops are price takers and only receive a small fraction of the international price. As a result, the share of the international price accruing to smallholders may be used as an indicator of the incentive they have to invest their time and resources into the production of the cash crop and hence their participation in international markets (see Section 4). Producer prices, in turn, depend on the type of market smallholders use to sell their crops. In general, farm-gate prices are lower than those found in markets. Traders who buy smallholders' smallholders' produce at the farm gate tend to take advantage of smallholders' lack of market information and high transaction cost they face individually by offering relatively low producer prices (Fafchamps and Hill, 2008). Some of these issues are discussed in some detail belowin the following paragraphs.

3. Smallholders'' access to markets: Some key issues

Smallholders'' involvement with markets can be gauged by discussing the extent to which they interact with input and output markets. This section briefly reviews some of the issues associated with smallholders'' market access in developing countries.

3.1. Small-scale farmers'' linkages with input markets

Farmers use a range of inputs in the production process. Key among them are seeds and fertilisersfertilizers, land, labour and credit. These are briefly discussed belowin the following sub-sections.

3.1.1. Access to seeds and fertilizer

Quality seeds are essential for increasing agricultural productivity. Hence, whether or not smallholders access high quality seeds contributes to their productivity which in turn determines their incomes and well-being.

Seed markets in the developing world are generally divided into formal and informal systems. Formal markets are characterized by their thinness and high cost of quality seeds resulting from expensive seed certification processes and important transaction costs. This means that These make smallholders can formal markets rarely affordable by smallholders formal markets. In 2007 in Tanzania, for example, due to high costs of agricultural inputs and associated services, 77 per cent% of farmers did not use improved seeds (REPOA, 2007). In India, about 80 per cent% of farmers rely on saved seeds despite the country's country's well established seed industry (Smale et al., 2009). Such channels leave farmers with no assurance of the seed quality, and plunge them further into a risky production process (Smale et al., 2009).

Fertilizers market structure varies across developing regions. Imports remain the main procurement channel. Domestically, both public and private channels are used to sell fertiliseizers to smallholders. A number of Several factors keep fertiliseizer prices too high for smallholders. They include the high power of sellers led by increased concentration at global and regional levels; high prices in international markets; poor infrastructure; lack of market information; lack of knowledge of farmers of fertilizer use; and, limited access to finance at national levels (Hernandez and Torero, 2011; Druilhe and Barreiro-Hurlé, 2012).

However, the to what extent to which these factors affect prices paid by farmers to procure fertilizers differs across countries. It was estimated for example, that farm gate prices for chemical fertilizers in Tanzania and Mali were respectively $419 and $509 USD per tonne in 2007. The corresponding value in

Thailand was $282 USD per tonne (Wanzala and Groot, 2013). Unless they benefit from subsidies, many smallholders in Africa are unable to afford such high fertiliseizer prices. In some cases, the high fertilizer prices prompted farmers to use fertilizers intended for industrial crops on for food crops fertilizers initially intended for industrial crops. Given that the necessary soil tests are not carried out to determine which fertiliseizer best suits best the soil and crop the use of the wrong type of fertiliseizer may affect the safety of the produce, contaminate soils, and reduce productivity. Table 1 illustrates the large gap in fertiliseizer use between least-developed countries and developed countries.

Table 1 Fertilizer consumption in selected countries, (kilograms per hectare kg/ha of arable land, 2002–2010) (2002-2010)

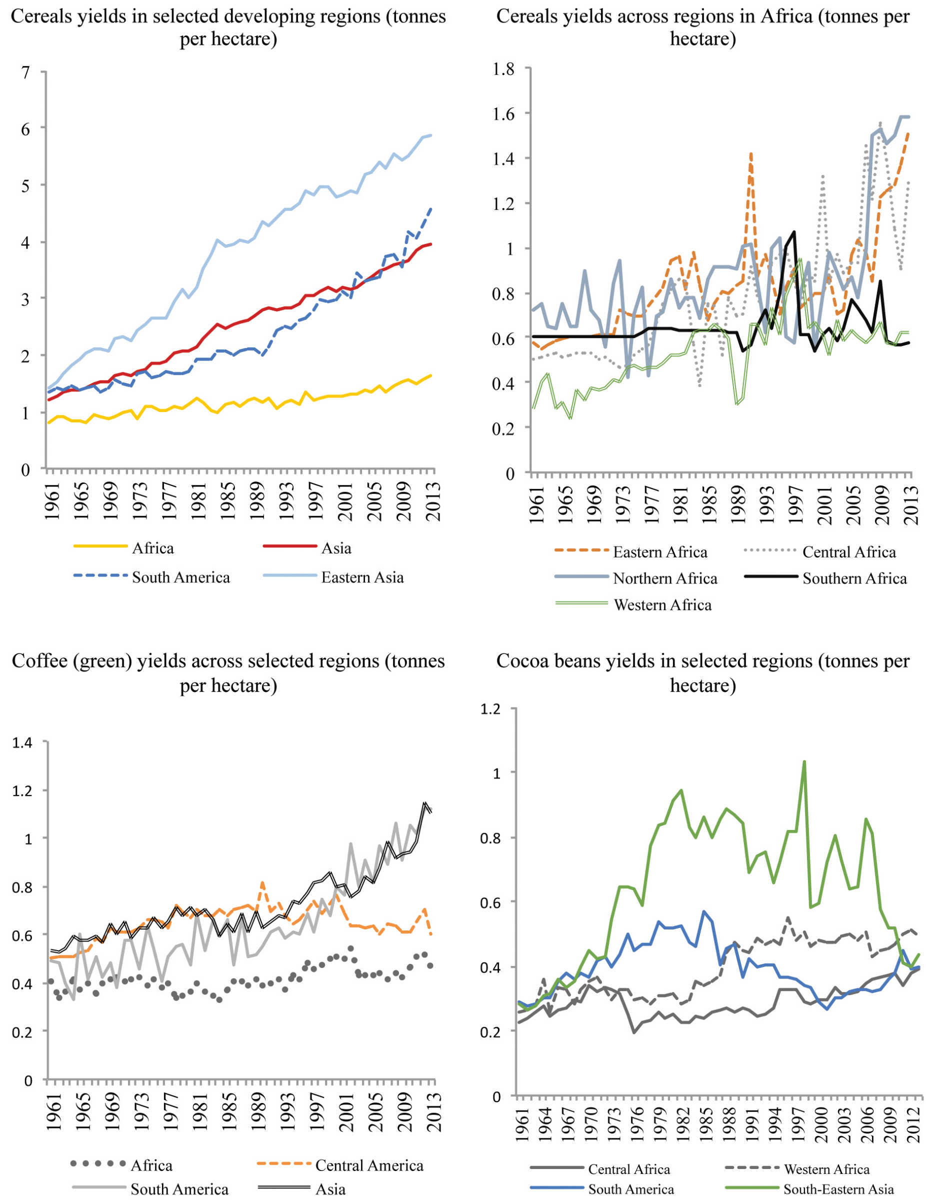
Country	2002–2004	2005–2007	2008–2010
Selected developing or least developed countries			
Congo, Republic	0.88	0.16	1.96
Burundi	0.92	2.85	2.30
Angola	2.65	3.08	3.78
Bolivia	4.35	5.90	6.92
Azerbaijan	10.02	12.45	14.77
Ghana	7.93	14.61	17.20
Kyrgyz Republic	17.81	23.09	20.99
Côte d'Ivoire			
29.56	21.51	21.91	
Zambia	27.38	28.67	30.93
Argentina	39.13	42.36	33.05
Mexico	63.63	70.60	55.33
Colombia	318.26	520.22	518.26
China	358.20	440.70	553.81
Chile	376.42	481.00	557.28
Selected developed countries			
Greece	182.93	141.82	117.89
France	214.51	195.86	150.04
Germany	218.30	208.35	184.20
United Kingdom	306.86	260.36	233.32

Source: UNCTAD Secretariat calculation based on data from World Bank.

Three-quarters of the variation in agricultural productivity in Subsub-Saharan Africa is explained by the use of conventional inputs, namely land, labour, physical capital, livestock and fertiliseizer (Wiebe et al., 2001). The quality of land, labour and livestock in Africa is comparable to that of other developing regions. Fertiliseizer and to some extent physical capital (proxied by the number of tractors used) are the main factors explaining

Africa’s Africa’s relatively low productivity (Figure 1). Therefore, the low level of fertiliseizer use in developing countries, particularly in Africa, is one of the main factors that explains why productivity levels are so low (Figure 1). Africa’s Africa’s cereals productivity improved from 0.8 tonne per hectare in 1961 to 1.8 tonnes per hectare in 2013 which, in absolute terms, is still very low. It took 50 years to double productivity in the continent even though the initial level (productivity in 1961) was very low. In East Asia, in contrast, productivity increased fourfold from 1.4 tonnes per hectare in 1961 to 5.9 tonnes per hectare in 2013. Comparatively, Africa’s Africa’s current cereals productivity is almost equal to East Asia’s Asia’s 50 years ago. The picture of Africa lagging behind other developing regions is the same for cash crops, but the differences in productivity are not as stark as for cereals.

Figure 1: Agriculture yields in developing countries (tonnes per hectare, 1961--2013)



Source: By the authors based on FAOStat.

With its low productivity level, Africa will find it more and more difficult to feed its people, particularly in view of the continent''s rapid population growth. The region is, therefore, faced with two strategies which are not mutually exclusive: increasing its use of fertiliseizer as a way of raising productivity, or embracing sustainable agricultural methods. What seems to be clear is that keeping the current level of productivity is incompatible with the objective of transforming smallholder agricultural activities into sustainable businesses in a context of rapid population growth and increasing pressure on land and water resources.

Increasing fertiliseizer use seems unavoidable in view of the very low productivity observed in Africa. This was the strategy pursued by countries in Asia and South America where productivity dramatically increased over the last 50 years. As Table 1 shows, in less than 10 years, China increased its fertiliseizer use from 358 kilogrammes per hectare kg/ha in the early 2000s to 554kg/ha kilogrammes per hectare in the late 2000s, a fifty per cent 50% jump. However, African countries should learn from the Chinese experience and keep in mind that the intensive use of fertiliseizer resulted in the pollution and degradation of the country's country's natural resources (Xiaoyung et al., 2013). Hence, the optimal use of fertiliseizers will require smallholders to know the type, quantity as well as and timing of fertiliseizer use relative to the needs of soils. A mismatch with any of these three elements not only is wasteful but also could damage the crops as well as and the environment through soil pollution, as observed in some parts of Asia and Europe (Rai et al., 2011).

In addition to fertiliseizer use, African smallholders could also consider dedicating part of their production to sustainable agricultural methods. Empirical research in Africa has shown that organic agriculture can match productivity levels achieved through fertiliseizer-based methods with the added advantage that organic agricultural methods build—-rather than destroy—-natural, social, human, physical and financial capital (United NationsUN, 2008). This choice particularly suits farmers who have limited access to fertiliseizers in the first place. Organic products command higher prices in niche markets which are expected to reach US$ 105 billion in size in 2015. This offers investment opportunities in organic-certified farming which, according to empirical results, generates a positive return on investment (Kleeman et al., 2014). It has been established that small Small-scale farmers participating in this scheme are less likely to be poor relative to non-certified producers (Ayuya et al., 2014).

3.1.2. Access to land

Access to land, when it is secured by legal documents, encourages smallholders to engage in long-term investments, eases their access to credit using land as collateral and allows them to generate revenues through land rental or sale. In many developing countries, however, inefficient market mechanisms, insecurity of land tenure systems and poor land management have limited smallholders'' access to land. In several regions customary systems of land ownership continue to dominate, skewing land distribution. The situation is alarming for women farmers who face additional gender-related constraints including legal or social norms that prevent them from inheriting or simply owning land (FAO, ILO and IFAD et al., 2010).

Land access has been worsened by the overall shrinking of arable land owing to population pressure, climate change, water scarcity (Madiodio, 2011) and, more recently, massive land acquisitions for large- scale -farming, the so-called "land grabs"." In Africa, despite the existence of ample but untapped water resources, poor water control systems as a result of the lack of irrigation infrastructure limit the size of arable land by keeping potentially arable land unproductive. In Subsub-Saharan Africa, only 3.7 per cent% of arable land is irrigated. This is very low in comparison compared with, for example, South Asia where the corresponding figure is 41 per cent%. The International Food Policy Research Institute (IFPRI) termed the lack of irrigation in Africa "the missing piece of Africa's Agriculture puzzle"." In Asia, poor quality of soils due to excessive uses of chemical fertilizers and pesticides has driven farmers to cultivate on increasingly degraded and less productive land. About 74 per cent% of agricultural land in South and Southeast Asia has been severely damaged by chemical pollution (UNESCAP, 2009). Securing access to land by tackling the land insecurity problem, expanding agricultural areas for vulnerable farmers, where feasible, through land reforms, and by addressing the issue of land grabs in some countries could be important ways of facilitating small farmers' sustainable access to land for small-scale farmers. In Rwanda, for example, a land tenure regularization programme which surveyed all the country''s 10.4 million parcels, resulting in the issuance of land titles to all rightful claimants nationwide (Gillingham and Buckle, 2014) had three major positive effects. First, it improved access to land by legally married women, correcting a gender bias in inheritance. Second, investment in land and soil conservation measures increased dramatically, particularly on land owned by women. Third, land market activity declined, rejecting the hypothesis that improving land tenure systems would increase landlessness through distress sales by vulnerable people (Ayalew et al., 2014).

It is also worth noting that Moreover, some African countries, including the Democratic Republic of Congo, the Central African Republic, South Sudan, and others have large swathes of unexploited land that could become productive assets if they were made accessible through infrastructure development and turned into productive farms, small and large.

3.1.3. Access to rural labour market

Rural labour markets serve non-agricultural and agricultural activities which often compete for available labour resources. Labour markets in developing countries are generally informal and tightly tied with the seasonality of agricultural activities (Wodon and Beegle, 2006). Small-scale farming households use rural labour markets to sell their own labour for wages, as well as and to buy labour to work on their farms. As a result, labour markets offer smallholders an opportunity to increase their incomes, diversify sources of revenues and smooth out the seasonality of agriculture incomes (Estudillo et al., 2012). However, in many countries, especially in Africa, thin rural labour markets and low wages imply that smallholders derive most of their revenues from their own agricultural activities. Other challenges including the lack of human, financial and physical capital, gender-related issues, social status and discrimination, restriction on geographic and occupational mobility, poor educational levels and weak government

support, frustrate smallholder farmers' participation in rural off-farm labour markets (Haggblade et al., 2010; Jayne et al., 2010).
On the other handHowever, rural labour markets allow farmers to buy labour in order to access specific skills their households lack; diversify the households labour between on-farm and off-farm activities; or respond to seasonal spikes in labour demand during intensive periods in the agricultural cycle. Most labour exchanges are governed by monetary transactions, but many smallholders are part of community reciprocal labour sharing arrangements.

In the developing world, however, one of the characteristics of smallholder farmers is that they predominantly rely on family labour (Birner, 2014). This is a response to the high cost of hiring labour, including selecting, supervising and paying costs that are often beyond the financial and managerial capacity of a small-scale farmer (Hazell et al., 2010). In most cases, income from selling one''s labour is complementary to, and not substituting for, small-scale farming.

3.1.4. Access to credit and other financial services

The financial sector in developing countries is characteriseized by the coexistence of formal and informal activities. Formal finance is provided by commercial banks with limited penetration in rural areas whereas informal finance is dominated by intermediaries including money lenders, credit associations, cooperatives and microfinance structures. These entities provide financing such as credit, savings and other services to farmers. These services not only help small-scale farmers to better manage their cash flows, but also invest when opportunities arise, while being protected from the vagaries of markets and production systems (Wiggins and Keats, 2013).
In most developing countries, smallholders are marginalized in terms of access to formal credit. In Africa, only about only one per cent 1% of commercial lending is allocated to agriculture, with most of it allocated to large-scale farmers (Salami et al., 2010). Formal financial institutions are often reluctant to provide financial services to small farmers. Among the reasons they cite are the lack of collateral such as titled land, unstable revenue flows, the risky nature of farming activities, and the difficulty in evaluating the small farmers' capacity of smallholder farmers to repay their loans (Salami et al., 2010). Where credit is available, interest rates are often too high and repayment terms often incompatible with the terms of farmers'' investment (ASFG, 2013).

The scarcity of formal financial services in rural areas has led to the emergence of informal financial intermediation, particularly microfinance. However, for a typical smallholder, the main shortcoming of microfinance is its high interest rates; annualized, they can reach 100 per cent%. As a result, many farmers cannot afford to borrow from microcredit institutions and rely on other informal financing mechanisms such as money lenders, pawnbrokers, crop-buying agents, group savings, as well as and credit associations and cooperatives (Hanumantha, 2012; Kadri et al., 2013). In some instances, poor access to credit has led smallholders to enter into partnerships with traders who provide them with the money they need during the planting season in exchange for their crops often with very unfavourable terms for the sellers (Bergaly Kamdem et al., 2009).

The provision of other financial services such as insurance services is also lacking in most developing countries although these would benefit smallholders in many ways, through better management of market and weather risks, expansion of farming business, and better access to credit. Weather index-based insurance, for instanceexample, was broadly considered as an attractive alternative to managing weather risks (United NationsUN, 2007). However, in a number of several cases, the scheme has met with limited success due to factors including the prevalence of covariant risk between insurance and credit, lack of an insurance culture, and the weaknesses of the financial sector in rural areas (Cole et al., 2012; Linnerooth-Bayer et al., 2011).

Therefore constraints to accessing financial services reduce farmers' capacity to invest in their productive capacity and drive them back into subsistence agriculture and poverty. Policies for innovative financing mechanisms are needed to increase farmers'' financial ability to invest in their productive capacity and propel them away from subsistence agriculture and poverty. There are sSome successful experiences have been recorded. For example, the Equity Bank of Kenya has developed a credit model targeting smallholders in the country, which shows that even the private sector can make a profit while allowing smallholders to transform their activities into sustainable small businesses.

3.2. Smallholders and output markets

Smallholders directly sell their production in domestic markets and indirectly in international markets through agents and exporters. What are the major issues they face in these markets?

3.2.1. Access to domestic markets

Smallholders produce mainly for domestic markets where they sell at the farm gate, village and urban markets. Part of the production is sometimes sold in regional markets which in most cases have similar characteristics as domestic markets. Crops traded in these domestic and regional markets comprise local staples such as cassava, maize, yam, plantain, sorghum and vegetables in Subsub-Saharan Africa; rice, vegetables and spices in Asia; and maize, roots and tubers in Latin America. Producer prices tend to increase as the farmer chooses to sell at a village rather than a farm gate market, and to an urban rather than a village market. As discussed earlier, transaction costs and the availability of market information are key determinants of where smallholders sell their products.

Farm gates and village markets

Farm gates and village markets in developing countries are generally informal and require low quality standards. Although they are easily accessible to farmers, they offer low profitability and growth potential. Participation in these markets is generally driven by the lack of infrastructure and market information that prevent farmers from bringing their produce to distant, but more lucrative markets, including urban markets. Smallholders face high transport costs as a result of the poor state of transportation infrastructure. This is particularly the case during the rainy season when rural roads become hardly almost impassable. Even where roads are of good quality, smallholders have to rely on costly public or private transport vehicles, making it hard to move away from farm-gate sales. As a result, many smallholders sell their produce at the farm gates or in the nearest village markets where prices are usually lower compared to than in urban markets (Prudencio B. and Ton, 2004).

Smallholders'' reliance on farm gate and village markets could also be due to the lack of market information on trade opportunities and prices. Despite the recent developments in information and communication technologies (ICTs), smallholders in many regions are still operating in an environment where poor market information services (MIS) forces them to depend on unreliable word of mouth market information from fellow farmers, relatives or middlemen. As a result, traders who generally have better access to market information use this information advantage to offer farmers prices that are substantially lower than those they could collect from urban buyers or exporters. This contributes to explaining the low ratio of domestic producer prices to international prices, as illustrated later in this paper.

Urban markets
Urban markets are more formal than village markets. They offer better market opportunities and higher profitability to farmers than farm gate and village markets. As discussed earlier, these markets are even larger than export markets for many products of interest to smallholders and they have a high growth potential. For example, the emergence of super markets in several developing countries gives smallholders access to middle and high income market segments, generating higher value with less volume, in comparison with village markets. The growth in super-markets in developing countries has induced profound changes in food demand from urban consumers. As a result, farmers are facing new challenges in terms of quality requirements (Reardon et al., 2012). If farmers are to comply with these quality requirements, they need to develop specific skills, and have access to financial resources and timely information, issues that are still problematic in many developing countries. However, the ability to comply with quality standards provides smallholders with an opportunity to grow their businesses: for instanceexample, the participation of Kenyan vegetable farmers in supermarket channels enabled them to increase their per capita revenues by 50 per cent% (Rao and Qaim, 2010).

As for input markets, farmers'' participation in urban and regional output markets is often constrained by poor or the absence of non-existent infrastructure that links them to markets. Poor infrastructure contributes to increasing the transport costs that erode farmers'' margins. In Africa, most smallholders use public transport, usually passenger buses to take their produce to faraway markets. This inadequate mode of transport often leads to bruises bruising and damages to the products as they are normally poorly packed, reducing their quality. Hence, smallholders often sell their produce at lower prices when they finally get to the markets. The problem becomes more acute as the distance from the farm to the market increases.
At the regional level, poor infrastructure and logistics limit smallholder farmers'' access to cross-border formal markets (Mbekeani, 2010). In some cases, weak regional

market integration makes regional trade so expensive that it forces agro-processors in developing regions to import agricultural products from outside rather than in the same region. Nevertheless, the increasing middle class in developing countries is spurring regional markets to become new hubs, sustaining smallholders'' businesses. The success of on-going initiatives for regional integration would help farmers to access such increasing opportunities.

Poor market information services often prevent farmers from meeting market requirements (Soule, 2013). A study in Tanzania showed that farmers with better access to market information through the use of ICTs tend to sell a lot much more and receive relatively better prices than other farmers (Mwakaje, 2010). Appropriate investment and support from private and public sectors are needed if ICTs are to fulfil their potential of facilitating farmers'' access to markets and related information.
Farmers need support to tackle these various constraints. Such support may include the creation of effective farmers' organizations to help attain economies of scale and comply more easily with quality and safety requirements in domestic and urban markets. Such organizations also would help farmers to develop their farming skills through appropriate training in order to take full advantage of the benefits offered by these markets. Some mechanisms put in place over the last two decades to assist smallholders to address some of the issues discussed above did not yield the expected results partly because these schemes failed to attract a large number of many smallholders, the backbone of agricultural production in Africa. For example, the promotion of commodities exchanges in Africa over the past two decades has not met expectations despite their potential to respond to some of the needs of smallholders' needs.

3.2.2. Access to international markets

Many smallholders also produce for international markets. Their production includes traditional cash crops such as cocoa, coffee, tea and cotton as well as and high value products such as vegetables, fruits and flowers. These markets remain important for many developing countries as a major source of hard currency, employment, and income for economic agents including farmers, traders and exporters. For most cash crops and high value products, international markets offer larger demand and higher prices than domestic markets (Wiggins and Keats, 2013). Various constraints continue to limit smallholders' participation in these markets, including high safety standards, price instability and market power imbalance.

Quality and safety standards contained in World Trade Organization (the WTO) Agreement on Sanitary and Phytosanitary measures (SPS) are set to protect human health and safety, animal welfare and natural resources. As such, these measures are legitimate. These standards have created opportunities for farmers to successfully (re-) position themselves in specific markets of certified products. Standards have contributed to boosting trade of products targeting niche markets, with part of the benefits passed on to farmers (Rao and Qaim, 2010). However, the extent to which farmers benefit from these opportunities depends on the support they receive to comply with the standards. Compliance with standards requires considerable knowledge, financial and technological resources which small-scale farmers, and even governments in exporting countries, might not have (Lee et al., 2012; Wiggins et al., 2011). Also, sometimes, safety and quality requirements are more stringent than internationally accepted norms. Such cases make standards appear as non-tariff trade barriers (NTBs) (Li and Beghin, 2012), a disguised form of discriminatory and protectionist measures that hamper the participation of developing countries' participation in international markets.

Recent trends in commodity markets have been characteriseized by high and volatile agricultural commodity prices. Price instability introduces uncertainty in the market making producers'' decisions difficult. For example, farmers who increase investments following a period of high prices and harvest during periods of low prices make losses, discouraging them to from make making further investments. Moreover, in a context where price risk mitigation systems are limited, sudden price variability affects smallholders' welfare as it erodes the incomes they derive from selling these commodities. Variability in international prices for wheat and cocoa beans, for example, has increased significantly after 2000 (see Table 2).

Table 2: Variability in international prices for wheat and cocoa beans, real terms

Wheat		**Cocoa beans**	
1980–1999	2000–2012	1980–1999	2000–2012
13.8	17.2	15.6	23.00

Source: Calculations of UNCTAD Secretariat based on data from UNCTAD Stat.

Note: The table reports the standard deviation of changes in international prices (denominated in USD) deflated by the US Consumer Price Index (CPI).
Source: Calculations of UNCTAD Secretariat based on data from UNCTAD Stat.

The issue of price variability in international markets and its negative effect on farmers has become particularly acute as farmers have been increasingly exposed to the vagaries of international markets following market liberalisation liberalization policies introduced in most developing countries in the 1980s and 1990s. This is illustrated by producer prices of wheat in Pakistan and cocoa in Côte d'Ivoire d'Ivoire which experienced dramatic changes during the 2000s (see Table 3).

Table 3: Variability in producer prices, real terms

Pakistan (wheat)		**Côte d'Ivoire (cocoa beans)**	
1980–1999	2000–2010	1980–1999	2000–2009
8.9	28.56	16.1	35.5

Source: Calculations of UNCTAD Secretariat based on data from FAO (producer prices)

and IMF (CPIs)
Note: The table reports the standard deviation of changes in producer prices deflated by national CPIs. Differences in sample periods in Tables 2 and 3 are due to data availability.
Source: Calculations of UNCTAD Secretariat based on data from FAO (producer prices) and IMF (CPIs)

Tables 2 and 3 show that international prices of wheat and cocoa were less volatile than producer prices in Pakistan and Côte d''Ivoire, suggesting that volatility in producer prices is more than a simple transmission of price volatility from the international to the domestic market. Domestic policies and market structure also contribute to producer prices' volatility. As the issue of market instability persists, a case should be made for adequate support to farmers, especially the most vulnerable ones, to enable them to cope with the vagaries of commodities markets.

The power structure in export crop markets is often unfavourable to scattered smallholders even when, collectively, they account for a large share of the export market for a specific product. This is the case with cocoa producers in Côte d''Ivoire and Ghana. Asymmetric power makes smallholders "''price takers"" a status that potentially erodes the share of the international price of the export commodities which accrues to them. Where concentration is not significant in national markets, a high number of many intermediaries along national value chains could prevent farmers from receiving high prices as each intermediary shares in the profit that could have been fully allocated to the farmers if they had a direct access to export markets (Lee et al., 2012). This national market structure usually leaves farmers with little room for negotiation. Some intermediaries also behave opportunistically by taking advantage of the weakness of smallholders, offering them the lowest possible prices (IFAD, 2010).

The discussion above does not mean that intermediaries are unwelcome in commodities value chains. On the contrary, they play an important role linking farmers with markets by providing them with services such as marketing, inputs and finance through contractual arrangements (Poulton et al., 2010). In addition, intermediaries are likely to attain economies of scale by bulking and selling large quantities of crops to exporters. This may ultimately result in efficient marketing chains with cost savings potentially transmitted to farmers. This is illustrated by the case of the shea value chain in Burkina Faso where wholesalers contribute to the smoothing of value chains and profit sharing with producers (Rousseau et al., 2015). Therefore, it is not the existence and usefulness of intermediaries that is contested but rather the opportunistic behaviour of some within domestic value chains. Again, strong farmers' organizations would not only allow bulking, but also confer larger negotiating space to farmers to defend their interests.

4. Assessing the impact of trade and economic policy on smallholders

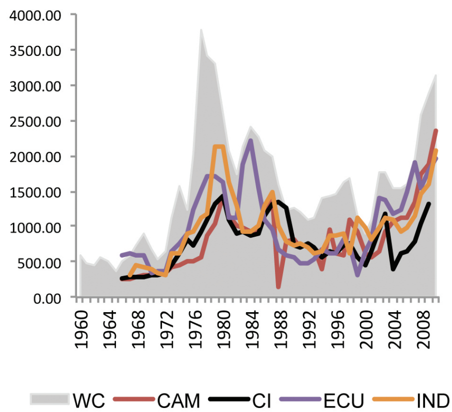
As stated earlier, agricultural development is first and foremost a matter of policy choice. This Section section illustrates the extent to which smallholders are affected by domestic policy changes following the liberalization of markets for export commodities. Smallholders are linked with international markets through their production and trading of cash crops, horticultural and floricultural products. Therefore, although they do not deal directly with importers, they are affected by changes in international markets. Understanding how international prices affect producer prices is important given that the price they receive is a key driver of farmers'' decisions to supply international markets. Moreover, it would be important to assess the extent to which new policies, for example, the dismantlement of commodity marketing boards, affect smallholders through changes in market exposure and variation in producer prices.

4.1. Brief discussion of the methodology

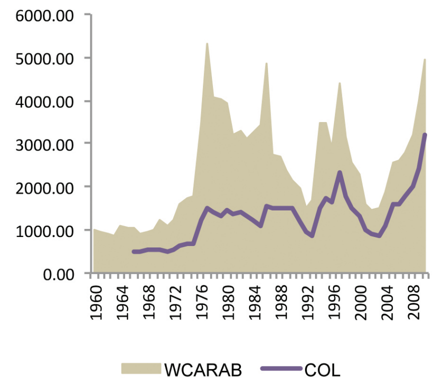
By analysing the co-movement or cointegration between producer and international prices of some selected commodities (see trends in Figure 2) before and after the introduction of policy reforms, time series econometric techniques are used to assess the extent to which smallholders' higher exposure to changes in international commodities markets affects them.

Figure 2: International and producer prices in some selected countries

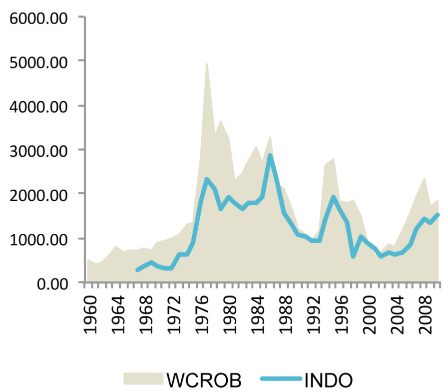
Producer prices in Cameroon (CAM), Côte d'Ivoire (CI), Ecuador (ECU) and Indonesia (IND) in relation with international prices of cocoa (WC)



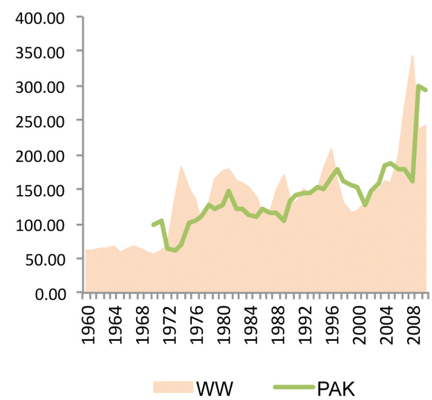
Producer prices in Colombia (COL) in relation with international prices of Arabica coffee (WCARAB)



Producer prices in Indonesia (IND) in relation with international prices of Robusta coffee (WCROB)



Producer prices in Pakistan (PAK) in relation with international prices of wheat (WW)



Note: All prices are expressed in US$ per tonne.

Source: UNCTAD Secretariat based on data from UNCTADStat and FAOSTAT.

Cointegration and its associated error correction methodology help to answer three key questions of policy relevance. First, is there a stable relationship between producer prices and international prices as suggested by their respective trends in Figure 2? If the relationship exists, how strong is it? Second, what are the short- term and long- term characteristics of this relationship? Third, how have these relationships been impacted affected by economic liberalization programmes, and in particular trade reforms in the commodities sector, undertaken by several developing countries in the context of Structural structural Adjustment adjustment Programmes programmes (SAPs) in the 1980s and 1990s?

The analysis of the international -producer price linkage must consider trade reforms as they may have introduced structural breaks in price patterns. Indeed, prior to before the reforms, government interventions through commodity marketing boards sometimes weakened the link between national and international commodity markets by acting as a buffer absorbing both positive and negative price shocks emanating from the international market. Therefore, to address the third question, cointegration is applied to price series before and after the introduction of policy reforms. The year of the abolition of commodity marketing boards is used to define the before and after periods (Table 4).

Table 4: Sample periods and break dates

Country and commodity	Period	Break date	Key arguments for break dates	Source of break date
Cameroon, cocoa	1966–2010	1989	Liberalization of domestic marketing and export trade started from 1989/1990 crop season	UNCTAD (2008)
Côte d'Ivoire, cocoa	1966–2009	1996	From 1995/1996, exporters began to purchase cocoa directly from farmers. However, we may note that disengagement of the state from the sector was progressive.	UNCTAD (2008)
Ghana, cocoa	1991–2012	1993	Liberalization of the internal marketing of cocoa during 1992/1993 crop season. Licensed private buyers started competing with a subsidiary of the Ghana cocoa board	UNCTAD (2008)
Ecuador, cocoa	1966–2011	1992	Market-oriented reforms with liberalization of trade and capital flow started around 1992	Vos (2000)
Indonesia, cocoa	1967–2010	1985	Gradual relaxation of trade barriers started in 1985	Baffes and Gardner (2003)
Indonesia			Gradual relaxation of trade barriers started in 1985	Baffes and Gardner (2003)
coffee (Robusta)	1967–2010	1985	Trade liberalization reforms began in 1990	Baffes and Gardner (2003)

Country and commodity	Period	Break date	Key arguments for break dates	Source of break date
Colombia, coffee (Arabica)	1966–2011	1990	1991 was the year of trade liberalization	Santos-Paulino (2002)
Pakistan, wheat	1970–2010	1991		

Break dates should be interpreted with caution as policy reforms may take several years before being fully implemented, even following official announcements. More generally, caution must be exercised in interpreting the results of the econometric approach and drawing strong conclusions since the data used are not perfect. For example, producer prices from the FAO statistical database may be wholesale prices instead of prices paid to producers. Moreover, some prices may have been estimated by the FAO when if countries do did not provide the required data. However, despite this caveat, the statistics are considered to be good enough and the methodology appropriate to generate useful insights.

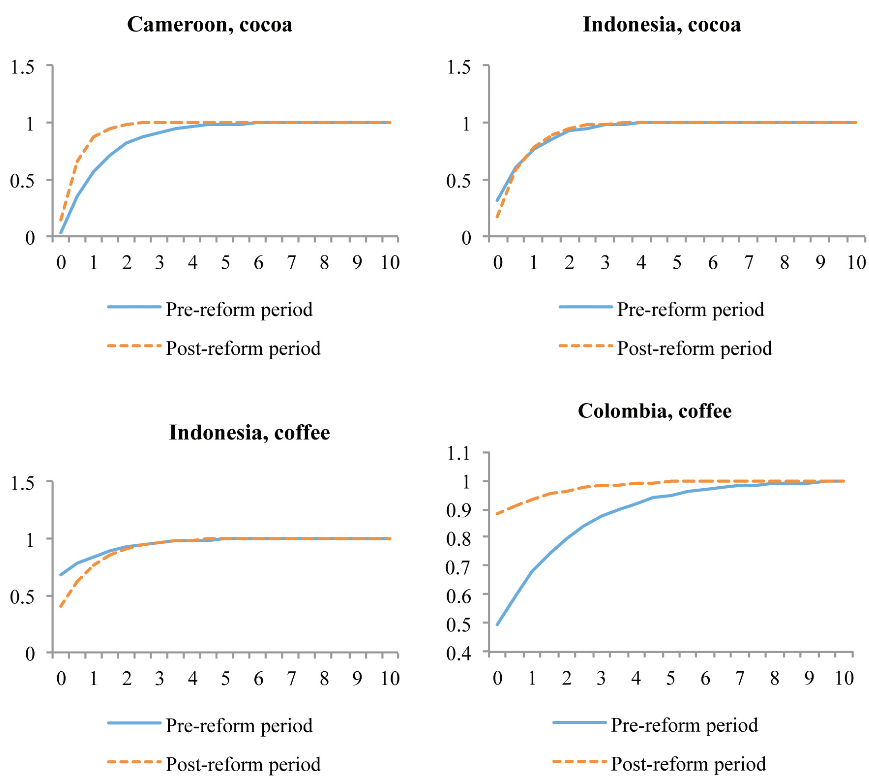
4.2. Main results and discussions

Stationarity tests for international and producer prices (see Table 1 and Table 2 of Annex 2) suggest that producer and international prices could have a stable relationship,; however, formal testing is needed to confirm this a priori.

The results of cointegration tests which do not account for policy changes that could have affected the relationship between producer and international prices (see Table 3 of Annex 2) confirm the existence of a cointegrating relationship between the two prices for the selected commodities and countries, with the exception of cocoa in Ghana. In Cameroon, for example, a unit decline in the international price of cocoa results in 0.6 unit decline in the domestic price. In Côte d''Ivoire, one unit decline in the international price leads to 0.9 unit decline in domestic prices. The implication is that small cocoa producers in Côte d''Ivoire are more exposed to changes in the international cocoa price than in Cameroon. Indeed, the results show that 78 per cent% of the variation of the producer price of cocoa in Côte d''Ivoire is due to changes in the international price, but the percentage is as low as 61% per cent for Cameroon''s cocoa, 38 per cent% for Ghana''s cocoa and 41 per cent% for Pakistani wheat. Coffee producers in Colombia seem to be even more exposed to changes in the international price given that the latter explain 88 per cent% of the variation in domestic producer prices. These long-term results suggest that small-scale farmers in these countries are, to varying degrees, exposed to changes in international markets which are beyond their control as they are price takers.

What about the short term effects? (See see Table 4 of Annex 2)?. The results suggest the existence of a short-term transmission mechanism between producer and international prices for the selected commodities in six out of seven cases. The time needed for a shock to the international price to end, the so-called speed of adjustment to equilibrium, varies by product and country, as Figure 3 illustrates (blue curves). For example, before policy reforms in Cameroon, information in Figure 3 suggests that it took about 4.5 years to for domestic prices to absorb a shock on cocoa prices whereas the corresponding period was about 2.5 years in Indonesia. For coffee, shocks required about 3 years in Indonesia and 7 years in Colombia to be absorbed, before the introduction of policy reforms.

Figure 3: Speed of adjustment to equilibrium price



Source: Computed by the authors based on econometric results.

In order to To illustrate the effect of trade and economic policy changes on small producers of cash crops, the models estimated in the previous section are re-estimated, but with the inclusion of a dummy variable that captures the adoption of a new policy. Specifically, this section uses equations Equations (4) and (5) (see Annex 1). The inclusion of structural breaks is based on information summariseized in Table 4. In brief, information in Tables 5 and 6 of Annex 2, which summariseize the findings of the cointegration tests taking into account the existence of structural breaks due to policy changes, . This information establishes the extent to which market liberalisation liberalization increased exposure of commodity producers to the vagaries of international markets.

With the exception of Except for Ghana, all cases in Table 5 of Annex 2 show that there is a cointegrating relationship between producer prices and international prices both before and after the introduction of liberalization policies. The elasticities of producer prices with respect to international prices are higher in the period post-reform than the period before. In Cameroon, for example, before the reforms, a one per cent 1% increase in the international price of cocoa led to only 0.3 per cent% increase in domestic prices, ceteris paribus. The effect became much stronger after the introduction of reforms as a one per cent 1% increase in the international price of cocoa resulted in a 0.9 per cent% increase in the domestic price, ceteris paribus. This result seems to confirm the assertion that the trade and economic reforms adopted in these sample countries in the 1980s and 1990s increased the exposure of small producers to the developments, both negative and positive, in international markets. The dismantlement of institutions such as commodity marketing boards that guaranteed prices to producers meant that producers were exposed to price volatility with important consequences on their production and investment decisions, and hence their incomes.

Table 6 of Annex 2 shows the short-term dynamics. The short-term results are mixed even though they are, generally, qualitatively comparable with the long-term results previously discussed above. The short- term relationship between producer prices and international prices is stronger in the period after the introduction of reforms in five out of the seven cases shown in Table 6 of Annex 2. The implication is that policy reforms increased the exposure of small-scale farmers to changes occurring in the international commodities markets. Moreover, the speed of adjustment to equilibrium is systematically faster in the post-reform period (Figure 2), indicating that trade and economic reforms did not only affect the elasticities measuring the extent to which changes in international commodity prices affect domestic prices, but also increased the speed with which prices adjust to their equilibrium level. For cocoa producers in Cameroon, policy reforms seem to have halved the speed of adjustment to the equilibrium price. In contrast, in Indonesia, policy reforms do not seem to have had any major effect on the speed of adjustment given that the market was relatively open even before the reforms were introduced. The difference in the speed of adjustment is even starker when comparing coffee prices in Indonesia and Colombia (Figure 2).

In summary, there seems to be a qualitative similarity of results before and after reforms, particularly for equilibrium prices. This suggests that although prices were regulated in developing countries before the implementation of market liberalization policies, producer prices were, over a long time horizon, continuously adjusted by state commodity marketing boards to reflect international market realities. Moreover, even during the periods when trade was liberalized, governments still had ways of affecting producer prices through other domestic policies such as taxation. This partly explains the differences in the shares of the international export prices accruing to small farmers across countries as illustrated in Table 5.

Table 5: Producer prices in percentage shares of international prices, (1985–-2009)

	Cocoa					Coffee		Wheat
	Cameroon	Côte d'Ivoire	Ecuador	Ghana	Indonesia	Colombia	Indonesia	Pakistan
1985–1989	63	65	53	n.a.	61	45	85	82
1990–1994	56	57	45	39	57	56	77	101
1995–1999	58	46	42	46	60	55	67	102
2000–2004	54	51	77	52	71	60	92	108
2005–2009	68	42	76	50	58	62	63	83

Notes: Price shares refer to share of average annual prices (nominal terms) over a given period (1985–-1989, 1990–-1994, etc.).
Source: UNCTAD secretariat calculation based on UNCTADstat and FAOSTAT.

The shares of producer prices relative to international prices are unstable both within and across countries. For example, in Côte d''Ivoire, the world's main producer of cocoa, the producer price share plummeted from 65 per cent% in the second half of the 1980s to 42 per cent% in the second half of the 2000s. In contrast, Ecuador's producer price shares increased from 53 per cent% in the late 1980s to 76 per cent% in the late 2000s. Why do Ivorian cocoa producers from Côte d'Ivoire only get almost about half of what their counterparts in Ecuador receive, assuming that both countries sell to comparable export markets? Even though there could be various reasons why these price shares could differ (e.g., proximity with international markets) the contrasting evolutions of producer prices in different countries might be explained, to some extent, by domestic factors.

High taxation of the domestic cocoa sector in Côte d''Ivoire could be one of the reasons why its smallholders only get a fraction of the international price. Taxes in Côte d''Ivoire were between 25% and- 30 per cent% of export prices over the period 2002–-2009 (Kireyev, 2010). In contrast, increasing shares of producer prices in Ecuador could have been associated with national policies such as the establishment of minimum reference producer prices by the government and the suppression of export taxes. Other determinants could include domestic market regulation or deregulation, marketing and processing costs, bargaining power, national socio-economic environment, and the level of farmers'' integration in the cocoa value chain. If differences were mainly explained by the proximity with international markets, there would be no substantial difference between domestic prices in Côte d''Ivoire and Ghana in the period 2005–-2009 given that these two major coca producers are neighbours and export to the same markets.

The main lesson from the econometric analysis is that, generally, smallholders are integrated in international markets through producer prices that seem to be strongly linked with international prices. This relationship appears to have strengthened in the post-liberalization period, exposing producers to wide swings in international prices particularly in the 2000s. While stronger integration in the international market might have brought advantages to smallholders who are able to rise to the challenges this integration entails, changing market conditions and price volatility heightened uncertainty that increased the vulnerability of smallholders. The lack of or inaccessibility to insurance instruments adapted to the needs of small-scale farmers compounds the problem. Moreover, for many countries in the sample examined above, strong integration in international markets coexisted with low producer price shares of international prices, suggesting that the level of the international price is just one factor among many that affect producer prices. Smallholders face additional challenges such as poor marketing skills, national policies particularly fiscal regimes that may be unfavourable to them as well as weak market power due to their atomisationatomization.

5. Conclusion and policy suggestions

Market participation is essential for smallholders to fully benefit from their agricultural activities. Although some of them may have access to lucrative segments of national and international markets, many continue to trade on less profitable local markets including farm gates and village markets. Input and output market failures and market imperfections that plague most developing countries' the rural economies of most developing countries continue to hinder participation of small-scale farmers' participation in the national and international trading systems. Poor infrastructure, lack of market information, and high safety and quality standards are some of the problems that will need to be overcome in order to increase smallholder farmers'' participation in domestic, regional and international markets.

Smallholders participation, indirectly, in international markets have has been affected by high price volatility particularly since the dismantlement of commodity boards in the 1980s and 1990s. While smallholders' exposure to international markets is not a constraint in itself;, the problem arises from the fact that these market players do not have the capacity and tools needed to fully benefit from these markets. For example, understanding and accessing insurance schemes protecting them from the adverse effect of price volatility would help smallholders to stabilize their incomes. Moreover, power imbalance in favour of large corporations penalizes small-scale farmers as they are atomiseized with little or no negotiating power. These impediments need to be addressed in order to help smallholders get obtain fair prices for their produce and increase welfare.

When implementing policies to enhance smallholders' participation in markets, policy makers should keep in mind that this group is heterogeneous. Not every smallholder has the skills or ability to participate in markets even in a much improved policy environment. But even the least performing among smallholders deserves support simply because assistance to smallholders is a way of addressing social problems, particularly poverty and inequality which keep large parts of populations in at the margins of economic progress. This is of particular importance as we approach the implementation of the Post-2015 Sustainable Development Agenda whose motto is "''leave no one behind".''

One way of linking smallholders with export markets would be to reduce the number of intermediaries who often benefit at producers'' expense. This is a matter for domestic policy relating to the industrial organization of the commodities sector. Strengthening farmers'' associations would also give more voice to atomized smallholder farmers and increase their bargaining power in domestic and export markets. There are many actions governments could take to encourage the formation of strong farmers'' associations. They include training, putting in place regular consultation mechanisms, increasing resources allocated to agriculture, etc. For some countries such as Côte d''Ivoire, lowering taxation could help increase the share of the international price paid to smallholders.

Smallholders deserve an enabling environment in which they could realize their full potential. This calls for the removal of biases against them where policies often favour large-scale farmers at the expense of small-scale ones. As discussed in this paper, improving land tenure systems can go a long way in towards addressing some of the recurrent issues that keep smallholder agriculture at the fringes of development policy. Easing constraints to accessing other inputs such as fertiliseizers, high quality seeds, and financial resources will allow smallholders to be more productive and derive higher incomes from their agricultural activities. This will make small-scale farming a viable business for many smallholders who currently derive limited revenues from farming. Even though the experience with commodity marketing boards was relatively unsuccessful in sustainably helping small-scale producers in many cases, there are other examples both from the public and private sector, which have shown that small producers can thrive if given the opportunity. Smallholders could enhance their productivity and output if they have had unencumbered access to credit, training and institutional support, as do other businesses. The experience of Ghana's Ghana's Cocobod suggests that focused reforms including efficient management, improved governance and greater accountability can help smallholders to improve their productivity, increase market access and, thus, income and welfare. (

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Annex 1.Domestic and international commodity market integration: empirical Empirical model, variable description and main results

Establishing whether or not domestic commodity markets are integrated with international markets is carried out through the establishment of a cointegrating relationship between producer and international prices. Similar studies relying on dynamic models to establish a relationship between producer and international prices include Baffes and Gardner (2003) and Worako et al. (2008).

Consider yt and xt as the producer and international price, respectively, of a given commodity expressed in logarithms. The link between the two prices may be written as follows:

(1)

where is the error term. A necessary condition to conclude that a producer price is strongly related to the international price for a given commodity requires that yt and xt be cointegrated, meaning that:

(2)

is a stationary process. If the two prices are cointegrated, their relationship is said to be in equilibrium or steady state. The short-term relationship is estimated through the following Error Correction Model (ECM) equation:

(3)

where gives the short-run relationship between the variation of yt and that of xt; and the coefficient is the adjustment coefficient. The latter captures the speed with which prices in equation Equation (1) re-adjust to their equilibrium level following short-term shocks.

In order to To consider the impact of possible structural breaks such as the introduction of trade reforms that might have affected the relationship between the two prices, multiplicative dummy variables are introduced in equations Equations (1) and (3) as in Worako et al. (Worako et al., 2008). An additive dummy variable is also added to equation Equation (1) to capture possible changes in the constant term before and after the reform periods. Denoting the dummy as for prices obtained during the period after the introduction of reforms and zero otherwise, equation Equation (1) becomes:

(4)

Coefficients (i = 1, 2) describe the short-run effect of the variation in producer and international prices, respectively, before and after the reforms were introduced, whereas (i = 1, 2) capture the speed of adjustment to equilibrium prices before and after reform periods, respectively.

Prices used for the econometric analysis are real prices. Nominal prices in US dollars are deflated by the United States Consumer Price Index obtained from the World Bank database. Producer prices are from the FAOSTAT. Where prices are expressed in local currency, they were converted into US dollars using annual average exchange rates from UNCTADStat. International prices for the selected agricultural commodities are also from UNCTADStat.

International cocoa beans prices represent the average of the daily prices of the nearest three active future trading months on the London Terminal Market and on the New York Coffee, Sugar and Cocoa Exchange at the time of the London close, as defined by the International Cocoa Organization (ICCO). Prices of Arabica coffee represent average daily prices of Colombia mild Arabicas (ex-dock USA). Prices of Robusta represent the weighted average prices of Côte d'Ivoire Robusta Grade 2, Uganda Standard, Indonesia EK Grade 4 and Vietnam Grade 2 (Exex-dock USA). Finally, prices of wheat represent the free on board (f.o.b.) prices of hard red winter wheat. Furthermore, all prices were converted into US dollarsD per tonne to facilitate comparison and were transformed into natural logarithm.

Annex 2. Tables depicting the main results of the econometric study

Table 1: Stationarity tests for international price of selected commodities

International prices	Prices in level				Prices in first differences	
	Without trend		With trend			
	ADF	PP	ADF	PP	ADF	PP
Cocoa	-1.962	-1.621	-2.752	-2.055	-6.442***	-5.199***
Coffee (Arabica)	-1.808	-1.825	-2.452	-2.378	-5.187***	-6.434***
Coffee (Robusta)	-1.720	-1.536	-2.845	-2.307	-5.261***	-5.557***
Wheat	-2.180	-1.766	-2.923	-2.118	-6.156***	-5.406***

Table 2: Stationarity tests for producer prices

Producer prices	Prices in level				Price differentials	
	Without trend		With trend			
	ADF	PP	ADF	PP	ADF	PP
Cameroon , cocoa	-1.687	-1.940	-1.754	-2.066	-5.630***	-7.808***
Côte d'Ivoire , cocoa	-1.565	-1.520	-2.431	-2.347	-5.011***	-6.580***
Ghana, cocoa	-1.836	-1.584	-4.818**	-3.090**	-5.058***	-4.158***
Ecuador , cocoa	-1.823	-1.734	-1.627	-1.519	-4.649***	-5.951***
Indonesia , cocoa	-1.650	-1.556	-1.742	-20.44	-4.422***	-6.253***
Indonesia , coffee (Robusta)	-1.518	-1.492	-2.349	-2.398	-4.52***	-5.796***
Colombia , coffee (Arabica)	-2.076	-1.909	-2.015	-1.784	-4.090***	-5.035***
Pakistan , wheat	-2.977**	-2.704*	-2.557	-2.268	-4.560***	-6534***

Note: Significance level at 1%***, 5%**, 10%*.

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Note: Significance level at 1%***, 5%**, 10%*.

Table 3: Cointegration between international and producer prices without structural break

Cointegration b/n world and producer prices without structural break					
	Constant	Beta coefficient	Adj-R^2	ADF	PP
Cameroon, cocoa	0.674***	0.631***	61	-3.287**	-3.922**
Côte d'Ivoire, cocoa	0.606	0.923***	78	-3.386**	-3.982***
Ghana, cocoa	-0.212	0.958***	38	-2.469	-2.407
Ecuador, cocoa	-0.260	1.0928***	77	-3.072**	-3.374**
Indonesia, cocoa	0.266**	0.837***	81	-5.211***	-4.569***
Indonesia, coffee (Robusta)	0.297**	0.830***	81	-3.588**	-3.908***
Colombia, coffee (Arabica)	0.522***	0.71***	88	-2.963**	-2.498
Pakistan, wheat	0.824***	0.508***	41	-6.230***	-4.286***

Table 4: Error Correction model without structural break

Error correction model without structural break			
	Short-run effect	Adjustment coefficient	Adj-R^2
Cameroon, cocoa	0.0689	-0.666***	38
Côte d'Ivoire, cocoa	0.496***	-0.5722***	40
Ecuador, cocoa	1.030***	-0.379***	39
Indonesia, cocoa	0.281**	-0.704***	46
Indonesia, coffee	0.427***	-0.551***	44
Colombia, coffee	0.713***	-0.250**	74
Pakistan, wheat	-0.228*	-0.389***	41

Note: Significance level at 1%***, 5%**, 10%*.

Table 5: Cointegration between international and producer prices with structural breaks

Cointegration between world and producer prices with structural break						
	Break date	Beta coefficient				
		Before reforms	After reforms	Adj-R^2 (%)	ADF	PP
Cameroon, cocoa	1989	0.312**	0.888***	65	-3.833***	-4.520***
Côte d'Ivoire, cocoa	1996	0.742***	0.988***	81	-3.838***	-4.469***
Ghana, cocoa	1993	0.839	0.972***	31	-2.255	-2.319
Ecuador, cocoa	1992	1.16***	1.133***	76	-3.251**	-3.527**
Indonesia, cocoa	1985	0.768***	0.755***	80	-5.130***	-4.525***
Indonesia, coffee	1985	1.156***	0.9000***	82	-4.02***	-4.355***
Colombia, coffee	1990	0.503***	0.980***	92	-3.729***	-3.040**
Pakistan, wheat	1991	0.442***	0.152	45	-5.605***	-3.883

Note: Significance level at 1%***, 5%**, 10%*.

Table 6: Error Correction model with structural break

	Error correction model with structural break					
		Short-run effect		Adjustment coefficient		Adj-R^2
	Break date	Before reforms	After reforms	Before reforms	After reforms	
Cameroon, cocoa	1989	0.031	0.144	-0.562**	-0.846***	40
Côte d'Ivoire, cocoa	1996	0.143	1.22***	-0.438**	-0.914***	55
Ecuador, cocoa	1992	0.917***	1.274***	-0.294	-0.497**	38
Indonesia, cocoa	1985	0.315*	0.169	-0.659***	-0.750***	43
Indonesia, coffee	1985	0.681***	0.399**	-0.511**	-0.621***	51
Colombia, coffee	1990	0.493***	0.883***	-0.370**	-0.446**	80
Pakistan, wheat	1991	-0.1644	-0.472**	-0.278**	-0.722***	40

Note: Null hypothesis of unit root rejected at 1%***, 5%**, 10%*.