

GHANA

Potentials and Possibilities for German Collaboration in Agriculture



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1. General background information of the agricultural and food sectors

The Republic of Ghana lies in West Africa, bordering the Gold Coast (Atlantic Ocean) in the South with a coast line of about 550 km. Ghana borders on the East with the Republic of Togo, West with Cote d'Ivoire and in the North by Burkina Faso. It covers a land area of 238,539 km², comprised of diverse ecological areas. Ghana has a population of over 27 million and is divided into ten administrative regions. While agriculture is the main occupation of the majority of the population, the total cultivable land, which is estimated at 57% of the total land size of Ghana, has only about 44% under the cultivation of diverse crops.

Ghana's GDP has been growing at an annual rate of 4-8% over the past decade, and continued robust performance is expected over the coming years, especially as offshore oil production has begun. Agriculture contributes close to 30% of GDP. It is the largest source of employment for Ghanaians, employing more than half of the total labour force, roughly 49% of men and 51% of women. Eighty percent of agriculture is conducted by smallholder farmers with an average of 1.2 ha who produce food and cash crops.

Historically, Ghana's traditional export crop is cocoa. Because of significant amount of exchange earnings from cocoa, it has featured importantly in discussions on the country's socio-economic development, reforms and poverty alleviation strategies. The cocoa sub-sector alone offers a source of livelihoods for over 700,000 farmers. All cocoa grown for export must be sold to the Ghana Cocoa Board (COCOBOD), which aggregates the crop for sale in the international market. In addition to cocoa, Ghana is becoming prominent for fruit cultivation, including pineapple and mango, which are exported to Europe.

In addition, Ghana produces maize, yams, cassava sorghum, millet and rice as main food crops. As pointed out earlier, agriculture provides the main livelihood, generating income and employment for the vast majority of people in the country. While this may represent an opportunity for growing the agricultural sector and broadening economic impacts, there are some challenges which need to be dealt with if the country is to reach its full potential and growth rates can be translated into greater food security for Ghana. These include lack of technological change, poor basic infrastructure, changing rainfall patterns, socio-economic inequalities between South and North of the country, inadequate productive credit, low organic matter and declining soil fertility as well as inadequate private sector involvement. Other cross cutting constraints in the agriculture sector include access inequality and discrimination by gender, age, social class and ethnicity, among others. The ecological zones of the country also have important differences in respect of infrastructural development and other investments.

Currently, the government of Ghana is making every attempt to correct some of these constraints and inadequacies. These are in line with the attempts to achieve the CAADP targets as well as improving the welfare of the local people. Plans to achieve these are outlined in the recently published development blue-print of Ghana, GSGDA II.

1.1 Pan-African policies and strategies

In 2003, the African Union (AU) Heads of State met in Maputo, Mozambique, and made the first declaration on the Comprehensive Africa Agriculture Development Programme (CAADP) as an integral part of the New Partnership for Africa's Development (NEPAD). This made the CAADP Africa's primary policy framework or strategy for agricultural transformation, wealth

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creation, food security and nutrition, as well as economic growth and prosperity for all. This is a new strategy, spearheaded by African leaders, as a way of addressing critical challenges facing the continent.

Ghana is among the first African countries that committed to CAADP. In adopting CAADP, Ghana agreed to achieve an annual agricultural growth rate of at least 6% and allocate at least 10% of the national budget to agriculture. Since 2003, Ghana has surpassed the 6% growth target for agriculture in several years, but not on a consistent basis. It has reached the commitment for a 10% share of agriculture expenditure target consistently since 2009 (see Table 2).

Ghana is among 10 African countries that have signed a cooperative agreement with the G8 donors under the **New Alliance for Food Security and Nutrition** with the commitment to achieve sustained inclusive, agriculture-led growth in the country. The New Alliance is a partnership that brings together capacities and interests of diverse stakeholders, including African governments and institutions, the private sector, civil societies, donors, and other development partners such as research institutions, to facilitate inclusive, agriculture-led growth in Africa and to address key constraints to private investment and increased smallholder productivity and market access. The New Alliance comprises country-specific commitments codified in Cooperation Frameworks, as well as Enabling Actions that address broad constraints and support country-level actions. As a shared commitment to achieve inclusive, agriculture-led growth and raise 50 million people out of poverty over the next 10 years, the New Alliance contributes to and catalyses the implementation of major components of CAADP. Key to its success is strong commitment and implementation at the country level (new-alliance.org)

Ghana is also part of the **Grow Africa Partnership**, which works to increase private sector investment in agriculture, and accelerate the execution and impact of investment commitments. The Grow Africa partnership was co-founded in 2011 by the African Union Commission (AUC), the NEPAD Agency and the World Economic Forum to spur private-sector investment and financing for African agriculture, in support of CAADP. It is an African-owned, country-led, multi-stakeholder platform, which seeks to mobilize private-sector investment. Grow Africa works to advance sustainable agricultural growth by facilitating alignment and partnership among all relevant stakeholders including African governments, the local and global private sector, international organizations and development partners, civil society and farmers.

1.2 National (and regional) policies and strategies

Ghana Shared Growth and Development Agenda II (GSGDA II) (2014-2017)

Ghana Shared Growth and Development Agenda II (GSGDA II) (2014-2017) is the latest blue print of Ghana. It builds on the experiences of previous documents by focusing on agriculture, fisheries, small and medium-scale enterprises, and sanitation—with special attention to the dry savannah region in the north of the country.

GSGDA II also recognises the importance for the country to invest in:

- Enhancing the competitiveness of Ghana's private sector;
- Accelerating agricultural development and natural resource management;
- Improving infrastructure, human resource development and job creation;
- Consolidating transparent, accountable and efficient governance.

In addition, this policy agenda underscores the central role of the country's **Food and Agriculture Sector Development Policy** for 2009-2015, known as FASDEP II. This policy recognizes the importance of supporting agriculture through value chain development. It was the departure point for the CAADP process in Ghana and comprises the following programmes:

- Food security and emergency preparedness;
- Improved growth in incomes;
- Increased economic competitiveness and enhanced integration into domestic and international markets;
- Sustainable management of land and the environment.

To bridge Ghana's North-South economic and social divide, the government has established the **Savannah Accelerated Development Initiative** as part of its overall northern development strategy. At the heart of this long-term (2010-2030) initiative is the Savannah Accelerated Development Authority (SADA), which aims to attract investments to growth corridors in the north. SADA's responsibilities include the three Northern regions (Upper East, Upper West and the Northern Region) and some parts of Volta and Brong Ahafo regions. SADA is an independent agency set up to coordinate a comprehensive development agenda for the northern savannah ecological zone in Ghana. SADA also constitutes a project aimed at responding to effects of climate change associated with floods and draught. The agency's main thrust is to promote sustainable development using the notion of a forested and green north to catalyse climate change reversal and improve livelihoods of the most vulnerable citizens in the area.

1.3 Data on food and nutrition security in the country and AIC-region

The following section includes information about important socio-economic indicators, production and trade data and data on consumption and nutrition status.

Table 1: Selected national economic and health-related data

Indicator	Data	Year
Population, total	26,442,178	2014
Population growth (annual %)	2.1	2014
Rural population (% of total population)	47	2014
GDP per capita, PPP (constant 2011 international \$)	3,953	2014
GNI per capita, PPP (constant 2011 international \$)	3,774	2013
Poverty headcount ratio at \$2 a day (PPP) (% of population)	52	2005
Poverty headcount ratio at \$1.25 a day (PPP) (% of population)	29	2005
Poverty headcount ratio at national poverty lines (% of population)	32	2005
Rural poverty headcount ratio at national poverty lines (% of rural pop.)	44	2005
Agricultural land (% of land area)	69	2012
Agricultural irrigated land (% of total agricultural land)	0.2	2010
Agriculture value added per worker (constant 2005 US\$)	752	2005
Agriculture, value added (% of GDP)	21	2014
Access to electricity, rural (% of rural population)	41	2012
Employees, agriculture, female (% of female employment)	38	2010
Employees, agriculture, male (% of male employment)	46	2010
Employment in agriculture (% of total employment)	42	2010

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Literacy rate, adult total (% of people ages 15 and above)	71	2010
Ratio of female to male secondary enrolment (%)	94	2014
Mortality rate, under-5 (per 1,000 live births)	78	2013
Malnutrition prevalence, weight for age (% of children under 5)	13	2011
Malnutrition prevalence, height for age (% of children under 5)	23	2011
Maternal mortality ratio (modelled estimate, per 100,000 live births)	380	2013

Source: World Bank, <http://data.worldbank.org/country>

Table 2: Overall Agricultural Growth

Years	Contribution of Agric to GDP (%)	Annual growth rate of Agriculture (%)	Budget allocation to Agriculture (%)
1994	40.8	1.0	
1995	40.6	3.7	
1996	40.8	5.2	
1997	40.4	4.3	
1998	40.6	5.1	
1999	40.5	3.9	
2000	39.6	2.1	
2001	39.6	4.0	6.6
2002	39.5	4.4	6.1
2003	39.8	6.1	6.5
2004	40.3	7.5	8.9
2005	39.5	4.1	9.6
2006	39.3	4.5	8.4
2007	38.0	4.3	9.1
2008	33.9	6.0	9.9
2009	31.8	6.1	10.3
2010	29.8	6.2	16.0
2011	25.3	0.8	11.2
2012	22.7	1.3	13.26
2013	21.5	5.2	
2014		5.3	

Source: Agriculture in Ghana Facts and Figures 2013, Ministry of Food and Agriculture Statistics, Research and Information Directorate (SRID); The State of the Ghanaian Economy in 1998, 2005, 2009 Ghana Statistical Service, April 2014

Table 3: Food supply by tons, kg per capita and kcal per capita

Food supply quantity (tons)		Food supply quantity (kg/capita/yr)		Food supply (kcal/capita/day)	
Top 10	% of total	Top 10	kg	Top 10	kcal
Cassava and products	23	Cassava and products	226	Roots & Tuber Dry Equiv	1,173
Yams	15	Yams	147	Cassava and products	664
Plantains	14	Plantains	133	Yams	403
Roots & Tuber Dry Equiv	12	Roots & Tuber Dry Equiv	112	Plantains	323
Rice (Paddy Equivalent)	5	Rice (Paddy Equivalent)	46	Rice (Milled Equivalent)	291

Roots, Other	4	Roots, Other	40	Rice (Paddy Equivalent)	291
Rice (Milled Equiv.)	3	Rice (Milled Equiv.)	31	Maize and products	233
Maize and products	3	Maize and products	27	Wheat and products	130
Tomatoes and products	2	Tomatoes and products	22	Sugar, Raw Equivalent	116
Oranges, Mandarines	2	Oranges, Mandarines	21	Sugar (Raw Equiv.)	114

1.4 Data on most relevant crops and VCs

The most relevant crops in Ghana include tubers (yams, cassava, taro), maize and rice, groundnuts and other pulses, bananas and plantains. Cocoa, oil palm and fruits (oranges, pineapple) are important export crops. Production and consumption data are provided below.

1.4.1 Production

Table 4: Top 10 crops produced by area, volume and value

Area harvested (ha)		Production volume (tons)		Production value*	
Top 10	Share of total	Top 10	Share of Total	Top 10	Share of Total
Cocoa, beans	10.2	Cassava	19.9	Yams	5.2
Maize	6.6	Yams	8.9	Cassava	4.8
Cassava	5.6	Plantains	4.8	Plantains	3.0
Yams	2.7	Oil, palm fruit	2.9	Cocoa, beans	2.3
Oil, palm fruit	2.3	Maize	2.4	Maize	1.5
Groundnuts	2.2	Taro (cocoyam)	1.7	Taro (cocoyam)	0.9
Plantains	2.2	Cocoa, beans	1.1	Groundnuts	0.9
Pulses, nes	1.6	Oranges	0.8	Rice, paddy	0.8
Sorghum	1.5	Pineapples	0.8	Meat, game	0.6
Rice, paddy	1.3	Rice, paddy	0.7	Oil, palm fruit	0.6
Rank 26: Pineapple	0.1			Rank 20: Pineapple	0.3

* Gross Production Value (constant 2004-2006 million US\$)

Note: nes refers to Not elsewhere specified

Data: average 2011-2013, FAOStat, accessed 9 July 2015

Table 5: Production and Yield Growth for Maize and Rice in Ghana

Years	Commodities			
	Maize		Rice (paddy)	
	Production ('000 mT)	Yield	Production ('000 mT)	Yield
1994	939.90	1.49	162.30	2.00
1995	1,034.20	1.50	221.30	2.22
1996	1,007.60	1.52	215.70	2.05
1997	996.00	1.53	197.10	1.67
1998	1,015.00	1.46	281.10	2.16
1999	1,014.50	1.46	209.80	1.99
2000	1,012.70	1.46	214.60	2.29
2001	938.00	1.32	253.20	2.88
2002	1,400.00	1.50	280.00	2.28

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2003	1,289.00	1.63	239.00	2.03
2004	1,157.60	1.60	241.80	2.03
2005	1,171.40	1.58	236.50	1.97
2006	1,188.80	1.50	250.00	2.00
2007	1,219.60	1.54	185.30	1.70
2008	1,470.10	1.74	301.90	2.27
2009	1,619.60	1.70	391.40	2.41
2010	1,871.70	1.89	491.60	3.03
2011	1,684.00	1.65	464.00	2.35
2012	1,949.00	1.87	481.10	2.54
2013	1,764.50	1.72	569.50	2.64
2014	1,768.54	1.73	604.04	2.69

Source: Agriculture in Ghana Facts and Figures 2013, Ministry of Food and Agriculture Statistics, Research and Information Directorate (SRID).

Table 6: Area planted to some selected food crops of significance to the economy

Year	Maize	Millet	Rice	Sorghum	Cassava	Cocoyam	Plantain	Yam	Total
1999	697	186	105	312	640	372	253	243	2,808
2000	695	208	115	289	660	247	244	261	2,719
2001	713	193	135	329	726	262	265	287	2,910
2002	940	198	123	337	794	282	277	300	3,251
2003	792	207	118	346	807	277	286	321	3,154
2004	733	182	119	298	784	270	281	311	2,978
2005	740	185	120	305	750	255	290	300	2,945
2006	793	200	125	320	790	260	299	325	3,112
2007	790	163	109	208	801	258	305	324	2,958
2008	846	182	133	276	840	252	312	348	3,189
2009	954	187	162	267	886	225	325	379	3,385
2010	992	177	181	253	875	205	328	385	3,396

Source: Statistics, Research and Information Directorate (SRID), Ministry of Food and Agriculture, Ghana.

1.4.2 Consumption and nutrition status

Table 7: Estimated Levels of Per Capita Consumption of Selected Food Crops

Commodity	Kg/head/year*					
	1985	1990	1995	2000	2005	2010
Roots & Tubers						
Cassava	146.3	148.0	149.7	151.4	152.9	154.0
Yam	43.8	43.3	42.8	42.3	41.9	50.0
Cocoyam	-	54.0	55.0	56.0	40.0	38.0
Plantain	82.5	83.0	83.5	84.0	84.8	85.0
Cereals						
Maize	39.2	40.3	41.4	42.5	43.8	45.0
Rice (Milled)	12.7	13.3	13.9	14.5	15.1	24.0
Millet	9.4	5.1	12.6	9.0	6.4	5.0

Sorghum	14.4	9.3	21.7	14.8	10.0	5.0
Wheat	-	-	-	8.0	8.0	13.0
Fish	-	23.6	24.2	27.0	30.2	31.0
Meat**		8.0	6.3	6.7	9.4	12.0

Source: SRID

*In the absence of a household consumption survey, these estimates have been based on food available for human consumption from both domestic and import sources.

**For meat, total meat available for consumption comprising, domestic meat production (incl. meat from the wild [bush meat] averaging 92,000 metric tons per annum) plus meat imports have been considered. Dashes indicate cells for which information was not available.

1.4.3 Trade

Table 8: Ghana's imports

Import volume (tons)		Import value (US\$)	
Top 10	Share of Total	Top 10	Share of Total
Rice – total (Rice milled equivalent)	21.2	Rice – total (Rice milled equivalent)	19.4
Sugar refined	16.9	Sugar refined	12.7
Wheat	13.9	Meat, chicken	10.4
Meat, chicken	7.0	Wheat	7.9
Oil, palm	5.2	Oil, palm	7.7
Tomatoes, paste	4.2	Tomatoes, paste	4.8
Onions, dry	3.3	Beverages, non alcoholic	2.7
Beverages, non alcoholic	2.7	Milk, skimmed dried	2.7
Flour, wheat	2.5	Food prep nes	2.1
Pastry	2.1	Pastry	2.1
Maize	2.1	Maize	0.9

Data: average 2010-2012, FaoStat, accessed 01 Oct 2015

AIC value chains marked in red; nes refers to Not elsewhere specified

Table 9: Ghana's exports

Export volume (tons)		Export value (US\$)	
Top 10	Share of Total	Top 10	Share of Total
Cocoa, beans	51.1	Cocoa, beans	73.4
Sugar refined	10.0	Cashew nuts, with shell	5.7
Cashew nuts, with shell	9.1	Cocoa, butter	4.7
Oil, palm	4.6	Sugar refined	2.4
Oil, palm kernel	3.0	Oil, palm	1.7
Oilseeds nes	2.6	Rubber natural dry	1.5
Cocoa, butter	2.6	Oil, palm kernel	1.4
Pineapples	2.1	Pineapples	0.8
Bananas	1.3	Cotton lint	0.8
Cotton lint	1.0	Margarine, short	0.7

Data: average 2010-2012, FAOStat, accessed 01 Oct 2015

Rice accounts for more than 20% of the import volume and just fewer than 20% of the import value. The import of sugar and wheat also play important roles in trade. In export

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trade, cocoa, sugar and cashew nuts are the most important goods. Pineapple accounts for about 2% of the export volume.

1.5 National (and regional) innovation system:

1.5.1 Research system and organizations

The role of science and technology as well as innovation is now greater than ever before. This is due to the significance of agricultural research and investment which will continue to be the precursor for any agriculture development programme. The sector will continue to be a vital key to improving food security, reducing poverty and sustaining broad-based economic development, despite the discovery of oil and gas in the country. Without sufficient and continued investment in agricultural research, there may be little impact on reducing food insecurity and poverty. It is therefore important that the agricultural research agenda responds to the needs and challenges of the society.

1.5.1.1 International

Some international agricultural research institutions that are carrying out research activities or have research centers in Ghana include:

- International Food Policy Research Institute (IFPRI);
- International Institute of Tropical Agriculture (IITA);
- International Water Management Institute (IWMI);
- Brazilian Agricultural Research Corporation (EMBRAPA).
- AfricaRice Center;
- International Fertilizer Development Center (IFDC);
- Forum for Agricultural Research in Africa (FARA)
- Alliance for a Green Revolution in Africa (AGRA);
- African Center for Economic Transformation (ACET);
- West Africa Science Service Center on Climate Change and Adapted Land Use (WASCAL), etc.

1.5.1.2 National

Innovation capacities in the agricultural and food sectors exist in the universities and the Council for Scientific and Industrial Research (CSIR). There are 13 research institutes under the CSIR, and the following play key roles in the agricultural and food sectors of Ghana:

- Animal Research Institute (ARI);
- Crops Research Institute (CRI);
- Forestry Research Institute of Ghana (FORIG);
- Food Research Institute (FRI);
- Oil Palm Research Institute (OPRI);
- Plant Genetic Resources Research Institute (PGRRI);
- Savanna Agricultural Research Institute (SARI);
- Soil Research Institute (SRI).

Other important national research institutes include:

- Cocoa Research Institute of Ghana (CRIG);
- Biotechnology and Nuclear Agriculture Research Institute (BNARI).

There are a number of research centers under the various public universities in Ghana. For instance, the University of Ghana has a Livestock and Poultry Research Centre (LIPREC), a Soil and Irrigation Research Centre (SIREC) and a Forest and Horticultural Crops Research Centre (FOHCREC).

1.5.2 Innovation platforms

In Ghana, some efforts have been made to establish a number of innovation platforms (IPs) in the agricultural sector as a way of promoting innovative activities and ideas that will help to improve agricultural productivity and trade. Among these are IPs by FARA's Integrated Agricultural Research for Development (IAR4D). The IAR4D concept engages all actors, organizations and institutions that are involved in the agricultural sector to interact and jointly foster the development of the sector. Both the system and the commodity approach are used, and all actors along the commodity value chain are engaged. The IP is thus a forum for groups of relevant actors (including farmers, researchers, extension agents, traders, processors, financial institutions, policy makers, regulators, output market operators, consumers and others) selected along the value chain of a specific commodity or production system to interact and learn from each other. Specifically this was established to help improve the productivity of cereal/legumes, sheep and goats farming systems. Specifically two innovation platforms, **Soybean** innovation platform and **Maize** innovation platform, were established. Formed in 2006 as part of IFDC "From thousands to millions" project (2006-2011). It operates in the Wenchi-Techiman area in the Brong Ahafo region of Ghana

Another IP is the DONATA (Dissemination of Agricultural Technologies in Africa). This IP was led by the Crops Research Institute (CRI) of the CSIR. An IP each was set up for the **cassava** value chains in five communities in the Wenchi municipal assembly of the Brong Ahafo Region, namely Wenchi, Amponsakrom, Nkonsia, Wurompo and Ayigbe. This was done in collaboration with the CSIR, Ministry of Food and Agriculture (MOFA), African Agricultural Women in Development (AAWID) and CSIR-INSTITUTIONAL RAILS Project.

The Convergence of Sciences-Strengthening Innovation Systems (CoS-SIS, 2008-2013) program also established two innovation platforms, **Oil palm** innovation platform and **Cocoa** innovation platform. These were initiated as part of a larger research programme, which was implemented by the University of Ghana, other universities in Mali and Benin. Technical backstopping was provided by Wageningen University in the Netherlands. The oil palm innovation platform was set up to support the improvement in the quality of palm oil. An exploratory study showed that one of the main challenges of the producers was lack or inadequate access to remunerative markets due to the low quality of their palm oil. Among the platform actors were the Ghana Standards Board and its Environmental Protection Agency. The platform is organised at the local level where experimentation takes place with small-scale processors. It aimed at improving small holder processors practices of processing the oil as well as gathering evidence and information to feed into the higher-level platform.

Three **rice** innovation platforms were recently established by the Africa Rice Center (AfricaRice) in collaboration with CSIR-SARI.

The West Africa Agricultural Productivity Project (WAAPP) innovation platforms focus on the development of technologies for dissemination. For example, for roots and tubers such as yam, cocoyam and cassava, good agronomic practices, soil fertility and weed management techniques, and improved varieties have been developed. One major outcome of the

technology dissemination was that women in particular have been encouraged to go into commercialization of yam planting material production. The platforms has also enhanced farmer-to-farmer learning and this is building the confidence levels of actors along the commodity value chain.

Another is the innovation platforms called **Climate Change, Agriculture and Food Security (CCAFS) Science Policy Platform**. This was established to address effects of climate change and its variability on growing food insecurity, and environmental degradation. It aimed at reducing vulnerability and enhances food security and resilience in agricultural development. This platform employs a diversity of actors for dialoguing. These include institutions, farmers, NGOs, policy, research, the Media and Donor partners. Key outcomes from the platform include (i) attraction and implementation of over five sub-grant agreements with ICRISAT, (ii) Over 1000 people sensitized on CSA practices/technologies, (iii) baseline policy process and product gaps identified at all levels, (iv) commitment from policy makers and legislature to support sectorial climate adaptation investments and (v) political buy-in by parliamentarians in Ghana.

1.5.3 Extension system and organizations

Agricultural extension in Ghana has gone through a number of political shifts from a focus on export commodity development prior to independence in 1957 to the promotion of food crop production. These shifts have been motivated by the intention to modernize traditional farming practices, transfer resources and technology, and train personnel to address extension needs of peasant farmers.

Among the agricultural extension approaches in Ghana include top-down commodity-based approaches, Training and Visit (T&V), participatory approaches such as farmer field schools (FFSs), the innovative ICT based approaches which provide advice to farmers on-line, and the promotion of mobile phones and community radio stations. These approaches have been promoted over the years by the various extension service providers, including government (MOFA, the main actors in extension), non-governmental organizations (NGOs), and farmer organizations.

For many years, the Ministry of Food and Agriculture (MOFA) has used its staff from the national level down to the field level to implement extension programs. With the decentralization leading to the transfer of power to the district level offices, MOFA also transferred resources including staff, to district offices. This transfer reduced the level of involvement of the ministries and the number of technical staff for coordination activities.

Below are some of the institutions offering agricultural extension in the country:

Public Extension Institutions:

- Ministry of Food and Agriculture (MOFA);
 - Directorate of Agricultural Extension Services (DAES);
- Ministry of Environment Science and Technology (MEST);
 - Council for Scientific and Industrial Research;
- Ministry of Local Government and Rural Development (MLGRD);
 - Regional Coordinating Council (RCC);
 - Metropolitan and Municipal District Assemblies.

Public Research and Education Institutions:

- ASTI Agricultural Research and Development;
 - Council for Scientific and Industrial Research;
- Sasakawa Africa Fund for Extension (SAFE);
 - University of Cape Coast;
 - Kwadaso Agricultural College;
- Cocoa Research Institute of Ghana (CRIG);
- Council for Scientific and Industrial Research (CSIR);
 - Water Research Institute (WRI);
 - Soil Research Institute (SRI);
 - Savanna Agricultural Research Institute (SARI);
 - Plant Genetic Resources Centre (PGRC);
 - Oil Palm Research Institute (OPRI);
 - Forestry Research Institute of Ghana (FORIG);
 - Food Research Institute (FRI);
 - Crops Research Institute (CRI);
 - Animal Research Institute (ARI);
- Kwame Nkrumah University of Science and Technology (KNUST);
- University of Development Studies (UDS);
 - University of Ghana (UG) (Institute of Statistical, Social and Economic Research (ISSER) and Faculty of Agriculture; www.g-fras.org).

1.5.4 Private R&D activities

Ghana is part of the **Grow Africa Partnership**, which works to increase private sector investment in agriculture. The private sector in Ghana has always joined forces with the state institutions to establish effective system of information delivery to farmers. In most cases private sector performance especially in input supply to farmers has been above average. As a result, a number of PPPs in commercial agriculture have been developed, e.g. Savannah Accelerated Development Authority (SADA). Some private agencies offering extension to farmers include, Africa Atlantic Holdings, Agriaccess Ghana Ltd., Amantin Agro Processing Co. Ltd., Okata Farms and Food Processing and several agro-chemical dealers (e.g. Dizengoff, Agrimat, Chemico, Aglow, Kurama Co. Ltd.).

In addition to the state organizations and institutions providing extension services to farmers, some NGOs have established great reputation of assisting both governments and farmers in the production, processing and marketing of agricultural commodities through extension and other agricultural advisory services. Examples of the NGOs working directly in the agricultural sector and local extension services include Africare, CARE International, Christian Relief Service, HarvestPlus, Presbyterian Agricultural Services, Tamale, Finatrade, and ActionAid.

Apart from the above stated organizations, farmer-based organizations (FBOs) have been involved in agricultural extension in the country. In Ghana, farmers have the tradition of organizing themselves at local level into membership-based entities (associations, unions, cooperatives or networks), which are mainly organized around a common interest like the production and marketing of a given agricultural commodity. These forms of organizations assist farmers to pool their resources together and facilitate access to credit and farm inputs among others. Although group formation has the potential to strengthen farmers bargaining

power in the market place, most FBOs in Ghana are weak in terms of financing and organization. Some major groups of farmers' organization in the county include traditional associations/groups, multipurpose associations/groups, informal contact groups, co-operatives and national farmers' organizations (www.g-fras.org).

1.6 Key challenges, emerging needs and potentials in the agricultural sector

The problems of the agriculture sector in Ghana include:

- Reliance on rainfed agriculture and low level and relatively inefficient irrigated agriculture;
- Low level of mechanization in production and processing;
- High post-harvest losses as a result of poor post-harvest management;
- Low level and ineffective agricultural finance;
- Poor extension services as a result of several institutional and structural inefficiencies; lack of ready markets and processing;
- Low performing breeds of livestock; poor feeding of livestock; high cost of feed for poultry;
- Poor livestock housing and husbandry management; competition from imports and poor post-production management of livestock products;
- Over-fishing of natural waters; undeveloped fish value chain (e.g. inadequate supply systems for fingerlings and feed) and lack of skills in aquaculture;
- Limited exploitation of potential income generating production systems;
- Low levels of income from cash crop production by men and women smallholder farmers;
- Low integration of commodity markets (Disjointed value chains with regards to most agricultural commodities);
- Customary system of land tenure (MoFA, 2010).

Based on the general approach (see Africa-wide study Chapter 4) and in pursuit of efficiency and effectiveness, investment by Germany into the agricultural and food sector are suggested in those African countries, which

- Show actual progress in sustainable agricultural productivity driven by related innovations, as indicated by comprehensive productivity measurement and innovation actions on the ground;
- Have a track record of political commitment to foster sustainable agricultural growth, as indicated by performance under CAADP, and
- Prioritize actions for hunger and malnutrition reduction and show progress, but where agricultural and rural development and nutrition interventions are likely to make a significant difference, as indicated by public policy and civil society actions.

Based on this approach, investments into the agricultural and food sector of Ghana can be expected to have only modest effects on food and nutrition improvement in the country.

Table 10: Country level Performance Indicators

Indicators	Index	Performance (%)
1. Number of Years with more than 6% agricultural growth (2005 to 2014)	2	20
2. Percentage point change in TFP index between 2001 and 2008	16	100

3. Number of years with more than 10% government expenditure (2005 to 2014)	0	0
4. Average share of agricultural GDP spent on R&D (2005 to 2011) in %.	0.6	62
5. Steps in CAADP completed	7	88
6. Percentage point improvement in undernourishment between 2001 and 2011	10	60
7. Global hunger index (2014)	7.8	0
Total score (weighted)		47

Source: Own computation based on World Bank (2015), FAO (2015), ASTI database and von Grebmer *et al.* (2014)

Note: the % performance (rounded) is defined as follows for the respective indices: 1. % out of 10 years; 2. classes: if <1, or negative= 0; 1 – 7= 30, 8-15= 60, > 15= 100; 3. % out of 10 years; 4. % of the AU target value of 1% spent on R&D; 5. % of the desired 8 steps; 6. classes: if < 2 = 0; if 3-5= 30; if 6-10=60, if>10=100; 7. classes: if < 12= 0; 12-16: = 60; 17-20: = 60; > 20= 100.

Total score (weighted) performance and need to invest: (sum of (1.+2.)/2 (expected growth performance); + sum of (3.+4.+5.)/3 (expected government commitment); + sum of (6.+7.)/2 (performance in food and nutrition security and need)) divided by 3.

Results of assessment (Table 10):

Expected agricultural growth performance:

- Ghana has increased its agricultural growth by more than the annual 6% agricultural growth target defined by CAADP only for two years, between 2005 and 2014, (www.resakss.org).
- However, total factor productivity in Ghana had improved by 16% between 2001 and 2008 (Fuglie and Rada, 2011), indicating that Ghana's innovation performance is above the sub-Saharan African average.

Government commitment:

- Ghana has a track record of political commitment to foster sustainable agricultural growth by being active in the CAADP process and having completed seven of the eight steps in the CAADP process (www.resakss.org).
- However, the Ghana government has not shown any willingness to invest in agricultural sector. In no single years Ghana had invested more than 10% of total government expenditures (CAADP target) in the agriculture between 2005 and 2014 (www.resakss.org).
- In addition, Ghana spends only 0.6% of its agricultural GDP on agricultural research and development, which is lower than the Sub-Saharan Africa average (www.asti.cgiar.org) and the AU target value of 1% spent on R&D. This indicates that Ghana's investment on agricultural innovation is not yet sufficient.

Food and nutrition security progress and need:

- Ghana is modestly prioritizing actions for hunger and malnutrition reduction and show a 10 percentage point improvement in undernourishment between 2001 and 2011 (FAO, 2014).
- Ghana has the GHI score value of 7.8 reflecting only a modest level of hunger (von Grebmer *et al.*, 2014)¹. This makes the investment into the agricultural and food

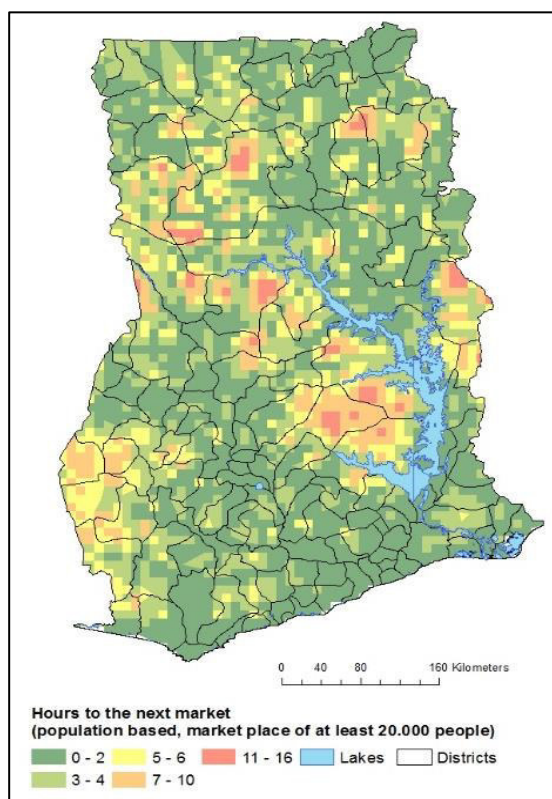
¹ GHI score Values less than 5.0 reflect low hunger, values from 5.0 to 9.9 reflect "moderate" hunger, values from 10.0 to 19.9 indicate a "serious" level of hunger, values from 20.0 to 29.9 are "alarming," and values of 30.0 or greater are "extremely alarming" (IFPRI, 2014).

sector in Ghana less urgent in terms of reducing children mortality rate and the proportion of the undernourished people and underweighted children. In sum, the economic, political, and social/nutrition framework in Ghana does not seem to suggest accelerated investment into the agricultural and food sector of the country.

Nevertheless, the potentials in Ghana's agricultural sector include:

- Production and export of non-traditional agricultural commodities, such as pineapple, yam, banana, fish, cashew, mango and papaya;
- Growing demand for guinea fowl meat all over the country and high potential for increased production;
- Urban and peri-urban agriculture;
- Aquaculture;
- Irrigation;
- Agro-processing;
- Opportunities for increasing incomes from cassava, with growing interest in utilising cassava in different industries, e.g. exporting starch to the international market;
- Private sector participation (MoFA, 2010).

Figure 1: Distance to markets



Data sources: Hours to next market - HarvestChoice, 2015;

Administrative areas: <http://www.gadm.org/>, accessed 20.9.2015

Inland water bodies: <http://www.diva-gis.org/gData> (water bodies), accessed 20.9.2015

Transport intensive products should be promoted in areas that are well connected to markets, whereas the remote areas should focus on low volume and livestock value chain segments.

2. Most relevant value chains in the country

2.1 AIC-Value Chains

2.1.1 Maize

Maize is Ghana's most important cereal crop and is grown by the vast majority of rural households. It is widely consumed throughout the country, and it is the second most important staple food in Ghana, next to cassava. It accounts for 55% of total grain production (Angelucci, 2012). It is grown in all regions of Ghana. In 2011, production was highest in Brong Ahafo, which accounted for 27% of national production, followed by Eastern (20%), Central (12%), Ashanti (12%), and Northern (11%) (Ragasa *et al.*, 2013a). Average yield is 1.9 tons/ha, achievable yield is 6 tons/ha. About 57% of total production is consumed directly by farm households; about 30% is traded either formally or informally and about 13% is used for animal feed in the poultry industry (Ragasa *et al.*, 2013a). More than 20% (1 million) smallholder households gain their primary income from the production of maize (WABS consulting 2008).

2.1.2 Rice

Rice is the second most important cereal crop, after maize. Paddy rice accounts for 23% of total grain output. Production of rice is highly prioritised by Ghana government to reduce imports and the agricultural development plans and strategies have featured rice as one of the targeted food security crops. In order to increase productivity, the National Rice Development Strategy (NRDS) was established in 2009. The majority of local rice production comes from the Northern (37%), Upper East (27%), and Volta regions (15%) (Ragasa *et al.*, 2013b). Average rice yield in the country is estimated to be 2.5 tons/ha, whereas the achievable yield is 6.5 tons/ha (Ragasa *et al.*, 2013b). Due to the continuous increase in the consumption of rice, the NRDS aims to double rice production by 2018 with 10% annual increases. Imported rice has a better quality, better taste and good appearance, and is long-grain perfumed; it is priced 15-40% higher than local rice. To support the rice value chain in northern Ghana, MOFA is currently implementing the Rice Sector Support Project in collaboration with Agence Française de Développement (AFD) of France.

2.1.3 Pineapple

Pineapple production covers over 8,000 acres of land and is mostly cultivated in the Greater Accra, Eastern, Central and Volta regions of Ghana (SNV 2012). The sector experienced growth from 1994 to 2004 at a cumulative annual growth of 172% (Gatune *et al.*, 2013). In 2004, there was a shift in market demand from smooth cayenne to the MD2 variety of pineapple (produced primarily in Costa Rica by Del Monte), and a number of smallholders have not been able to transit to MD2 production, therefore there are now less than 200 smallholders engaged in commercial production of pineapples. This has also led to a decline in fresh pineapple exports since 2014. A number of juice processing firms have been established to take advantage of pineapples that are rejected for exports, thereby creating employment. However, most of the processing factories are not operating due to lack of pineapples, and sometimes they have to source from Togo, Benin and Côte D'Ivoire (Gatune *et al.*, 2013). Thus, a high potential exists for the expansion of local production. The

productivity of pineapple in Ghana is 60 tons/ha compared to 120 tons/ha for Costa Rica (Gatune *et al.*, 2013).

2.2 Other relevant Value Chains

2.2.1 Soybeans

Soya is also produced by smallholder farmers under rainfed conditions. Under these subsistence methods, soya yields average only 0.8 metric tons per hectare, although soya has been demonstrated to grow at yields of as much as 4.5 metric tons per hectare under the best commercial agricultural practices in Ghana. Crop rotation of soya with maize on commercial farms in Ghana will provide for improved fertility on fields with multiple crops per year. Although current production and consumption data for soya are not readily available, FAO estimates that Ghana imported soybean oil alone of between 2,700 and 7,826 metric tons annually between 2001 and 2007.

2.2.2 Vegetables

GhanaVeg believes that vegetable exporters, processors, wholesalers and retailers can become key drivers of change for improving the productivity and quality of vegetables in Ghana. Closer arrangements in terms of contracting, service provision and certification between the chain actors can boost the reliability and quality supply of vegetables to the high-end domestic and export markets. Target vegetable crops include: tomatoes, onions, capsicum, okra, garden egg, eggplant, other Asian vegetables and members of the Cucurbitaceae family (cucumbers, squash, butternut and melons). GhanaVeg is continuously issuing calls for proposals to strengthen the vegetable value chain in Ghana (www.ghanaveg.org).

2.2.3 Fruits

Market for fresh fruits and fresh juice in Accra was estimated at US\$ 402 million in 2011, representing 17% of total non-traditional exports. Among the fresh fruits, oranges are the most favourite fruits in the metropolitan area, followed by pineapple, mango, watermelon and pawpaw with a growth of 100% per annum. The African Development Bank's Export Marketing and Quality Awareness Project (EMQAP) was set up to address the marketing challenges of horticultural produce and introduce new fruits and vegetables for both the local and external markets. One critical factor that could reduce the performance of the sub-sector is lack of basic infrastructure like sheds, cold rooms and packing areas. It has also been observed that about 90% of market women consider post-harvest and food safety education in the markets as a major challenge and called on all stakeholders to step up their efforts in that direction.

2.2.4 Cocoa

The cocoa value chain consists of not many actors, who span from local to international levels. The key actors at the local level include farmers, COCOBOD, Produce Buying Company, haulers, warehousing and logistic service providers, domestic chocolate manufacturers, domestic grinders, distributors, retailers and local consumers. At the international level, there are multinational brokers/traders, shipping companies, international warehouses, international grinders and manufacturers, and international consumers as some of the key actors along the chain. As most of the food crops in Ghana,

cocoa farming is mainly done by smallholders. The COCOBOD fixes the price of the beans locally and this price uniformity allows that farmers all over the country to benefit equally (that is if transportation costs are not taken into account). However, in Ghana, farmers have the advantage that there are a large number of local buying companies (LBCs) to choose from and as such farmers tend to choose LBCs that offer cash and credit facilities. Ghana's strategy is to encourage secondary and tertiary processing in the country since local processing will add little value (World Bank, 2012). First stage processing into butter and liquor is only 5% of the final value. Further processing to liquid chocolates is about 10% and the final manufacturing and retailing constitutes 74% of the processing. Ghana has considerable grinding capacity of about a third of local production, especially in recent years, providing an aggregate investments of US\$ 300 million, equivalent of 400,000 metric tons. Capacity utilization is close to 60%. The industry states that it created an estimated value of US\$ 56.31 million in 2011 for the US\$ 18 million it received in incentives through utility revenues, job creation, capacity building, business opportunities and tax revenues.

2.2.5 Palm oil

Oil palm is native to West Africa and it is mainly cultivated in Côte d'Ivoire, Ghana, Nigeria and Sierra Leone, which is a major producer of both palm oil and palm kernel oil. Yet, the reliability of the supply of palm oil is hampered by internal marketing and supply-side constraints, as well as subsidies for commercial and food aid imports of competing vegetable oils, which have dramatically reduced the domestic availability of Ghanaian palm oil. However, consumption of palm oil and other palm products is projected to increase with the increase in population of consuming countries. Statistics show that production of palm oil now accounts for 37% of the total global output of oilseeds, overtaking soybean oil as the leading vegetable oil. Ghana imported about 112,000 metric tons of vegetable oil in 2010, of which almost 45% was palm oil (crude and refined). Thus, there is the opportunity for Ghana to develop the oil palm industry to meet the increasing market interest in oil palm products.

2.2.6 Cassava

Cassava is a starchy root crop. Cassava leaves do not have a market value in Ghana since they are not consumed as a vegetable (Angelucci, 2013). Cassava can be considered as a primary food security crop in Africa due to its resistance to drought and plant disease, flexible planting and harvesting cycles. Cassava constitutes about 22% of Ghana's agricultural GDP and is one of Ghana's main staple crops. In terms of area harvested, cassava is now the second largest food crop after maize. According to the World Bank, Ghana's cassava value chain is still in its infancy (World Bank, 2009) Emerging growth opportunities, however can be identified with reference to different cassava-derived products (Angelucci, 2013). The three most common products from cassava are (i) *gari* (ii) starch and (iii) dried chips for export as well as (iv) cassava flour for the preparation of a local food, *Konkonte* or bread.

a. *Gari*

Since the introduction of mechanical graters to prepare *gari* in the late 1990's, cassava has increasingly being produced and processed as a cash crop for urban consumption (Angelucci, 2013). The largest food processing enterprises, whose products include *gari* and cassava flour, employ about 20 to 50 workers (Angelucci, 2013). These enterprises have modernized the traditional processing technologies through the adoption of better manufacturing processes in production (Angelucci, 2013). The upgrade of processing technologies in Ghana

was possible due to the public-private partnerships between private sector institutions engaged in business promotion and agro-industrial research.

b. Starch

The production of cassava for industrial starch was implemented in Ghana under the Presidential Special Initiative (PSI) on Cassava Starch. Cassava is a major food crop in the country; hence, it has alternative market outlets apart from the starch (Angelucci, 2013). This implies that apart from the industrial raw material market, farmers are able to choose whether to sell to the Ayensu Starch Company (ASCo), of course and depending on the respective price. This two alternative sources in the marketing of cassava led to problems both for the supply and demand sides (Angelucci, 2013). The company was shut down in January 2008 due to the inability to operate at its full capacity as the supply of fresh cassava by farmers declined. Furthermore, the variety being produced for the starch industry had higher starch content, hence, it was not very suitable for traditional processing. Consequently, buyers for traditional processing paid lower prices for the produce (Angelucci, 2013).

c. Chips

Ghana has several cassava processing plants, particularly in the Brong Ahafo, Ashanti and Eastern Regions of the country, and this makes mechanized cassava processing a common activity in the country (Angelucci, 2013). Due to high transport costs for raw fresh roots, majority of farmers produce chips through on-farm processing by using chipping machines or manually. In Ghana, the export companies are the sole buyers of cassava chips, and they establish the chipping/buying centers in the producing districts. Hence, in the case of cassava chips for the export market there is no wholesale market as it is the exporter who deals directly with the many smallholder farmers and small scale processors to obtain adequate volumes of chips for exports (Angelucci, 2013). The attainment of adequate volume of chips to be exported is also essential to make internal transport costs affordable for the exporters (Angelucci, 2013).

3. Innovations in value chains in the past 20 years

Some of the government policy interventions in Ghana aimed at influencing uptake of technology and innovations include:

- Provision of subsidy on farm inputs such as seeds and fertilizer and fishing nets;
- Improvement of research and extension services and improving their linkages;
- Provision of rural credit for farming through micro credit schemes;
- Improvement of rural infrastructure especially the road network and electricity;
- Development of rural agricultural markets and agribusiness skills;
- Enhancement of opportunities in the use and management of natural resources, especially land and water for irrigation;
- Encouraging diversification of agriculture and encouraging youth in agriculture;
- Private sector initiatives to mobilize citizens to contribute to agriculture development.

3.1 The most crucial limiting factors in Ghana / AIC-region / in AIC-Value Chains

The limiting factors include:

- Lack of access to production inputs;
- Lack of access to efficient produce markets;
- Cost of new technologies are very expensive for most smallholders;
- Very limited access to credit from the formal sector;
- Response to demand for new varieties of products (as in the case of pineapple);
- Low innovation adoption by farmers;
- Poor agricultural extension;
- Poor coordination among actors in value chain.

3.2 The most important / beneficial innovations in the relevant VCs of Ghana

Some technological innovations related to local crops in Ghana refer to crop improvements for maize, rice, cowpea, soybean and groundnut. In addition, there are innovations for cassava, yam, cocoyam, sweet potato, vegetables and fruit crops, plantain and bananas as well as for some legumes of local importance. These have mainly been carried out by the universities and some key institutions of the CSIR. The institutes have plans to enter into some diverse PPP arrangements in the area of production, processing and marketing activities involving improved crop varieties of rice, cassava, maize, pepper, groundnuts and any other exportable and local products.

3.2.1 AIC value chains

a. Maize technologies

These include the development and release of 19 improved varieties, including high yielding, streak and lodging resistant and hybrid varieties and accompanying crop management recommendations.

b. Marketable Rice Technologies

Seven improved varieties of rice were released in Ghana between 1997 and 2010. Each of these improved varieties have their own unique attributes which includes the growing ecology, number of days to mature, potential yield, milling yield, cooking quality, grain shape, colour and aroma.

3.2.2 Other Value Chains and cross-cutting innovations

Ten improved cassava varieties have been released and disseminated by CSIR-CRI since 1993. The key attributes of these varieties are their resistance and tolerance to the Cassava Mosaic Disease (CMD). Their most suitable ecology are the Forest, Forest Savannah and Coastal Savannah zones.

In addition to the cassava varieties released, good production practices were also established, including procedures for site selection, land preparation, planting materials selection, when and how to plant, soil fertility, pest and diseases management and were developed as a package for increased cassava production. In collaboration with IITA, CSIR-CRI has developed protocols for the biological control of cassava mealy bugs.

Further innovations include the release of several pepper varieties and fertilizer recommendations for citrus and plantain.

Other cross-cutting innovations include an innovation contest, in which awards serve as incentives to overcome innovation secrecy. This has been found to be a good instrument in scouting innovations developed by farmers in the Upper East region of northern Ghana (Tambo and Wünscher, 2014).

Local Innovation Support Funds (LISFs) initiated to support innovative farmers to further develop and disseminate their innovations are also a tool that has been used to accelerate farmer innovations in northern Ghana (Avornyo *et al.*, 2011).

3.3 Most promising approaches for farmer and small business related Value Chain innovations

- pending further information -

4. Suggestions for Collaboration

4.1 Promising agricultural products and value chains

Besides assessing the returns of investments into institutional innovations in Ghana, analysis to choose the most promising value chains in the country is also undertaken. In compliance with the availability of data and the purpose of the study four criteria that focus on poverty and market potential are used to select the five most promising agricultural products from the long list of agricultural products the country produces and sells. The first indicator, the trade potential (revealed comparative advantage (RCA) index), is computed to identify value chains over which the country has revealed (but not potential) comparative advantage. In the present case, the RCA index compares the share of a given agricultural product in Ghana's export basket with that of the same product in total world exports. The second indicator, yield gap, is used to assess the expected return of the envisaged Germany investment on the given AIC country value chains. A third indicator, average yield growth, is used to examine the potential of the product for poverty reduction. The production share of total supply is also used to assess the present integration of the poor in the market (relevance).

The summary of the five most promising value chains based on Revealed Comparative Advantage (RCA) index, average yield growth and relative yield gap is reported in Table 11 below. The production share, RCA index, actual yield growth and relative yield gap for the GIZ-selected value chain(s) is also reported at the bottom of the table, when they are not included in the list of the first five most promising value chains.

Table 11: Selection of the most promising agricultural product /value chain

Rank by RCA		Rank by Yield progress***		Rank by yield gap		Rank by relevance of crop		
Rank	Name of agricultural product	RCA index (2011)	Name of the crop	Average annual yield growth (2005 to 2012)	Name of staple crop (rainfed)	Relative yield gap (%)**	Name of agricultural Product	Production share of supply (2011) in %*

1	Cocoa, beans	61	Pineapples	136	Rainfed millet	86	Plantains	100
2	Cashew nuts, with shell	41	Coconuts	21	Rainfed rice	82	Millet & products	100
3	Coffee, husks and skins	14	Oranges	15	Rainfed maize	80	Sorghum & products	100
4	Pineapples	8	Beans, dry	10	Irrigated rice	79	Sweet potatoes	100
5	vegetable oil	5	Groundnuts, with shell	8			Roots, Other	100
GIZ selected	Flour, maize	0.22	maize	3			maize	99
			Rice, paddy	2				

Source: * Own computation based on FAO 2015 data, ** from Van Bussel and *et al.* (2015).

Note: *** a minimum of 0.5% production (volume) share threshold is used as a screening (crop relevance) criteria

Results of assessment (Table 11):

- The trade potential (revealed comparative advantage (RCA) index) is above 1 for cocoa beans, cashew nuts, coffee, Pineapples (GIZ selected value chain) and vegetable oil. This indicates that Ghana has a comparative advantage (in the export) of these commodities. The RCA value for the other GIZ selected crop, maize, is less than 1 indicating that Ghana has a comparative disadvantage on the export of this commodity. The other GIZ value chains are not exportable;
- The yield performance indicating progress suggests that over the CAADP period (2005 to 2012) pineapples (GIZ selected value chain), coconuts, oranges, dry beans and ground nuts are the five most promising crops². The yield level of the other two GIZ selected value chains, maize and rice; grows only at a small rate over the period under consideration;
- The yield gap is observed to be high for rain fed millet, rain fed rice, rainfed maize and irrigated rice indicating the high potential return of investing on these value chains;
- In terms of relevance (production share of supply), plantains, millet, sorghum, sweet potatoes, roots, and maize are the leading. The total supply of these products are domestically produced.

² However, it should be noted that the extremely high average yield growth rate of pineapple is due to a massive increment of yield level since 2011 (from 52,632 Hg/ha in 2010 to 561,224 Hg/ha in 2011) only with a small area expansion (from 9,500 ha in 2010 to 9,800 ha in 2011). The yield level of pineapple keeps on increasing even after 2011 but at a modest rate of 6%.

4.2 A systematic assessment of promising partnerships for each promising innovation area

The Ghana Agricultural Sector Investment Programme (GASIP) aims at providing a framework and institutional basis for a long-term engagement and supplementary financing for scaling up investments in private sector-led pro-poor agricultural value chain development. GASIP will contribute to the realization of Ghana's Medium Term Agriculture Sector Investment Programme (METASIP), which provides the road map for the CAADP compact in Ghana. The Ministry of Food and Agriculture (MOFA) will implement GASIP with the aim to promote a "standard setting approach" that will drive its policy, serve as a core investment for value chain development in Ghana, and for aligning parallel financing to complement, following the modalities that each of the Development Partners (DP) prefer. In line with the agreed Strategic Framework for IFAD in Ghana (2012 COSOP), GASIP is built along four strategic axes:

- a. Linking smallholder farmers to agribusinesses to enhance pro-poor growth.
- b. Nationwide scaling up of a successful value chain investment approach.
- c. Promoting and mainstreaming climate change resilience approaches in Ghana, in particular in the northern regions, financed through the Adaptation for Smallholder Agriculture Programme (ASAP).
- d. Knowledge management, harmonization of intervention approaches and policy support.

The agricultural development plans of the Government of Ghana, alongside the strategic priorities of the NARS, have identified a number of prime commodities (such as chilies, pineapples and maize) as well as their value chains. Support for the latter has been focused on locating market opportunities to the identified food crops cultivated by local farmers. Collaboration in research for technology generation, production, development and dissemination along these selected commodities has been critical to all these activities and may have served as the hub around which all these relationships and partnership revolve around.

Some of the key areas of initiatives supported in Ghana have included:

- Value chain approach and out grower schemes;
- Policy advice and capacity building at different levels;
- Improvement in quality standards;
- Cooperation with the private sector;
- Agricultural finance.

The mode of delivery of the German Development Cooperation (GDC) has been based on value chain development. This has aimed at linking stakeholders of the value chains and distributing value added equally. This has been the central to the GDC approach and ensuring that quality along the value chain is not compromise.

Through the Ghana-Germany relations, nine value chains have been supported. They include rubber, mango, pineapple, citrus, chili pepper, maize, guinea fowl, grass cutter and fish value chains in five regions (Western, Central, Brong Ahafo, Volta and Northern) of the country. In total about 5,800 farmers have been directly supported in addition to other processing companies.

4.3 Some potential partners for the German collaboration: in science and research, private sector and NGOs and governmental organizations

Ghana and Germany have had long standing diplomatic relations dating back to Ghana's independence in 1957 in several areas, most specifically in the areas of socio-cultural and human development. The collaboration between the two countries has aimed at promoting development in areas of agriculture, the private sector development and good governance. However, in recent times, Germany have continued to support Ghana through sectors like road infrastructure, health, and education, water and reforestation and forestry management. This collaboration continues strongly and the two countries are further seeking greater collaboration for nation building.

Partnership in the agriculture sector has been enormous, and research and development have been critical parts of the relationship as a way of supporting Ghana to come out of the many challenges it faces in alleviating poverty through agriculture-led economic development. Thus, the relationship has supported the development of some innovation systems and platforms in the country. These have mainly aimed at complementing efforts to translate research output into development outcomes, beyond the demand-driven research process and other benefits.

Importantly, some of the institutions of the German Development Cooperation working already in Ghana are Kreditanstalt für Wiederaufbau (KfW) for Financial Cooperation, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the German Institute of Metrology (PTB).

A call for a good partnership framework is crucial in terms of continuing the strong Germany-Ghana collaboration. Prospective partners with Germany in Ghana are mainly the following national and international institutions:

- Ministry of Food and Agriculture;
- Center for Scientific and Industrial Research (CSIR), particularly, SARI, CRI, FRI, STEPRI;
- Blue Skies Ghana. Ltd. (Pineapple value chain);
- USAID-Ghana (maize and rice value chain);
- International Food Policy Research Institute;
- International Institute of Tropical Agriculture, Tamale, Ghana;
- ACDI/VOCA (maize and rice value chain).

4.4 Needed implementation research

Summary of Recommendations for Consideration

- Improvement in the system performance, especially through better AEA motivation and incentives, particularly in the context of governmental decentralization;
- Farmers groups and organizations should receive capacity-building training to advocate for their receipt of agricultural extension services;
- Local government (District Assembly) capacity to utilize extension to improve small-holder incomes and food security should be strengthened so that decentralization does not further damage the ability of small-holder farmers to receive extension services;
- Capacity building at the national level is necessary to improve coordination of extension activities and programs across a wide variety of extension providers;

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- Support and improvement via strengthening should be provided to MoFA ICT-based extension efforts;
- Ensure that widely available training materials and supporting supplies exist for all the major crops in northern Ghana, particularly rice, maize, and soya;
- Increase the media development capacity of the MoFA Extension Directorate through training, coaching and learning by doing;
- Develop a properly catalogued and shared (via the internet and via a resource library) set of all extension training materials for Ghana;
- AEAs and other front-line extension workers be able to access in-service training programs through a variety of delivery platforms;
- Ghanaian university and other extension training programs to offer the strongest possible degree and certificate training programs should be enhanced through faculty-strengthening and exchanges;
- Establish a program to pilot and enable the ability of farmers' organizations to directly hire, finance, and utilize agricultural extension agents;
- Build upon existing and previously developed and implemented programs of community extension volunteers (lead farmers, etc.) via strengthening, training, and support so that farmers' groups and their extension needs are met;
- Develop and promote small-scale independent farm advisors who provide services to farmers on a fee-for-service basis;
- Implement an extension program targeted to mechanization service providers (tractors, combines, threshers, etc.) in northern Ghana to strengthen business skills and technical capacity, as well as their business lines and offerings.

With the help of the FARA and Ghana Agricultural Sector Investment Programme, as well as a good partnership with Germany, agricultural research and development will be improved in the country.

The PARI initiative, which is one of the latest in the country and aims at ensuring that research activities results in development has taken this pathway in Ghana and plans are far advanced to align research actions with the German-led Agricultural Innovation Centers in the country.

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