FARA
Forum for Agricultural Research in Africa

IRAD

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CAMEROON

Potentials and Possibilities for German Collaboration in Agriculture

PARI

Program of Accompanying Research for Agricultural Innovation

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This report is work in progress and continuously being updated. Any feedback and suggestions for further improvement are welcome and can be sent to pari@uni-bonn.de.

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1 General background information of the agricultural and food sectors

Cameroon is a country located in Central Africa with a total land area of 475,440 km^2 and a population of about 22 million inhabitants. It is bordered by Nigeria to the West, Chad to the Northeast, the Central African Republic to the East and Equatorial Guinea, Gabon, and the Republic of Congo to the South. Cameroon's coastline lies on the Bight of Bonny, part of the Gulf of Guinea and the Atlantic Ocean. Cameroon is sometimes described as "Africa in miniature" because it exhibits all the major climates and vegetation of the continent: mountains, desert, rain forest, savannah grassland, and ocean coastland. Cameroon can be divided into five agro-ecological zones (Table 1) distinguishable by dominant physical, climatic, and vegetative features. The climate varies with terrain, from tropical along the coast to semi-arid and hot in the north. Exceedingly hot and humid, the coastal belt includes some of the wettest places on earth, as is the case with Debundscha, at the base of Mt. Cameroon, with an average annual rainfall of about 10,287 mm.

Agriculture is the backbone of Cameroon's economy; employing 70% of its workforce, while providing 44% of its gross domestic product and 30% of its export revenue. Cameroon produces several agricultural commodities, for export and domestic consumption. The most important of these, which vary from one agro-ecological zone to another (see Table 1) are cocoa, coffee, cotton, banana, rubber, palm oil, sugarcane, tobacco, tea, pineapple and peanuts for cash crops, and plantains, cassava, corn, millet, sorghum, yams, potatoes, sweet potatoes, dry beans, and rice for food crops. Animal husbandry is practiced throughout the country and is particularly important in the Northern region.

Table 1: Major crops cultivated and animal species reared in each agro-ecological zone

Agro-ecological zones	Main crop and animal production
Sudano-Sahelian	Maize, millet-sorghum, rice, cowpea, soybean, onion, sesame, fruits, cotton, cattle and small ruminants
High Guinea Savanna	Maize, yam, cassava, sweet potatoes, rice, cotton, cattle, pig, small ruminants, poultry birds
Western Highlands	Maize, beans, potatoes, rice, sweet potatoes, vegetables, coffee, pig, poultry, cattle, small ruminants, fisheries
Mono-modal Humid Forest	Banana, plantain, cassava, cocoyam, sweet potatoes, maize, vegetables, cocoa, coffee, oil palm, rubber, fruits, poultry, pig, poultry birds, small ruminants, fisheries
Bimodal Humid Forest	Plantain, cassava, banana, maize, cocoyam, sweet potatoes, cocoa, oil palm, rubber, coffee, maize, cocoa, oil palm, fruits, poultry, pig, fisheries, small ruminants

1.1 Pan-African policies and strategies

Like most African countries whose economies greatly depend on the agricultural sector, Cameroon has established strategies and policies that align with those laid down by the African Union and other related organizations.

Even though the country signed the Comprehensive Africa Agriculture Development Program **(CAADP)** on July 17th 2013, it has not yet met the CAADP 10% expenditure target as its agricultural spending in 2013 only stood at 6.8%. Cameroon has also not been able to meet the CAADP annual increase of agricultural productivity by 6%. CAADP is Africa's policy framework for agricultural transformation, wealth creation, food security and nutrition, economic growth and prosperity for all. Cameroon joined the **Scaling Up Nutrition (SUN)**

Movement in March 2013. SUN consists of 55 countries that have committed to scaling up nutrition and working collectively as a movement. The movement unites people—from governments, civil society, the United Nations, donors, businesses and researchers—in a collective effort to improve nutrition. Within the SUN Movement, governments are prioritising efforts to address malnutrition. In addition, the country is a member of the **Africa Stockpiles Programme** (**ASP**) that was initiated in 2000 by the Pesticide Action Network (PAN) and the World Wide Fund for Nature (WWF) whose objective is to clean up stock piles of obsolete pesticides (especially of persistent organochlorines). Cameroon is also a member of the **Bamako Convention** on the ban of the import into Africa and the control of trans-boundary movement and management of hazardous wastes within Africa. This was signed on the 1st of March 1991 and ratified on 11th of July, 1997.

Cameroon is a member of the Central African Economic and Monetary Community (CEMAC) and Economic Community of Central African States (ECCAS) that approved a **Common Agricultural Policy** for the region on 22-23 October 2014. ECCAS is an Economic Community of the African Union (AU) for the promotion of regional economic co-operation in Central Africa. The country is also a member of an important organization in the Central African Region – The Inter-State Committee of Pesticides (CPAC). This organization was created in 11/03/2007 in Ndjamena, Chad, with the purpose to ensure that agricultural production (especially use of agrochemicals) does little or no harm to the environment and to human/animal health. The main services offered by this organization are:

- To carry out a common procedure for the registration of pesticides;
- To maintain the safety of food products;
- To recommend alternatives for extremely dangerous and dangerous pesticides;
- To analyse pesticides.

1.2 National (and regional) policies and strategies

Cameroon adopted a National Agricultural Investment Plan in April 2014 to be implemented for seven years (2014-2020). The aim is to invest about FCFA 3.35 trillion in the development of agriculture in the country. The four priority areas for this investment plan are:

(i) Development of the agricultural sectors (plants, livestock, fisheries and forestry);
(ii) Modernisation of production infrastructure in rural areas and improved mechanisms for access to finance;
(iii) Management and sustainable use of natural resources; and
(iv) Capacity building of stakeholders in rural development and the promotion of collaboration among these stakeholders.

Cameroon has a National Strategy for the Development of Rice Growing that seeks to improve the productivity and competitiveness of local rice by mitigating the constraints to production. The priorities and strategic directions include: (i) support for the acquisition of agricultural inputs, (ii) basic planning of irrigable areas and the rehabilitation of infrastructure and agricultural equipment in the large rice irrigation schemes, (iii) support to structuring and professionalizing producers and (iv) support for processing and marketing of rice.

Formulated for a long-term development, the country's Vision 2035, "Cameroon: An emerging, democratic and united country in diversity" has the overall objective to make Cameroon an emerging country within the next generation (25-30 years). The Vision also has medium-term objectives, notably: (i) poverty alleviation, (ii) becoming a middle income

country, (iii) becoming a newly industrialised country and (iv) consolidating democracy and national unity while respecting the country's diversity. The country's Vision 2035 is to be implemented in three phases: phase 1 (2010-2019), phase 2 (2020-2027), and phase 3 (2028-2035). The country is presently implementing phase 1 whose overall objective is to modernize the economy and accelerate growth with specific objectives as: (i) increasing Cameroon's overall economic productivity significantly so as to address urgent sector crises (food, energy, financial and employment, (ii) raising the investment rate significantly so as to attain a two digit economic growth, (iii) bringing the poverty rate to less than 25%, and (iv) improving the business climate, as well as public and corporate governance.

In addition, the government in collaboration with many external/international research and funding agents has been putting in place much effort to improve agricultural productivity. Government is combating these constraints and wants to ensure food security by increasing the production of food stuff and other crops which could substitute importations. To meet these needs, Government has set a target in 2015 to train 30,000 farmers per year in 35 centers for agricultural training. In addition, the government has authorized the creation and functioning of more private and government higher institutes of learning to train more students in the field of crop production, crop protection, agro-economics, food technology/processing. Since 2009, the government, through the Ministry of Agriculture and Rural Development, developed an emergency plan to increase agricultural production by providing farmers with improved planting materials (for rice, plantain, maize, fruit trees, beans), subsidize pesticides and fertilizer from 20 to 50%, grant loans at low interest rates, create five pools of agricultural machinery support of up to 15%, acquired hundreds of tractors and increase the capacity of processing, storage and packaging. The National Agricultural Extension and Agricultural Research (PNVRA) through outreach activities provided technical and financial guidance to farmers.

1.3 Data on food and nutrition security

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

Table 2: Selected national economic and health-related data

Indicator	Data	Year
Population, total	22,818,632	2014
Population growth (annual %)	2.5	2014
Rural population (% of total population)	46	2014
GDP per capita, PPP (constant 2011 international $)	2,829	2014
GNI per capita, PPP (constant 2011 international $)	2,803	2014
Poverty headcount ratio at $2 a day (PPP) (% of population)	53	2007
Poverty headcount ratio at $1.25 a day (PPP) (% of population)	28	2007
Poverty headcount ratio at national poverty lines (% of population)	40	2007
Rural poverty headcount ratio at national poverty lines (% of rural population)	55	2007
Agricultural land (% of land area)	21	2012
Agricultural irrigated land (% of total agricultural land)	no data	
Agriculture value added per worker (constant 2005 US$)	1,264	2014
Agriculture, value added (% of GDP)	23	2014

Access to electricity, rural (% of rural population)	19	2012
Employees, agriculture, female (% of female employment)	58	2010
Employees, agriculture, male (% of male employment)	49	2010
Employment in agriculture (% of total employment)	53	2010
Literacy rate, adult total (% of people ages 15 and above)	71	2010
Ratio of female to male secondary enrolment (%)	86	2013
Mortality rate, under-5 (per 1,000 live births)	95	2013
Malnutrition prevalence, weight for age (% of children under 5)	15	2011
Malnutrition prevalence, height for age (% of children under 5)	33	2011
Maternal mortality ratio (modelled estimate, per 100,000 live births)	590	2013

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

Table 3: Investment in Agriculture

Year	Percentage of total public investment dedicated to MINAGRI
2003	0.07
2004	0.11
2005	0.07
2006	0.062
2007	0.044
2008	0.038
2009	0.043
2010	0.03
2011	0.063
2012	0.06

Source: MINAGRI is Ministry of Agriculture and Animal Resources

Table 4: Agricultural GDP

Year	Agric (% of GDP)	GDP Growth (Annual %)
1995	23.6	4.1
1996	23.6	4.9
1997	24.7	5.3
1998	25.3	4.9
1999	24.4	4.1
2000	22.1	4.2
2001	22.2	4.5
2002	22.1	4
2003	21.7	4
2004	20.4	3.7
2005	20.6	2.3
2006	21	3.2
2007	22.9	3.3
2008	23.4	2.9
2009	23.5	1.9

2010	23.4	3.3
2011	23.6	4.1
2012	23.2	4.6
2013	22.9	5.6

Source: MINAGRI

1.4 Data on most relevant crops and value chains

The most relevant food crops in Cameroon include include maize, rice, sorghum, tubers (mainly cassava, yams and taro), fruits, groundnuts, bananas and plantains, coffee, cocoa and oil palm. Production and consumption data are provided below.

1.4.1 Production

Cassava ranks high in particular in terms of its share volume and value of production (Table 5). Other main crops produced by area are maize, sorghum, cocoa beans and groundnuts. Regarding production value, plantains, maize, groundnuts and Taro also account for the top-ranking shares. Meat from indigenous cattle constitute 43% of total meat production followed by chicken meat with 27% (Table 6).

Table 5: 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**
Maize	14.2	Fruit excl. melons, Total	13.9	Cassava	12.2
Sorghum	12.7	Cassava	11.2	Plantains	11.6
Cocoa, beans	10.9	Plantains	9.0	Maize	9.2
Groundnuts	7.6	Cereals, Total	8.0	Groundnuts	7.7
Cassava	5.2	Cereals (Rice Milled Eqv)	7.8	Taro (cocoyam)	6.2
Plantains	4.5	Coarse Grain, Total	7.5	Yams	5.9
Beans, dry	4.2	Oil, palm fruit	6.4	Cocoa, beans	5.6
Coffee, green	3.4	Maize	4.3	Sorghum	5.5
Cucumbers & gherkins	3.4	Taro (cocoyam)	4.1	Beans, dry	4.9
Seed **cotton**	3.0	Bananas	3.8	Oil, palm	4.7

* Gross Production Value (constant 2004-2006 million US$)
Note: AIC value chains are marked in red
Data: average 2011-2013, FAOStat, accessed 9 July 2015

Table 6: Meat production (tons)

Commodity	% of total meat
Meat indigenous, cattle	43.2
Meat indigenous, chicken	27.3
Meat indigenous, pig	12.5
Meat indigenous, goat	7.9
Meat indigenous, sheep	6.6
Meat indigenous, horse	0.1
Meat indigenous, rabbit	0.0

* Gross Production Value (constant 2004-2006 million US$)
Note: AIC value chains are marked in red
Data: average 2011-2013, FAOStat, accessed 9 July 2015

1.4.2 Consumption and nutrition status

The importance of cassava is also reflected in total and per capita food supply quantities (Table 7). Other important food crops include vegetables, plantains, bananas, roots & tubers and maize.

Table 7: 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	13.4	Cassava and products	95	Roots & Tuber Dry Equiv.	421
Vegetables, Other	8.8	Vegetables, Other	63	Maize and products	321
Plantains	6.4	Plantains	45	Cassava and products	283
Bananas	5.9	Bananas	42	Sorghum and products	234
Roots & Tuber Dry Equiv	5.9	Roots & Tuber Dry Equiv	42	Rice (Milled Equivalent)	212
Maize and products	5.8	Maize and products	41	Rice (Paddy Equivalent)	212
Beverages, Fermented	5.5	Beverages, Fermented	40	Wheat and products	141
Tomatoes and products	4.8	Tomatoes and products	34	Palm Oil	128
Rice (Paddy Equivalent)	4.4	Rice (Paddy Equiv.)	32	Beans	111
Beer	4.1	Beer	29	Plantains	111

Data: average 2009-2011, FAOStat, accessed 22 July 2015

1.4.3 Trade

Cameroon is the most important market in the CEMAC zone, accounting for nearly 50% of the GDP. Millet, sorghum, rice, yam, cassava, fruits (e.g. pineapple, papaya, oranges), fresh vegetables and plantain are produced for both domestic consumption and for exports to countries within the central African region. The main cash crops, which provide about 40% of

Cameroon exports are bananas, cocoa (the country is the world 5th largest producer), cotton, coffee and natural rubber (Table 8). The top agricultural imports are rice, wheat, malt and refined sugar (Table 9).

Table 8: Top 10 agricultural products exported

Export volume (tons)		Export value (US$)	
Top 10	**Share of Total**	**Top 10**	**Share of Total**
Bananas	36.0	Cocoa, beans	47.9
Cocoa, beans	28.4	Cotton lint	10.7
Cotton lint	9.5	Rubber natural dry	9.0
Coffee, green	6.1	Bananas	7.7
Rubber natural dry	4.3	Coffee, green	7.1
Pineapples	1.6	Cocoa, butter	3.1
Food prep nes	1.5	Food prep nes	2.2
Cocoa, butter	1.3	Rubber, natural	2.0
Sugar refined	1.1	Cocoa, paste	2.0
Rubber, natural	1.0	Cocoa, powder & cake	1.7
Chicken, meat	0.0	Chicken, meat	0.0
Onion (dry)	0.0	Onion (dry)	0.0
Irish Potato	0.0	Irish Potato	0.0

Data: average 2010-2012, FaoStat, accessed 31 Oct 2015
AIC value chains marked in red.
nes refers to: Not elsewhere specified

Table 9: Top 10 agricultural products imported

Import volume (tons)		Import value (US$)	
Top 10	**Share of Total**	**Top 10**	**Share of Total**
Rice – total (Rice milled equivalent)	35.5	Rice – total (Rice milled equivalent)	29.2
Wheat	32.8	Wheat	18.5
Sugar refined	5.8	Malt	6.3
Malt	5.6	Sugar refined	6.3
Oil, palm	2.5	Oil, palm	4.2
Cake, soybeans	2.5	Food prep nes	3.9
Flour, maize	1.4	Milk, whole dried	3.9
Food prep nes	1.3	Cigarettes	3.4
Maize	1.0	Infant food	2.1
Macaroni	0.9	Cake, soybeans	1.9
Meat, chicken	0.0	Meat, chicken	0.0
Onion (dry)	0.3	Onion (dry)	0.1
Irish Potato	0.0	Irish Potato	0.0

Data: average 2010-2012, FaoStat, accessed 31 Oct 2015
AIC value chains marked in red.

The most important import goods in Cameroon are rice and wheat, which both account for more than 30% of the import volume. Cocoa plays an important role in exports and accounts for nearly 30% of the export volume. The other AIC value chains (Chicken, Onion, Irish potato) do not appear among the traded products.

Generally, the European Union (EU), China, Nigeria, and USA are Cameroon's biggest trading partners (Table 10). Cameroon's total trade share to the EU is 0.1% and half of the country's total export is to the EU, with France as the main trading partner and source of private investment and foreign aid. Although US investment in Cameroon is about 1 million Dollars, it is mainly in the oil sector.

Table 10: Total Goods: Top trading partners 2013

	Imports				Exports		
No	Partner	Value (million €)	Share in World (%)	No	Partner	Value (million €)	Share in World (%)
	World	5,520	100		World	4,228	100
1	EU 28	1,883	34.1	1	EU 28	2,196	51.9
2	China	1,276	23.1	2	USA	256	6.1
3	Nigeria	593	10.8	3	China	255	6.0
4	USA	282	5.1	4	India	208	4.9
5	India	243	4.4	5	Chad	181	4.3
6	Thailand	132	2.4	6	Gabon	170	4.0
7	Brazil	89	1.6	7	Trinidad and Tobago	120	2.8
8	Turkey	86	1.6	8	Ghana	90	2.1
9	Ivory Coast	81	1.5	9	Norway	76	1.8
10	South Africa	58	1.1	10	Nigeria	66	1.6

Source: EuroStat IMF. World trade excluding inter-region trade and top partners excluding region member states

1.5 National (and regional) innovation system

1.5.1 Research system and organizations

- pending further information -

1.5.2 International

A number of international research institutions have country offices and research stations in Cameroon. Examples of these institutions and their research domains are presented below.

- International Institute of Tropical Agriculture (IITA): cassava, banana, plantain, maize, cocoa, entomology and social studies;
- The World Vegetable Center (AVDRC): vegetables;
- Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD): food security, agroforestry systems, agro-industrial plantations, aquaculture systems and cotton cropping systems;
- World Agroforestry Centre (ICRAF): agroforestry systems;
- Biodiversity International: agricultural and tree biodiversity;
- Center for International Forestry Research (CIFOR): forest management, gender, climate change, food and biodiversity, forest policy, products and trade, and landscape;
- UCLA International Research and Training Center in Cameroon (IRTC): conservation, ecology and evolution, infectious diseases, and biodiversity;

- GIZ (Cameroon-German partnership). The GIZ is a major funder of agriculture and environment activities in the country;
- Forum for Agricultural Research in Africa (FARA) which, through other organizations like IITA and AVRDC, has been putting efforts to set up innovation platforms and support their activities;
- The African Research Center on Bananas and Plantains (CARBAP) has been playing an important role by carrying out research on bananas and plantains

1.5.3 National

The public agricultural research organization is the Institute of Agricultural Research for Development (IRAD), which was established in 1996 to conduct agricultural research with mandates around annual and perennial crops, livestock and fisheries, forest and environment, farming systems, economics and rural sociology. IRAD works in collaboration with many local and international research institutions and development partners. Some government and private universities are also involved in agricultural research in Cameroon. These include: University of Dschang, University of Ngaoundere, University of Yaounde I, University of Buea, University of Bamenda, Catholic University of Cameroon, Cameroon Christian University, and Catholic University Institute of Buea.

1.5.4 Innovation platforms

According to FARA, an innovation platform is a physical or virtual forum established to facilitate interactions and learning among stakeholders selected from a commodity chain, leading to participatory diagnosis of problems, joint explorations of opportunities and investigations of solutions. The aim of innovation platforms is to promote agricultural innovation along the targeted commodity chain. Innovation in agriculture is the process of ensuring that a new product or knowledge is converted to perpetual use. One of the important and emerging ways to implement the innovation systems approach for agricultural development is via the Integrated Agricultural Research for Development (IAR4D) concept developed by FARA. Innovation platforms are widely used in agricultural research projects in Cameroon (see Table 11 for a few examples).

Program of Accompanying Research for Agricultural Innovation (PARI)

Table 11: Some agricultural innovation platforms set up in Cameroon

Location	Project/Purpose	Commodity Value Chain
Adamawa Region (Ngaoundere and Guider)	Sustainable Intensification of Integrated Agricultural Farming Systems. Funded by AusAid and implemented by IRAD/CSIRO/CORAF (2013) Purpose was to increase agro-pastoral productivity and food security in West and Central Africa.	Fresh milk and Meat
Center, East, South & Littoral Regions (Nkong-Abok, Batchenga, Okola, Ngat, Gouekong, Lobo, Banyo, Mefomo, Kiki, Pouma)	Dissemination of New Agricultural Technologies in Africa (DONATA) (2007 to 2014) Funded by the African Development Bank via FARA and implemented by IRAD Focus in Cameroon was on production, processing and marketing	Cassava
South & Littoral Regions (Ambam and Kombe)	INNOBAP Project Funded by European Commission and implemented by Bioversity/CARBAP Regional Network of Multi-stakeholders Platforms for Participatory Improvement of Banana & Plantain Varieties	Plantain and Banana
South (Ntem)	Food Security Thematic Programme (FSTP) Project Funded by European Commission and implemented by CARBAP/CIRAD Implemented for the improvement of food security and living standards of the poor via development of banana and plantain sector in Central Africa.	Banana and Plantain
North, Extreme North, West and North West	NERICA Rice Project Funded by Common Funds for Commodities (CFC) via Africa Rice To enhance competitiveness of rice in Central Africa and to improve food security, rural income as well as to reduce importation of rice.	NERICA Rice
Western Highlands (Kouoptamo community)	Funded by International Livestock Research Institute (ILRI) Implemented by IRAD For purpose of Harnessing Genetic Diversity for Improved Goat Productivity	Goat
West and SouthWest Regions (Bansoa & Ekona)	Funded by CORAF/WECARD Implemented by CARBAP Promote integrated management technologies for the cultivation of plantains to improve farm productivity	Plantain

1.5.5 Extension system and organizations

Agricultural extension proper began in the 1970s when the government increased its intervention in agriculture by establishing as many as 24 parastatal development agencies. After the 1986 worldwide fall of prices of export crops, low income of farmers and food shortages in Cameroon beginning 1988, the World Bank financed the National Agricultural and Education Program (NAEEP). The focus of this support was on the Training and Visit (T&V) extension system comprising three main components; Extension, Training, and Information. Because the T&V system was not very effective, the government launched the National Program for Agricultural Extension and Research (PNVRA – Programme Nationale de Vulgarisation et de Recherche Agricole). The major institutions providing extension/advisory services are as follows:

a. Public Institutions

- The Ministry of Agriculture and Rural Development in Cameroon has a number of agricultural extension-related functions. These include: disseminating information and advice to farmers; checking agricultural and cooperative education; supervising private agricultural education in conjunction with the Ministry of Vocational Training; and managing farmers and agricultural extension;
- The National Program for Agricultural Extension and Research (PNVRA), operating with the Ministry of Agriculture and Rural Development, is the main public agency for providing extension services to the farmers in Cameroon. It had about 1,651 extension staff in 2009. This agency carries out the following activities: agricultural extension, training and development of human resources, support to producer organizations and associations, partnership with the private sector, agricultural research, village community participatory pilot development operations, and monitoring and evaluation as well as impact assessment of the extension program;
- Chamber of Agriculture, Fishery, Livestock and Forest (CAPEF): Its main role is to defend the interests of producers in the Agricultural, Fishery, Livestock and Forestry sectors, develop partnerships with investors and facilitate the training of farmers;
- Institute of Agricultural Research for Development (IRAD): From time to time and/or in collaboration of MINADER, IRAD trains farmers on best practices for cultivation of certain crops or rearing of certain livestock;
- The Societe de Developpement du Coton du Cameroun (SODECOTON) is a semi-autonomous public organization that also provides extension services in cotton production in northern Cameroon. It had about 306 extension staff in 2009;
- Southwest Development Authority (SOWEDA): This organization is funded by the government and other foreign agents. Its key role is to help the small-scale farmers in the Southwest Region by training and providing improved seeds and information in collaboration with MINADER and IRAD;
- North West Development Authority (MIDENO) Project caters for the Northwest Region and its mission is to help strengthen extension services to female producers. The method of extension used were mainly individual and group contacts, provision of farm inputs (www. g-fras.org).

b. Private sector

There is no established private company or NGOs that provide extension and advisory services to the farmers on regular basis. However, some of the NGOs (e.g. FADENAH) are active in extension type activities. There are also many agrochemical companies that train farmers and other stakeholders on the pesticide safety measures although the service rendered might not be too regular. These companies include Agrochem, Fimex, Syngenta, LDC (ADER), JAKO, and DuPont. In addition to these,

some service CIGs such as AgroVital Services & Consulting (AgroViSc) carry out research and sensitize the public on pest and pesticide management using different media e.g. print, TV and Radio.

A number of farmer-based associations or cooperatives provide extension and market advisory services to their members. Some of these associations are:

- Associations de Producteurs et de Stockeurs de Cereales (APROSTOCs) ;
- South West Farmers Association, Ltd.;
- South West Federation of Plantain Farmers (PLANTSFED);
- Cameroon Federal Farmers Association (CAMFFA);
- Northwest Cooperative Association Limited (NWCA);
- WUM Honey Farmers Association;
- Cameroon Cooperative Credit Union League (CamCCUL);
- CNOP-CAM and PLANOPAC.

1.5.6 Private R&D activities

Some of the private sector companies involved in the supply of agricultural inputs, and in the trading, export, import of agricultural commodities in Cameroon are presented below. Some of them are international companies but have offices or agents in Cameroon. Besides import and export of agricultural inputs, these companies collaborate with some research institutes to carry out research.

- Cameroon Agric Complex Inc. (located in Littoral; manufactures and supplies cooking oils, seeds, chemicals and animal feed);
- Glochem Industries Ltd. (located in Littoral; deals in pesticides, fungicides, insecticides and algaecides);
- Cameroon Chemical Fertilizer Production Company Ltd. (located in Muyuka, South West Region; produces chemical fertilizers, like urea and DAP);
- Nlaten Farms, Ltd. (established in 2008; trades in agriculture, food and beverages and chemicals);
- Agriculture and Pet Products (established in 2010; exports fresh eggs and egg products);
- Mohamedou adventures, Ltd. (established in 2001; exports agricultural inputs and outputs);
- Lipenja Development Corporation (established in 2010; deals in palm oil, sunflower oil, and olive oil);
- Development Action Group (GRADEV - Groupe d'Action pour le Développement). It is a private company involved in some extension work, and had about 46 extension staff in 2009 (www.g-fras.org).

The agrochemical companies (Jako, Syngenta, Agrochem, Arysta Life Sciences, LDC, DuPont and Senachem, BASF) put lots of efforts to fund research especially on the bioefficacy of pesticides and effects of fertilizers with much focus on export crops such as bananas, cotton, oil palm, rubber, cocoa as well as other important crops for domestic consumption such as maize, yams, cassava, and vegetables. In all cases, these companies fund research and collaborate with public and/or private research institutions such as IRAD, Faculties of Agriculture/Agronomy of universities, AgroVital Services & Consulting (AgroViSc). In addition, for purposes of registration of chemicals on some main export crops by MINADER or CPAC, these companies collaborate with large plantations (e.g. PAMOL, CDC, PHP, SODECOTON, SOCAPALM, HEVECAM) to carry out research.

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

Key challenges to the development of the agricultural sector in Cameroon include:

- Production shortages in all major crops (rice, cassava, plantains, corn, potato and sugar cane);

- Low productivity of the smallholder farming systems;
- Poor methods for the conservation and marketing of fresh vegetables;
- Difficulty in accessing farm inputs (fertilizers and pesticides);
- Lack of or insufficient improved seeds;
- Weak organization by producers;
- High postharvest losses;
- Dilapidated or low output husking equipment in the rice sector;
- Poor funding of agricultural research activities;
- High dependency on imported rice;
- Limited access to credit/rural finance;
- Poor value chain development for most commodities;
- Very limited mechanization;
- Inadequate farm to market roads (especially in high crop production areas), most of which are in very bad state.

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 Cameroon can be expected to have only relatively low effects on food and nutrition security improvements in the country.

Table 12: Country level Performance Indicators

Indicator	Index	Performance (%)
1. Number of Years with more than 6% agricultural growth (2005 to 2014)	1	10
2. Percentage point change in TFP index between 2001 and 2008	7	30
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 %	na	na
5. Steps in CAADP completed	2	25
6. Percentage point improvement in undernourishment between 2001 and 2011	18.9	100
7. Global hunger index (2014)	12.6	30
Total score (weighted)		43

Source: Own computation based on World Bank (2015), FAO (2015), ASTI database and von Grebmer *et al.* (2014), na refers data is not available.
Note: the % performance (rounded) is defined as follows for the respective indexes: 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.+5.)/2 (expected government commitment); + sum of (6.+7.)/2 (performance in food and nutrition security and need) divided by 3.

Results of assessment (Table 12):

Expected agricultural growth performance:

- Cameroon has increased its agricultural growth to more than 6% (CAADP target) in only one year between 2005 and 2014 (www.resakss.org).
- Total agricultural factor productivity in Cameroon has improved only by 7% between 2001 and 2008 (Fuglie and Rada, 2011), indicating that Cameroon's commitment to research and development in the agricultural and food sector is not sufficient.

Government commitment:

- Cameroon has not a good track record of political commitment to foster sustainable agricultural growth by being less active in the CAADP process and having completed only two out of the eight steps in the CAADP process (www.resakss.org).
- Cameroon has not shown a strong willingness to invest in agricultural sector. In no single years, the country has invested more than 10% of total government expenditures (CAADP target) in agriculture between 2005 and 2014 (www.resakss.org).

Food and nutrition security progress and need:

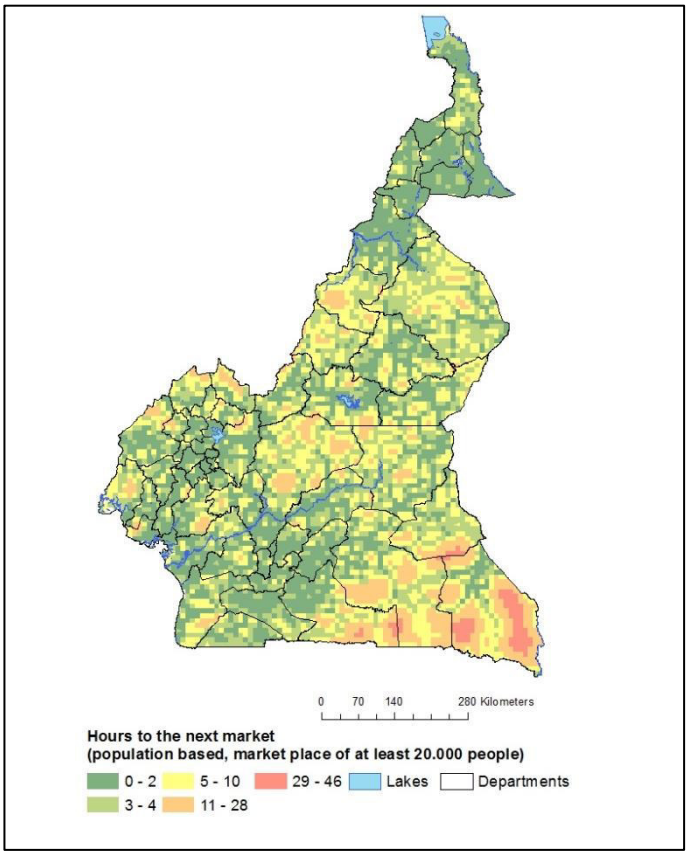
- Cameroon is prioritizing actions for hunger and malnutrition reduction and show about 18% improvement in undernourishment between 2001 and 2011, which is above the 10% threshold level (FAO, 2014).
- Still, Cameroon has the GHI score value of 12.6 reflecting a serious level of hunger (von Grebmer *et al.,* 2014)[1]. This makes the investment into the agricultural and food sector in Cameroon urgent to reduce the high numbers of food insecure people.

[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" (von Grebmer *et al.,* 2014).

However, the overall economic, political, and social/nutrition framework in Cameroon does not seem to suggest accelerated investment into the agricultural and food sector of the country.

Nevertheless, Cameroon has potentials for agricultural development, and this includes the country's large land resources. Cameroon has fertile lands covering 25% of its surface area most of which has not been exploited. Different agro-ecological zones and therefore different agricultural activities can be pursued based on careful selection of sites. Rice can be grown in practically all natural regions of the country and there is a long tradition of rice production among the local populations in the Great North, Northwest and West of the country. Lots of fruits are produced and these are wasted during peak seasons since no value is added to them. There are lots of water resources for irrigated agriculture and there is a huge market for food products in the region especially from CEMAC and Nigeria. Also, labour is readily available and cheap.

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 Cameroon

2.1 AIC value chains

The value chains chosen for the agricultural innovation centers include chicken (broiler), cocoa and onions (potato).

2.1.1 Poultry value chain

Cameroon's annual poultry production amounts to approximately 30,000 tons and its export are extremely low. The poultry-meat sector is not a major mainstay of the country's economy as its

contribution to GDP is estimated to be less than 1%. However, it plays an essential role for food security and income generation. The sector generates a yearly net profit of about 30 million US Dollars and contributes an estimated 14% of the population's needs in animal proteins. Traditional village systems of the sector are responsible for about 35% of total poultry meat production, and generates 65% of the poultry sector's annual net profits.

The domestic poultry sector benefits from a high degree of import protection and domestic demand is projected to increase rapidly. Total demand for poultry meat in 2015 is estimated to be about 73,000 metric tons, of which 19,000 metric tons will be for traditional chicken and 54,000 metric tons for commercial broilers. Commercial and family farm produced village chicken are treated differently as they are not internationally traded, have a different flavour, and only 10% is sold in urban markets. Production at all levels is mainly based around Bafoussam (West Region) including the agro-industrial hatchery. Presently, numerous consumers regard village chickens as having a much better flavour than the commercial broilers and there are indications that there is good demand in the urban areas for this type of bird.

2.1.2 Cocoa value chain

According to FAOSTAT (2012), Cameroon is ranked 14th in terms of world cocoa production with about 256,000 metric tons. Cocoa also ranked 3rd in terms of the country's export commodities. Cocoa is one of the best crops to increase income in households within forest communities in Cameroon. Except the three northern regions, cocoa is produced in all the other regions but with highest production (about 80%) in three of the regions; Southwest (35%), Centre (28%), and South (16%). Unlike other cash crops like oil palm and rubber, only smallholders are involved in cocoa activities. A cocoa development society (SODECAO) exists, that supports extension services to farmers. Production trend in the country has been on a steady rise from the period 1960 (600,000 tons) to 2005 (2,400,000 tons) and the country contributes 4% to world cocoa production.

After harvesting and extraction of the beans (mostly done manually by family labour or hired labour), the beans are dried using ovens and then put into bags. These are sold to intermediaries who most often exploit the farmers due bad roads (no means to transport) or using false scales. Some of these intermediaries (licensed buyers) sell to local bigger exporting organizations such as TELCAR COCOA, sell to local cocoa processing companies in Douala or they export themselves to Europe. A small amount of cocoa butter, paste and powder are produced in Cameroon and sold/consumed locally or sold to neighbouring countries.

2.1.3 Onion

- pending further information -

2.2 Other relevant value chains

2.2.1 Cassava value chain

Cassava value chain plays an important role in food security in Cameroon. It occupies about 20% of cultivated land (about 270,000 ha dedicated to the crops) and around 46% of national food crop production. Cassava products are components of basic food intake for seven to eight million people in Cameroon, mostly living in the eight southern regions, and cover around 8% of daily nutritional needs. Cassava is the first consumed staple in Cameroon. Also, cassava products represent 60% of the market share of roots and tubers in Cameroon (Emmanuel, 2013).

Most of the cassava is produced in small holdings (0.3 to 2 ha) and over 3.9 million tons were produced in 2011 and 4.3 million tons in 2012, topping the list of crop production. Most of the activities of cassava value chain (planting, processing, and selling) are carried out by women. Cassava

is eaten in different forms in the country (boiled, gari, fufu, bobolo, miondo, pounded and the leaves as vegetables especially in the South and Centre Regions). To improve the cassava production and marketing, several Farmer Field Schools (FFSs) have been established with about 25,000 producers involved of which 53% are women. The country is self-sufficient in the production of cassava and already enjoys a high degree of competitiveness and is well situated to grow in domestic and regional markets (especially Gabon and Equatorial Guinea).

2.2.2 Plantain and Banana value chain

In Cameroon, bananas are mostly cultivated in large agro-industrial plantations for export purposes (worth about 1.4 million metric tons produced). In terms of plantain production, Cameroon is ranked 8th in the world with an increasing quantity of 1.1 million tons in 1999, 2.18 million tons in 2006, and about 2.4 million tons in 2013. In the Central African Region, although Cameroon is ranked 2nd in consumption (126 kg/person/year), it is the highest producer and exporter especially to countries such as Gabon, Congo, Equatorial Guinea. Plantain is cultivated mainly in the Southern parts of the country (dominated by small-scale farmers and a few large-scale farmers practicing monocropping on several hectares) while banana for exports are concentrated in South west, and Littoral Regions.

In About 650,000 farmers are involved in the production of plantains with greater than 92% being small farmers and 60-70% having farms smaller than 2 ha. Consumption of these food crops is gradually increasing in the urban areas with about 40 kg/year/person consumed in Douala and Yaounde (the two largest cities in Cameroon). Plantains contribute 4.5% of Cameroon's agricultural Gross Domestic Product, 16% of producers' income, with an annual consumption rate per person of 126 kg. In some rural areas, though farmers produce many bunches, because of very bad roads, they are forced to give away to middle men at very low cost (as low as 300 FCFA per bunch of about 18 kg). In addition to selling fresh bunches, few persons produce banana chips that are packaged and sold in stores or road side. With the government's emphasis on modernizing agriculture by 2035 and with its move to boost plantain/banana production, many investors and previous subsistence farmers are now considering establishing larger farms/plantations. This trend has resulted in an increasing demand for seedlings.

2.2.3 Maize value chain

Cameroon is the 46th in the world in terms of maize production with a share of 0.2%. The total area of land harvested for the crop is 832,400 m^2. Total production of this crop has increased drastically from 280,000 metric tons in 1960 to 1,647,036 in 2013. It is the most widely grown crop in the country. In addition to being an important staple food in most parts of the country (especially in the grassland areas), it is also widely used to produce feed for livestock all over the country. Farmers sell either the fresh cobs or dry grains. In spite of this, most farmers cultivate in relatively smaller areas (0.4 to 0.6 hectares) and the country is not self-sufficient.

Until the late 1980s, maize was considered by many as crop only for home consumption (can be roasted, boiled, eaten in form of pudding, transformed to flour eaten as porridge or fufu and fermented to traditional beer) and not for cash. However, with high demands from the brewery companies and livestock sector, its production is gaining more importance as a cash crop. The crop provides about 20% of the country's caloric and protein requirements. Generally, production is dominated by small-scale producers (low-input-use farms) although some medium-scale and large-scale producers are found in the Western and Savanna regions respectively.

2.2.4 Cotton value chain

Cotton is one of six agricultural commodities that account for the lion's share of Cameroon's export revenues. Produced mainly in the Sudano-Sahalian and High Guinea Savannas of the Northern parts

of the country, the production of cotton is an important source of income for the relatively poorer Northern regions. This crop therefore represents a value chain with significant potential impacts on poverty reduction and export development. Seed cotton production in the country amounted to over 100,000 metric tons in 2003 and increased to 190,000 metric tons in 2012 (ranking 18th in the list of production commodities in the country). Between 2000 and 2006, cotton export represented between 20-25% of total agriculture exports. Production in Cameroon occurs mainly in the North and Far North Regions where the cotton system is managed as a more or less vertically integrated enterprise by the parastatal firm SODECOTON. Even though this company is not involved directly in field production, it enjoys official monopoly status on the purchase, processing, and marketing of all cotton in the country. However, it has important responsibilities for farmer extension, input procurement, and input distribution. Cotton is not irrigated and picking is exclusively by hand.

2.2.5 Oil Palm value chain

In Cameroon, palm trees are mostly grown in Southern regions in the tropical forests. Cameroon has the capacity to be an important palm oil exporter, but currently, domestic production does not meet total demand, hence, the imports from other countries such as Indonesia and Malaysia. Cameroon exports limited quantity of palm oil to its regional partners in CEMAC, but this could be expanded to displace imports from Southeast Asia in these countries where Cameroon enjoys a clear transport advantage.

Cameroon is the 4th largest oil palm producer in Africa and its production is on a steady rise (from 44,000 metric tons in 1964 to 270,000 metric tons in 2014). In terms of production, oil palm ranks 15th in the country and Cameroon's oil palm ranks 25th in world. Three types of producers contribute to the production of palm oil in the country: smallholders, commercial farms, and agribusinesses (industrial plantations such as CDC, PAMOL and SOCAPALM). Small holdings are characterized by low yield, low input use and reliance on family labour. Commercial farms operate more professionally, at a larger scale, use improved seeds, use inputs and employ wage labour. Industrial plantations use improved seeds, are highly mechanized, and employ wage labour. By global standards, per hectare yields in Cameroon are low and this is mostly due to use of poor quality seedlings by most smallholders and some commercial farmers.

2.2.6 Vegetables value chain

World ranking of Cameroon commodities puts fresh vegetables at the 55th position while in terms of production in Cameroon, it is ranked 9th with about 700,000 metric tons in 2012. Although much still has to be done with respect to research on traditional African vegetables (TAVs) and government support to these crops, more and more people especially in the urban areas, are increasing their consumptions of vegetables.

Generally, vegetables are cultivated in all regions but with productions in West, Northwest, Southwest, Littoral, Center and South. In these areas, focus has been on the production of exotic vegetables such as cabbage, tomatoes, lettuce, carrots etc. In the production of these vegetables, there are more women active in the cultivation of leafy vegetables and more men in the non-leafy vegetables such as tomatoes, African garden egg, cabbage and pepper. Although the cultivated TAVs vary with regions, common vegetables are African nightshade, amaranth, African eggplant, okra, *Telfeiria* (Okongobong), *Vernonia* (bitter leaf), and *Talinum* sp. (water leaf). Most of the vegetables are cultivated at the banks of streams/ponds/rivers/lakes (38.3%), fallows of plantations (10%) or in marshy areas (8.6%) and are hardly irrigated. With the exception of cabbage and tomatoes which may be cultivated on large areas (3-10 ha), others are within maximum of 0.2 ha .Vegetables are produced either for home consumption or for sale. Farmers at the country boarders like those in

Ambam and Kiosi take advantage of the high demands from neighbouring Equatorial Guinea and Gabon.

2.2.7 Rubber value chain

In Cameroon, natural rubber is produced essentially by the larger agro-industrial plantations such as the CDC, HEVECAM, SAFACAM and PAMOL (95%) as well as by smallholders (~ 5%). There are about 750 smallholdings with about 2,250 ha under cultivation. Most of these small holders only use agro-chemicals in the form of stimulants to boost latex production. They equally get improved planting materials in the form of budded seedlings from IRAD, CDC or experienced private nurseries.

Once rubber has been tapped and the cups are full with coagulated latex, it is put into jute bags and transported to nearby roads. Here, the harvest is given to CDC (to be paid later) or sold directly to HEVECAM or private individuals who take the raw products to Nigeria. Within Cameroon, coagulated latex is taken to factories of CDC or HEVECAM, where they processed to obtain semi-finished rubber bales or sheets (mostly exported to Europe and few sold to local companies for the manufacture of rubber goods). Unlike the oil palm sector, where many smallholders or groups of smallholders have access to private machines for oil extraction, machines to obtain semi-finished products of rubber are still to become a reality for smallholders. Despite this lack, rubber is still referred by many in the country as 'white gold'.

2.2.8 Rice value chain

Rice has become the most rapidly growing food source for millions of people. In 1984, average annual consumption of rice was 11.5 kg/capita for the entire country, accounting for 5.2% of food expenditure of households. Presently, consumption is about 8% with over 95% the population eating rice at least once per week. Domestic production has never been able to meet demand, leading to huge imports (400,000 tons/year). Major rice cultivation areas are in the extreme or far North (Maroua and Kousseri) and North West (Ndop plains), with small cultivation in the West Region. Currently the highest rice production is in the far North region with approximately 1,000 ha of land cultivated by some 1,100 traditional food farmers. Presently, the NERICA rice is gaining more importance.

The country represents about 0.3% of Africa rice production. In 2012, paddy rice production ranked 20th in the country with production of 181,818 metric tons. Most farms are irrigated (about 85%), some in swampy areas and rainfed (10%) and few are upland (5%). Harvesting is manual while milling is carried out by small scale workshops with average capacity of 200 kg of milled rice per hour. Women are mainly involved in activities such sowing, weeding, threshing, winnowing, crop processing (drying, milling, and de-stoning) and distribution. Most farmers make use of family labour and therefore labour is intensive.

3 Innovations in value chains in the past 20 years

Since most of the cash crops in the country are cultivated in large plantations and managed by agro-industrial companies, many innovations have been developed and applied for the cultivation, processing and marketing of these crops. Most importantly, best practices (for pests and pesticide management, land preparations, agronomic practices, harvesting, postharvest losses) are enforced accompanied by stringent quality control especially for consumables and export products. For the crops of domestic consumption, over 95% are cultivated by small-scale farmers most of whom are illiterates and most still use traditional methods of cultivation.

3.1 The most crucial limiting factors in Cameroon / AIC-region / in AIE value chains

Agriculture in Cameroon is faced with a handful of constraints:

- Low productivity of the smallholder systems due to traditional practices. The traditional practices are still prevalent because improved practices require inputs that are not readily available or more expensive than the financial capacity of the smallholders;
- Limited public expenditure dedicated to agricultural research, extension and education. Public spending on agricultural projects and programmes are financed mostly by development assistance under shared funding arrangements whereby the Government may contribute 20% or less to the total with donors covering the rest;
- Limited mechanization: Cameroon has a low mechanization ratio with few tractors serving several hectares of arable land;
- Insufficient storage/processing facilities and marketing infrastructure. Insufficient storage and marketing infrastructure is aggravated by the isolation of agricultural production areas because of the poor quality of rural roads;
- Limited access to credit/rural finance. Peasant farmers have limited access to credit/rural finance because of: (a) their inability to present viable projects for financing; (b) the perceived high cost of financing; and (c) the absence of specific financial services/instruments for their segment;
- Poor value chain development for most commodities, reducing the country to net producer of raw agricultural commodity and limiting the margin of benefits;
- Less competitiveness of rice and cotton in particular due to trade protection and domestic support afforded OECD farmers which lead to lower-than-otherwise world market prices for those commodities.

3.2 Most relevant value chains in Cameroon

3.2.1 AIC value chains

- pending further information -

3.2.2 Other value chains and cross-cutting innovations

- pending further information -

3.2.3 Cassava breeding and multiplication of disease-free planting materials

The cassava value chains created within the DONATA (Dissemination of New Agricultural Technologies) initiative have contributed to the rapid multiplication of disease-free cuttings, production of cassava products (e.g. *gari* and *bâtons de manioc*) of consistent quality, and better organization of cassava processing and marketing (e.g. group-based marketing). This project was carried out in the Centre region (6 innovation platforms), Littoral region (1 platform), South region (1 platform), and East region (2 platforms). In addition, in 2003, a project on the improvement of the root and tuber sector was funded by IFAD and implemented by a government agency (Roots and Tubers National Development Program – PNDRT). This national agency distributed IRAD/IITA improved varieties across the country notably the clone “8034” which is very productive and resistant to the cassava mosaic virus. Most small scale cassava producers received disease-free planting materials of improved varieties of cassava. Over 40% of women benefited from the project. The enthusiastic involvement of different stakeholders from the beginning of the project partly accounted for the successes of this project. However, after giving these planting materials, there are hardly any follow up on the subsequent performance of the materials.

3.2.4 Improved Livestock Production System

IRAD works in collaboration with the International Atomic Energy Agency (IAEA) for the improvement of livestock productivity, food security and poverty reduction through artificial insemination (AI) and

reproductive disease diagnostics. In the last years, more than 500 inseminations have been performed with approximately 70% conception rate using oestrous synchronization. Furthermore, the prevalence of Brucellosis has been reduced drastically as a result of the establishment of a control programme, use of AI and culling of infected animals. Hybrids of female cows are available that can give 8-12 litres of milk per day as compared to the 1-2 litres from traditional breeds.

As part of the project "Sustainable Intensification of Integrated agriculture farming systems to increase the agropastoral productivity and food security in West and Central Africa" (ISIAE), which was funded by AusAID, and is coordinated by CORAF/WECARD, crop/livestock value-chains were established in Ngaoundere and Guider regions of Cameroon. Crop/livestock farmers involved in the project benefited from improved crop-livestock integration techniques, improved forage crops, and livestock fattening methods. The value chains also contributed to increased revenues and wellbeing of producers in agropastoral systems.

3.2.5 Development and Dissemination of Improved Maize and Sorghum Seeds

Diageo, an alcoholic beverages company, launched a sorghum value chain initiative in Cameroon in 2008 by providing smallholder sorghum farmers in the main sorghum-growing regions in northern Cameroon with access to improved variety seeds and agricultural inputs, hands-on agronomic training and advice, and support in the development of storage and transport infrastructure. Diageo's initiative has stimulated the demand for sorghum and created a sustainable source of income for the farmers due to an increase in the yield of sorghum. Diageo Company also benefits from a stable, secure source of sorghum for beer (Business Call to Action, undated).

As far as other cereals are concerned, many high yielding varieties have been developed and distributed to farmers in all the maize-growing regions of the country. Some recent hybrid varieties with high yields and tolerance to aluminium toxicity are TP S6 31Y-Bb x 9450 (8.5 t/ha), ATP-SR-Y (tolerant to acid soils), and C4RR SA4 x Cam Inb gp1 17 (8.3 t/ha). For sorghum, new varieties that are high-yielding and adapted to local conditions have been distributed to farmers. Examples are Safari 40 (yellow), and Madjeri (white).

3.2.6 Dissemination and cultivation of improved beans and traditional vegetables

In partnership with AVRDC–The World Vegetable Center and with funding from CORAF/WECARD, IRAD together with the Center for Assistance for Sustainable Development (CASD), is distributing improved traditional African vegetables (TAVs) to farmers. These TAVs include amaranth, African nightshade, jute mallow, and African eggplant. The farmers have been trained and are now using some best practices such as planting distance of 30x30 cm for African nightshade that increases growth/yield and reduces infestation of insect pests. There are varieties of the common beans (e.g. TY 3396-12, NITU, MEX-142, ECA PAN 021, MAC 55), and soy bean (TGX 1835-10 E) that are tolerant to mosaic and anthracnose disease, have been selected and distributed to farmers. Through funding from C2D and PABRA, IRAD is able to test these varieties in different localities, distribute them to farmers and train farmers on best cultivation practices.

3.2.7 Rapid multiplication of plantains and promotion of best cultivation practices

CARBAP has produced lots of innovations as far as bananas and plantains are concerned (e.g. rapid multiplication of plantains using macro-propagation technique popularly known as 'PIF' technique, cost-effective and environment-friendly ways of managing pests/diseases, new hybrids of plantain – CRBP 039 that is resistant to black sigatoka). The 'PIF' technique is widely used by smallholders to boost plantain production. With the C2D project, many demonstration plots have been established with focus on the following aspects, Integrated Pest Management, Best Cultivation practices. Furthermore, following a partnership agreement between IRAD and MINADER, IRAD is producing

over 5 million *in vitro* plantains (of highly demanded and common varieties). Plantain and sweet potato flour have been used to replace about 40% of wheat flour used in making bread**.**

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 Cameroon, 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 Cameroon'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 13 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 13: Selection of promising agricultural products /value chains

	Rank by RCA		**Rank by yield progress****		**Rank by relevance of crop**	
Rank	**Name of agricultural product**	**RCA index (2011)***	**Name of the crop**	**Average annual yield growth % (2005-2012)**	**Name of agricultural product**	**Production share of supply (2011)***
1	Pyrethrum, dried	58	Onions, dry	22	Beans	110
2	Cocoa, beans	36	Rice, paddy	16	Cocoa Beans and products	109
3	Bananas	7	Tomatoes	12	Sorghum and products	103
4	Rubber, natural	5	Bananas	11	Bananas	100
5	Cotton lint	4	Plantains	8	Roots, Other	100
GIZ Selected products	Onions, dry	0.00	Cocoa, beans	2	onions	98

Source: * Own computation based on FAO 2015 data

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

Results of assessment (Table 13):

- The trade potential (revealed comparative advantage (RCA) index) is high for dried pyrethrum, cocoa beans, Bananas natural rubber, cotton lint and the GIZ selected cocoa beans. This indicates that Cameroon has comparative advantage (in the export) of these commodities. The RCA value for the other GIZ selected value chain, onion, is much lower than 1 indicating that Cameroon has comparative disadvantage (in the export) of this commodity;
- The yield performance indicating progress suggests that over the CAADP period (2005 to 2012) onion (GIZ selected value chain), paddy rice, tomatoes and bananas are the five most promising crops. Cocoa, the other GIZ selected crop, shows only a small growth performance over the CAADP period;
- In terms of relevance (production share of supply) beans, sorghum, bananas, roots, and the GIZ selected cocoa value chains are the leading. The total production of the first three products exceed the total supply. The full supply of the latter two is fully produced in the country. About 98% of the total supply of the other GIZ selected value chain, onion, is also locally produced.

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

Since Germany has a rich experience in agriculture, agro-processing and technology, partnership with the country will play an important role in shaping the agricultural sector in Cameroon especially in the following areas:

- **Value addition:** Many food and cash crops are wasted because their raw forms are not being transformed to other useful products that can be preserved for a longer time. The technical know-how of Germany will boost the transformation of local raw materials. For example, transformation of plantains and cassava to flour and starch respectively;
- **Soil fertility management:** With the evidence of declining soil fertility, German collaboration in this area will help reverse the situation and therefore ensure increasing yields of crops such as cassava and maize that are heavy feeders on soil nutrients. The help here will focus on finding ways of increasing soil fertility by use of cost-effective and environment-friendly techniques adapted to local conditions e.g. use of mycorrhizae, cover crops and the manufacture and use of biofertilizers;
- **Capacity building:** In this case, Germany will help to train students and technicians in the fields of food technology and in the manufacture of small food processing machines;
- **Rapid diagnosis of diseases in animals:** Using advanced molecular techniques, certain serious diseases on animals can be detected earlier before signs appear or before the situation get worse. German and Cameroonian molecular researchers will work together to develop simple, rapid but cost-effective diagnostic field tools/kits;
- **German experience on innovation platforms:** The successes of Germany in the fields of science, technology and agro-processing cannot be over-emphasized. Experiences of Germany in the area of setting up, operationalising and sustaining an agricultural innovation platform is strongly recommended;
- **Conservation of cereals and legumes:** One major problem with cereals is losses incurred after harvest. With the German partners, appropriated techniques of drying and preservation these crops so as to minimize post-harvest losses during storage would be developed and applied;
- **Policy formulation:** With the help of German experts that have been and/or are involved with agricultural projects in Cameroon, Cameroon can benefit from recommendations that would help establish or build policies for certain agricultural sectors.

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

a. Collaborators for science and research

IRAD; CARBAP; University of Ngaoundere; Biotechnology Units of University of Buea & Yaounde 1.

b. Collaborators in the private sector and NGOs

Agrochemical companies e.g. Agrochem, LDC, Syngenta, DuPont.

c. Collaborators from governmental organizations

MINADER; Ministry of Livestock/Fisheries; SOWEDA; NOWEFOR; CNOPCAM.

4.4 Needed implementation research

- Partnerships (regional and intercontinental) should be explored for exchange of knowledge and technologies on sustainable intensification pathways taking clues from emerging economies with similar agro-ecological delineations and socio-economic conditions;
- Agricultural research and development systems needs to give attention to the paradigm change of the innovation systems approach;
- There is the need to develop innovative funding mechanism to support agricultural innovations;
- There is also a need to develop a policy support system for the smallholder farmers.

5 References

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