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Status of Agricultural Innovations, Innovation Platforms and Innovations Investment in

Cameroon

PARI

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FARA Forum for Agricultural Research in Africa

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Status of
Agricultural Innovations, Innovation Platforms and Innovations Investment

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TABLE OF CONTENTS

STUDY THREE: Investments in Innovations for Agricultural Development and Food and Nutrition Security

STUDY BACKGROUND

Science and technology remains the fulcrum for development over the ages. There is hardly any national development in contemporary history that is not based on consistent efforts from the science and technology sector. The spate of development in agriculture follow suit; the state of efficiency in science and technology generation correlates highly with the development of agriculture. In Africa, agriculture is considered as the sector with the best potential to lead the socioeconomic development of countries on the continent. However, the sector is bedevilled with many constraints that could be categorized as technological, socio-cultural, institutional, infrastructural, and economical. The poor productivity of the enterprise stream in the sector is clearly seen from its contribution to a country's GDP versus the number of active workers engaged in the sector. Africa's agriculture currently engages about 65% of the working population and its average contribution to GDP still stands at 22.9%.

The crave to develop Africa has received good attention in recent years, starting with the political will of the heads of states, under the auspices of the Africa Union Commission, to develop and implement the Comprehensive Africa Agricultural Development Programme (CAADP), the Science Technology and Innovation Strategy (STISA). The Forum for Agricultural Research in Africa (FARA) also came up with a handful of continental initiatives, such as the Sub-Saharan Africa Challenge Programme (SSA CP), *Strengthening Capacity for Agricultural Research and Development in Africa* (*SCARDA*), Dissemination of New Agricultural Technologies in Africa (DONATA) and several others. The different initiatives aim to foster change by addressing specific issues that constitute constraints in the path of progress in Africa agriculture. The notion that African agricultural research system has generated a lot of technologies with great potentials, but which are not realized due to different institutional and organizational constraints—more specifically, the way agricultural research and development systems is organized and operated—is prevalent among stakeholders in the sector. Indeed, this notion appeals to reasoning. However, there is no known cataloguing or documentation of existing technologies and their veracity in delivering broad-based outcomes. The possibility of finding some documentation in annual reports of research institutes, journal articles and thesis in the universities is known, but this will not meet an urgent need.

Thus, the Programme of Accompanying Research for Agricultural Innovation (PARI) commissioned the three studies reported in this volume to provide a compressive analysis of the state of agricultural technology generation, innovation, and investment in innovations in the last 20 years in selected countries in Africa.

Study 1 is the "situation analysis of agricultural innovations in the country" and provides succinct background on the spate of agricultural innovation in the last 30 years. It provides useable data on the different government, international and private sector agricultural research and development interventions and collates information on commodities of interest and technologies generated over the years. It also conducted an assessment of the different interventions so as to highlight lessons learnt from such interventions, with regard to brilliant successes and failures.

Study 2 concerns a "scoping studies of existing agricultural innovation platforms in the country". It carried out an identification of all the existing Innovation Platforms (IP) in the country, including identification of commodity focus, system configuration, and partnership model. The study provides an innovation summary for each IP for use in the electronic IP monitor platform. It further synthesises the lessons learnt from the agricultural IPs established through different initiatives in the country in the last ten years.

Study 3 was an "Assessment of the national and international investment in agricultural innovation". It is an exhaustive assessment of investments in innovation for agricultural development, food and nutrition security in the country. It collates updated data on investment levels in the past and present, including a projection for the next decade requirement to assure food and nutritional security in the country.

The three studies form the comprehensive collation on the state of agricultural innovation in the 12 countries where the PARI project is being implemented. It is expected that these studies will benefit all stakeholders in Africa's agricultural research and development, including the users of technologies, research stakeholders, extension system actors and, more importantly, the policymakers.

STUDY ONE

Inventory of Agricultural Technological Innovations (1995 to 2015)

INTRODUCTION

African agriculture is at a crossroads. Persistent food shortage has led to mass protests and created panic among policymakers in some big cities. However, there seems to be some light in the tunnel, with three major opportunities that can help transform Africa's agriculture to be the global engine of economic growth. First, advances in science, technology and engineering worldwide offer Africa new tools to promote sustainable agricultural development. Second, efforts to create regional markets are providing new incentives for agricultural production and trade. Third, a new generation of African leaders is helping the continent to focus on long-term economic development. These opportunities have led innovation in agricultural development to receive growing attention as a means of addressing the challenges of feeding an increasingly populous and resource-constrained Africa. The approach has made a major change in the way that the production of knowledge is viewed, and thus supported. It shifts attention away from research and the supply of science and technology, towards the whole process of innovation, of which research is only an element. Innovation entails essentially the result of an interactive process between many actors. For FARA and its partners, these involve farmers, extension workers, researchers, seed companies, government officials, and many others.

Individual organizations rarely possess all the knowledge necessary for the whole process of innovation. The need to create an innovation system is thus critical to creating a favourable network of organizations within an economic system that are directly involved in the creation, diffusion and use of scientific and technological knowledge, as well as the organizations responsible for the coordination and support of these processes. Such actors are focused on bringing new products, processes, policies, and forms of organization into economic use. In their attempts to bring about change in agriculture, these multiple stakeholders become part of what is seen as agricultural innovation systems (AIS).

The African Union Commission's Science, Technology and Innovation Strategy for Africa 2024 (STI Strategy 2024) takes into consideration the social, economic, and technological progress that Africa has made over the last decade. Innovation for sustainable and high agricultural growth forms an important part of the AUC agenda for prosperity. This is combined with the increasing importance of international scientific and research collaboration as an imperative for achieving regional and national science, technology, and innovation policy goals.

2 Programme for Accompanying Research in Innovation (PARI)

The Forum for Agricultural Research in Africa (FARA), in partnership with the German Government, represented by the Centre for Development Research (ZEF) of the University of Bonn under its "One World No Hunger" initiative, is implementing the "Programme of Accompanying Research for Agricultural Innovations (PARI)". PARI is taking cognisance of the successes of research and innovation initiatives in African agriculture and in consideration of the concept of integrated agricultural research for development (IAR4D), promoted by FARA, to build an independent accompanying research programme to support the scaling of agricultural innovations in Africa and, thereby, contribute to the development of Africa's agricultural sector. PARI is implemented together with the agricultural innovation centres within the "One World No Hunger" initiative.

To ensure that PARI is effectively taken forward, the grantees proposed the review and assessment of the extent and level of national and international investments in agricultural innovations in their respective countries. The expected deliverables are:

a. Review the national and international investments that may have taken place in agricultural innovations in the countries targeted in PARI.
b. Review the context(s) within which the investments were made.
c. Assess the extent of investments and specific innovations targeted.
d. Analyse and determine the value addition of these investments to the target innovations.
e. Identify possible areas of investments by PARI and the likely value it would add to the realization of the PARI objectives.
f. Suggest appropriate measures or steps to position the BMZ initiative for agricultural innovation centres.

Therefore, FARA proposed to provide sub-grants to 12 countries to facilitate the required studies in their respective countries and generate the required outputs.

Objectives

The major objective is that PARI would collaborate with NARIs in 12 African countries (i.e.; Benin, Burkina Faso, Ethiopia, Malawi, Nigeria, Mali, Ghana, Cameroon, Kenya, Togo, Tunisia, and Kenya) to coordinate activities in their respective countries. In 2015, the activities focused on a situation analysis of agricultural innovation. Specifically, the situation analyses entailed:

a. an inventory of existing functional and promising agricultural innovations in each country
b. a scoping study of existing agricultural innovation platforms in the country

c. an assessment of the state of national and international investment on agricultural innovation system in the country

Outputs and Milestones

a. A report of the situation analysis of agricultural innovations in the respective countries.
b. A report on lessons from a synthesis of existing agricultural innovation platforms in the respective countries.
c. A report of the analytical review of the investment profiles and the value they may have added in enhancing the plausibility of innovations to resolving food security and livelihood issues in the respective countries.
d. Priority areas for investment in agricultural innovation and innovation platforms, as well as the value they will add to resolving food insecurity and livelihood issues in the respective countries.

Approach and Activities

FARA developed sub-grant agreements with a National Agricultural Research Institutes (NARI) in each of the 12 countries. In 2015, these sub-agreements focused on the following studies:

a. Conduct a situation analysis of agricultural innovations in the country and produce reliable information. This analysis should be rich enough to generate publishable reports and policy briefs on the state of agricultural innovation knowledge in the country as well as usable data set on the key subject matter.
b. Conduct a scoping study of existing agricultural innovation platforms in the country and synthesize the lessons learned from agricultural innovation platforms that are established from different initiatives in the country in the last ten years. The study is expected to generate reliable data sets and publishable information.
c. Conduct a study on national and international investment initiatives in innovation for agricultural development and food and nutrition security in the country. The research outcomes should be sufficient to provide updated data on investment levels in the past and present, including a projection for the next decade, required to assure food and nutritional security in the country. The study is expected to generate publishable information.

Agricultural Innovation as Drivers of Economic Development

The importance of agriculture in reducing poverty and ensuring economic growth in developing countries has been emphasized by many international organizations (FAO, World Bank, FARA, etc). In developing countries, research plays an important role in improving the agricultural sector by generating data for applicable techniques and

technologies. But in spite of all these, especially in sub-Saharan Africa, the rate of modernization in agriculture does not seem to match the volumes of agricultural research results or techniques/ technologies generated each year. Critical analyses from many experts have revealed that the slow rate of modernization is, to a great extent, as a result of inadequate innovations in agriculture.

Generally, an innovation is a process by which something new is implemented in a given context; it is often socially accepted or appropriate and provides benefits for the parties involved. Innovations are also considered as new methods, customs, or devices used to perform new tasks. It should be noted that there are several categories of innovations—for example, innovations that are embodied in capital goods or products (e.g. tractors, fertilizers, seeds, etc) and those that are disembodied (e.g. integrated pest management schemes). Experience has shown that private stakeholders do not usually invest in disembodied innovations because of the difficulty in selling the final product; hence, it is often an area for public action or investment.

Innovations can also be classified according to form—for example, mechanical innovations (e.g. tractors and combine harvesters), biological innovations (e.g. new seed varieties), chemical innovations (fertilizers and pesticides), agronomic innovations (e.g. new management practices), biotechnological innovations, informational innovations, and process innovations (e.g. a way to modify the genes in a plant). They can also be distinguished by their impacts on economic agents and markets; for example, an innovation can increase yield, reduce risk, increase environmental protection, and enhance shelf-life. Innovations are more likely to emerge in response to scarcity and economic opportunities. In agriculture, an innovation is the process of ensuring that a new product, idea or knowledge or technology is converted to perpetual use, as well as leading to social and economic benefits.

For increased adoption of technologies generated through research, as well as for more meaningful and applicable innovations to be generated, literature recommends the use of innovation platforms. An innovation platform is a forum (physical or virtual) where stakeholders from a particular commodity chain interact, learn, diagnose problems, explore opportunities and provide improvements within the value chain. Thus they are important factors in agricultural development. There are two main types of innovation platforms: strategic and operational/cluster/grassroots innovation platforms. The former brings together chief executive officers (CEOs) from different stakeholders' organizations to strategically determine the agricultural agenda for the country, region, division or district, while the latter brings together stakeholders at the grassroots where they do hands-on work in the area of diagnosing, exploring, and investigating solutions and facilitating the adoption.

Innovations in agriculture (easily generated within innovation platforms) are important drivers of economic development, especially for developing nations like Cameroon, whose economy significantly depends on agriculture. Even though part of Cameroon's Vision 2035 emphasizes the modernization of agriculture, true modernization can only be attained if the government wholeheartedly embraces the concept of innovation platforms and provides an enabling environment. Also, researchers and their institutions should have a paradigm shift, from the existing research for development models to the more widely promoted and applied integrated agricultural research for development (IAR4D) model, which focuses mainly on solving problems arising from value chain activities within a given platform. In a platform whose entry point is maize production with focus on grain preservation from pests and diseases, for example, researchers would focus on the identified problem.

METHODOLOGY

The five agro-ecological zones of Cameroon were considered for the country. It is noteworthy that the zonal headquarters of IRAD are located in each of these zones. In each of these IRAD research centres, a term of reference (developed by the PARI project coordinator and the general manager of IRAD) was sent to the IRAD zonal chiefs. In the term of reference, two focal persons (researchers) were chosen to be in charge of data gathering with regard to study 1 (inventory of agricultural innovations) and study 2 (information on innovation platforms). The focal persons used key informant interviews (KIIs) and review of some relevant documents, such as newspapers and annual reports of IRAD and other agricultural institutions in the zones. For the KIIs, the informants were chosen from different stakeholders (farmers, agricultural extension officers, researchers, and heads of agricultural and livestock delegations).

RESULTS

After both primary and secondary data were aggregated and analysed, the results showed that the existing innovations were mainly in the following areas:

- New varieties of crops and livestock (NCV)
- Soil fertility improvement/management/enhancement (SFM)
- Processing and packaging especially for food and cash crops (PP)
- Agroforestry techniques (AT)
- Pests and diseases management (PDM)
- Capacity building of farmers/producers (CBF)
- Non-conventional livestock rearing (NCLR)
- Market improvement (MI)
- Agricultural shows, open and field days (AS)
- Irrigation scheme (IR)
- Seed production and marketing (SPM)

- Mutual health organizations (MHO)

Figure 1 shows the first four areas where innovations are focused are soil fertility management, capacity building of farmers, processing and packaging of food/cash crops, and new crop varieties.

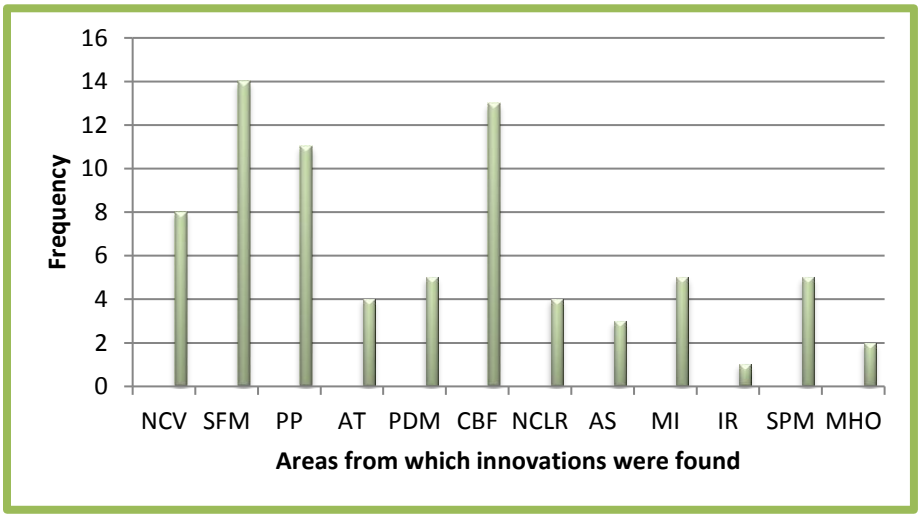

Figure 1. Frequency of areas from which innovations were reported

STUDY TWO

Inventory and Characterization of Innovation Platforms

INTRODUCTION

The importance of agriculture in reducing poverty and ensuring economic growth in developing countries has been emphasized by many international organizations (FAO, World Bank, FARA). In developing countries, agricultural research has played an important role in improving the agricultural sector by generating many techniques and technologies. However, in spite of all of these in many parts of Africa, South of the Sahara, the rate of modernization of agriculture does not seem to match the volume of agricultural research results or techniques/technologies generated each year. A critical analysis from many experts in the world has revealed that this slow rate of modernization is to a greater extend as a result of lack or inadequate innovations in agriculture.

Generally, innovation is a process by which something new is implemented in a given context – it is socially accepted or appropriate and provides benefits for the parties involved. Innovations are also considered as new methods, customs, or devices used to perform new tasks. It should be noted that there are several categories of innovations. For example, innovations that are embodied in capital goods or products (e.g., tractors, fertilizers, seeds, etc) and those that are disembodied (e.g., integrated pest management schemes). Experience has shown that private stakeholders are less likely to invest in generating disembodied innovations because of the difficulty in selling the final product. Therefore, it is an area for public action or investment. According to Dacian Cioles (an EU Commissioner for Agricultural Development), an innovation is a driver for change and a way to turn challenges into opportunities and concrete improvements on the ground. This is also the case in the agricultural sector, which is faced with a number of growing challenges – not only economic, but also environmental and social. Innovation should be a process of generating, accessing, sharing and putting knowledge into use, in which stakeholders learn and innovate together; managing the risks and benefits.

Generally, there are four basic requirements for innovation; (i) it is something new to the user, (ii) it is better than what currently exists, (iii) it is economically viable and socially desirable, accepted or appropriate, and (iv) it has a widespread appeal.

Innovations can also be classified according to form. For example, mechanical innovations (e.g., tractors and combine harvesters), biological innovations (e.g., new seed varieties), chemical innovations (fertilizers and pesticides), agronomic innovations (e.g., new management practices), biotechnological innovations, informational innovations, process innovations (e.g., a way to modify the genes in a plant). Innovations can also be distinguished by their impacts on economic agents and markets. For example, an innovation can increase yield, can reduce risk, increase environmental protection and enhance shelf-life. Innovations are more likely to emerge in response to scarcity and economic opportunities. The bottom line is that innovation

in agriculture is the process of ensuring that a new product, idea or knowledge or technology is converted to perpetual use, as well as leading to social and economic benefits. This implies therefore that innovation in agriculture plays an important role in agricultural development.

For greater adoption of technologies generated by research institutions and universities, as well as for more meaningful and applicable innovations to be generated, several literatures recommend the use of innovation platforms. An innovation platform is a forum (physical or virtual) where stakeholders from a particular commodity chain interact, learn, diagnose problems, explore opportunities and come out with improvements within the value chain. This implies that innovation platforms are important breeding grounds for innovation. Basically, there are two main innovation platforms: strategic and operational/cluster/grassroots innovation platforms. The former brings together chief executive officers (CFO) from different stakeholder organizations to strategically determine the agricultural agenda for the country, region, division or district. Operational/grassroots innovation platform brings together stakeholders at the grassroots level, where they do hands-on-work in the area of diagnosing, exploring, investigating solutions and facilitating their adoption.

In conclusion, innovations in agriculture (easily generated within innovation platforms) are important drivers of economic development, especially for developing nations like Cameroon, whose economy significantly depend on agriculture. Even though part of Cameroon's Vision 2035 emphasizes on modernization of the agricultural sector, true modernization can only be attained if the government whole-heartedly embraces the concept of innovation platforms and provides an enabling environment. It is also time for researchers to have a paradigm shift from existing research for development models to the present widely-promoted and applied Integrated Agricultural Research for Development (IAR4D) model. With this model, researchers within a platform focus mainly on solving problems that arise from the value chain within the platform. For example, in a platform whose entry point is maize production, with a focus on grain preservation from pests and diseases, then researchers in the platform should focus their research towards this problem.

Overview of Cameroonian Agriculture

Generally, Cameroon is a Central African Nation located on the Gulf of Guinea, and one of the member countries of the Economic Community of Central African States (ECCAS). It has a population of about 20 million people (population density of about 42.1 per km^2, land surface area of about 475,442 km^2 with French and English as official languages, and over 24 major African language groups. Cameroon shares boundaries with the following countries: Nigeria, Chad, Central African Republic, Democratic Republic of Congo, Gabon, Equatorial Guinea, and the Atlantic Ocean. It has a GDP per capita of 1,700, life expectancy of 48 years and a literacy rate of 79%.

Cameroon has a diversified agricultural sector, resulting from various agro-ecological zones. Because of this, there is a wide range of crops and livestock species, ultimately leading to difficulties and/or complexities in on-farm data collection methods as well as low rate of coverage. Over 60% of the population lives in the rural areas, with agriculture as the main activity. About 4 out of every 10 persons live below the poverty line, 75% of which live in the rural areas. The country's agricultural sector plays an important role in the national economy; (i) it contributes over 20% to the national GDP with an annual growth rate of about 4.1% as against 3.4% for the rest of the economy, (ii) the sector provides employment to over 60% of the active population, (iii) contributes significantly to the export taxes, with the rural sector contributing about 54%.

However, in spite of its great agricultural potentials, it should be noted that besides a few mechanized industrial exploitations, agriculture in Cameroon is essentially traditional (comprising traditional tools and traditional production techniques). With such traditional conditions, work is usually manual and very difficult, cultivated surface area is reduced, yields are average or low when compared to world average values. In some cases, yields are insufficient to meet domestic and regional demands for food. Generally, Cameroon is characterized into five major agro-ecological zones (figure 1), with the major crops and livestock production activities for each zone listed in table 1.

- Zone I = Sudano-Sahelian in the extreme north and north regions
- Zone II = High Guinea Savanna in the Adamawa region
- Zone III = Western Highlands in the northwest and west regions
- Zone IV = Humid Forest with monomodal rainfall in the southwest, littoral and small part of south regions.
- Zone V = Humid forest with bimodal rainfall in major parts of south and east regions

Table 1: Agro-ecological zones and agricultural activities

Agro-ecological zones	***Major Crops/livestock***
Sudano-Sahelian	Cotton, millet-sorghum, cowpea, onion, cattle and sesame
High Guinea Savanna	Maize, cotton, millet-sorghum, yam, potatoes, cattle
Western Highlands	Cocoa, coffee, maize, beans, potatoes, poultry, cattle, vegetables
Monomodal Humid Forest	Cocoa, bananas, plantain, cassava, coffee, palm oil, poultry, rubber, ginger, pepper, papaya
Bimodal Humid Forest	Cocoa, plantain, cassava, poultry, coffee, maize, palm oil, pineapple,

Source: World Bank Document: Cameroon Agricultural Value Chain, 2008 with additions by the authors

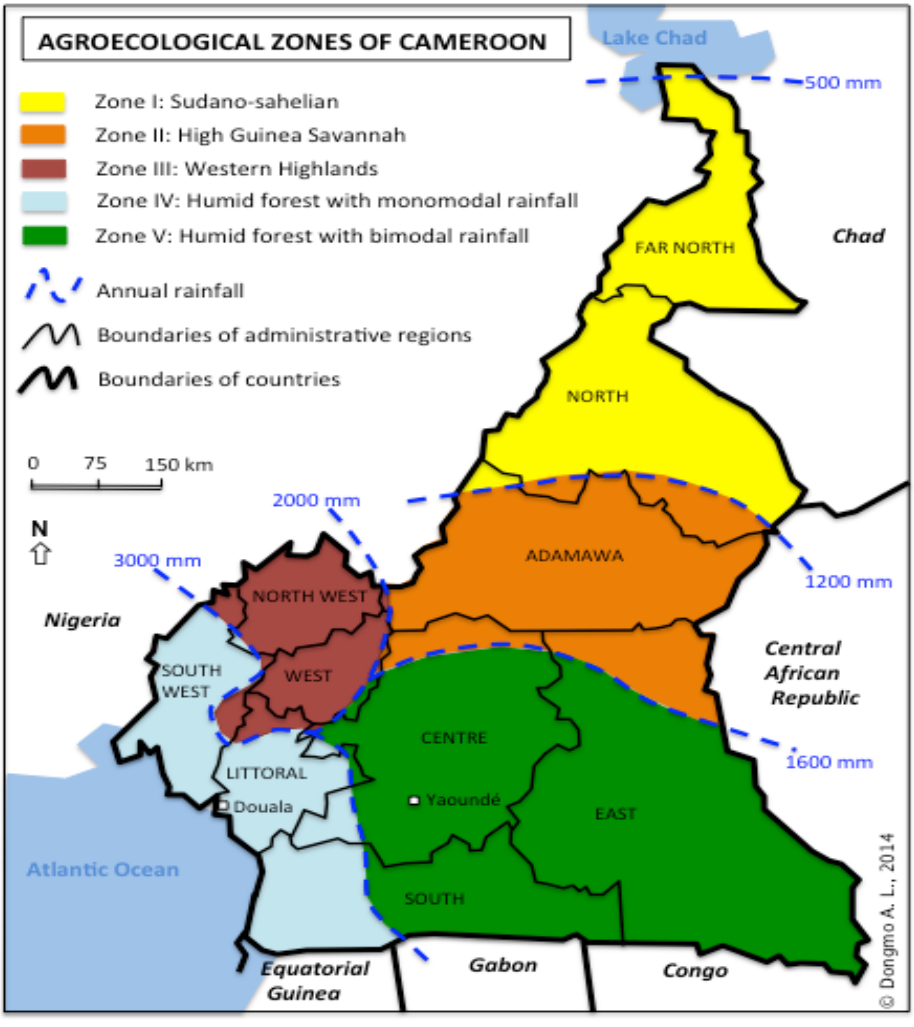

Figure 2. Map of Cameroon showing the different regions and agro-ecological zones.

In addition to these signed conventions, in the last agro-pastoral show in Ebolowa-2011 (South Region), the president of the country (H.E. Paul Biya) stressed the need to modernize the agricultural sector so as to increase productivity of small farmers especially in the rural and peri-urban areas.

International and Pan-African policies and strategies related to agriculture

Like most African countries whose economies greatly depend on the agricultural sector, Cameroon has put much effort to put in place strategies and policies that relate to agriculture and align with those of the entire continent, as laid down by the African Union and other related organizations. These include: Comprehensive Africa Agriculture Development Programme (CAADP), the Scaling Up Nutrition (SUN)

Movement, the Africa Stockpiles Programme (ASP), the Bamako Convention, the Stockholm Convention and the Rotterdam Convention. In addition, as part of the continuous effort to improve living conditions of Cameroonians, the government has subscribed to the following: (i) Millenium Development Goal – MDG, (ii) New Partnership for Africa's Development - NEPAD, (iii) The New US/African Partnership, (iv) ACP/EU Cotonou Convention, (v) Tokyo International Conferences on African Development (TICAD).

National (and regional) policies and strategies

From 1953 to 2005, so many documents have been produced to form the National Agricultural Policy (NPA). The NPA between 1960 and 1985 was characterized by crop protection through the acquisition and free distribution (government subsidizing about 40-65% according to the region) of pesticides, including area-wide treatments for certain pests and diseases. Generally, the NPA of this period had the following objectives

- To increase agricultural production and improve quality of export products.
- To increase farmers' income.
- To valorise agricultural production via local transformation.
- To increase agricultural productivity.

According this plan, the following agro-industrial plantations resulted for the following crops: rice, banana, oil palm, sugar cane, rubber, tea and maize. With the economic crisis and devaluation between 1985 and 1990, there were no more free/subsidized pesticides and the economy was liberalized and s led to the creation of the Crop Protection Law No 90/013 of 10 August 1990, with an application text No 92/223/PM of May 25, 1992. This 1992 law evolved with time to give rise to law No. 003/2003 of 21 April 2003, concerning phytosanitory protection including the importation, sale and use of pesticides.

In 1990, a new NPA was elaborated with five main objectives:

- Modernization of production tools (e.g., make accessible improved planting materials, privatization of importation and distribution of fertilizers/pesticides, put at the disposal of farmers, machines and other agriculture equipment adapted to local conditions, and liberalization of commercialization of agricultural products (both internal and external)).
- Food security (diffusion of agricultural research results, creation of frontier markets, improve on conservation of stored products, establish inter-regional trade.
- Promotion and diversification of export products.
- Improve the transformation of local agricultural products.
- Stabilize production networks.

In 1998, the World Bank helped the Ministry of Agriculture and Rural Development (MINADER) to carry out a project to establish a programme for the prioritization of the agricultural sector (table 2).

Table 2: Prioritization of the agriculture sector

Objective	*Percentage obtained*	*Rank*
Improve income and living conditions of farmers.	24	1
Food security	17	2
Improvement of production and productivity.	17	3
Promotion and diversification of agricultural export commodities.	16	4
Modernization of production tools.	14	5
Transformation of local products	12	6

Source: World Bank/MINADER, 1998 Study culled from Ondoa Manga, 2006 Report

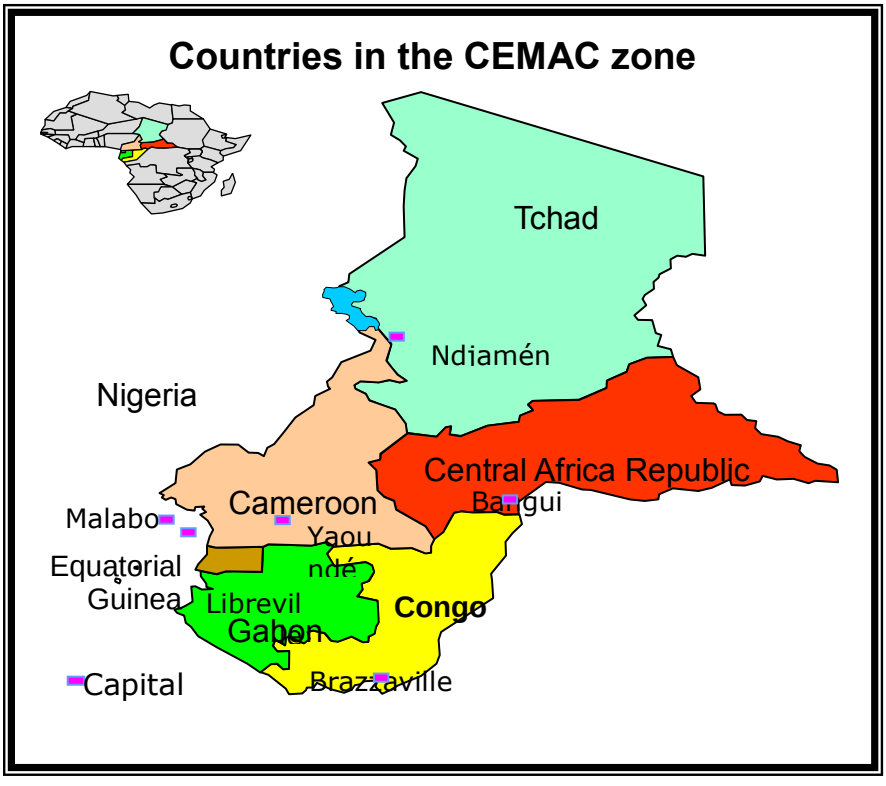

Figure 2: Countries in the CEMAC Zone

Furthermore, 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 are: development of the agricultural sectors (plants, livestock, fisheries and forestry); modernisation of production infrastructure in rural areas and improved mechanisms

for access to finance; management and sustainable use of natural resources; and 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 of production. 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. The country is also a member of an important organization in the Central African Region – CPAC (Inter-State Committee of Pesticides), created in 11 November 2007 in Ndjamena, Chad. This organization's purpose is to ensure that agricultural production (especially use of agrochemicals) does little or no harm to the environment and to human/animal health.

Major crops by area, volume and value

Figures 3, 4 and 5 show the 10 top crops, considering the area cultivated, the production volume and the production value.

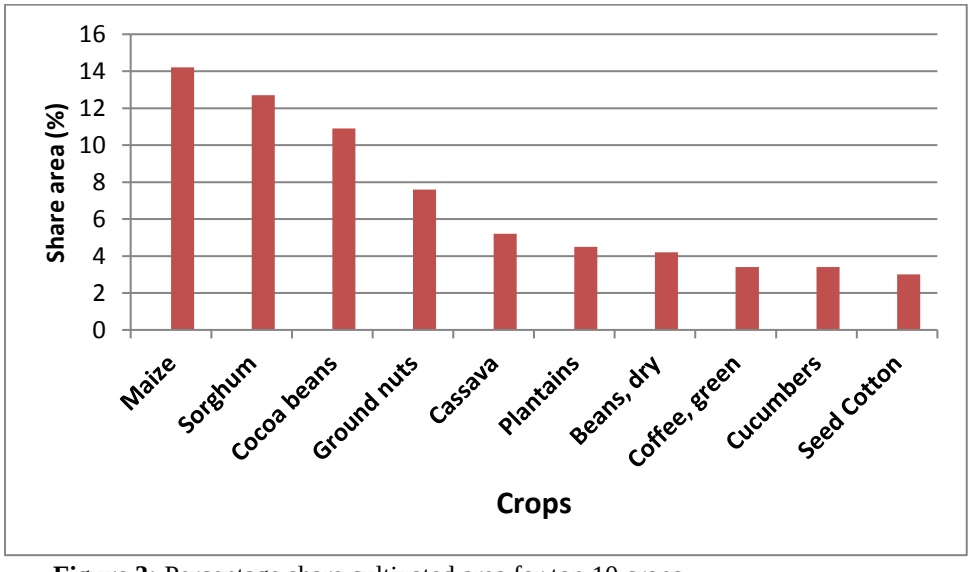

Figure 3: Percentage share cultivated area for top 10 crops

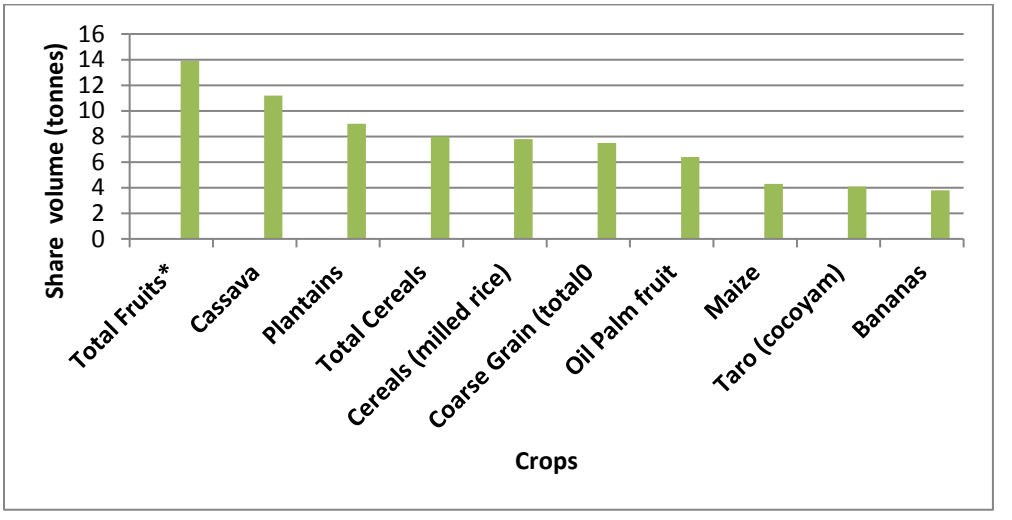

Figure 4: Percentage share production volume for top 10 crops (*excluding water melon)

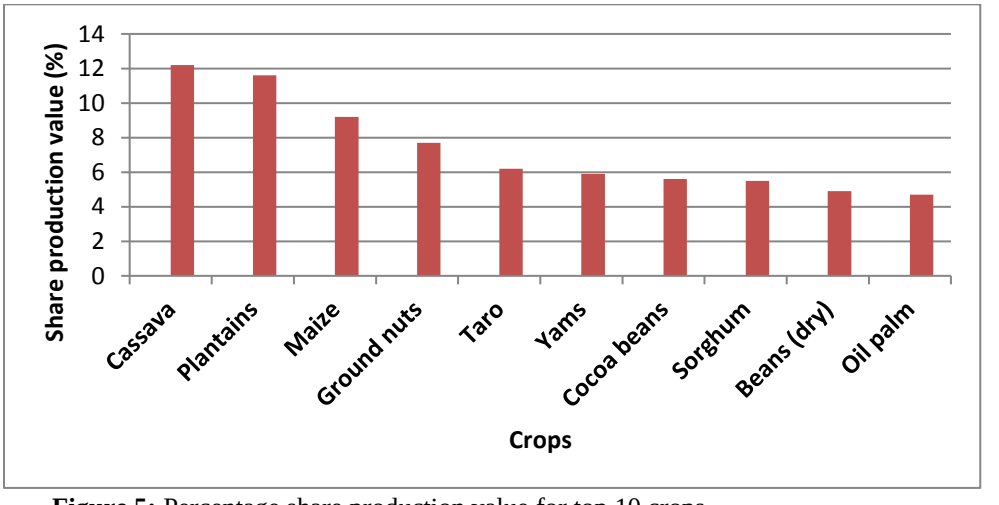

Figure 5: Percentage share production value for top 10 crops

In documenting or taking Inventory of all functional and promising agricultural innovations in the country, the following considerations were given:

1. The different agricultural innovations (whether functional or potential) and the five agroecological zones in the country with distinct characteristics were considered. Zonal centres of IRAD were found in each of these agro-ecological zones. In each of the centres, a term of reference (developed by the PARI Project Coordinator and the General Manager of IRAD) was sent to all the Zonal IRAD Chiefs of Centres. From this term of reference, each zone chose two focal persons (researchers) who were in charge of getting information concerning study 1 (inventory of agricultural innovations) and study 2 (information about platforms).

2. Generally, the focal persons used key informant interviews (KIIs), and review of some relevant documents such as newspapers, and annual reports of IRAD and delegations of agriculture in the zones. As for the KIIs, the informants were chosen from different stakeholders (farmers, agric extension officers, researchers, heads of agric and livestock delegations).

RESULTS

Generally, information on different innovations were gotten from three main sources: interviews of selected stakeholders, review of literature (newspapers, magazines, annual reports, project reports, journal articles) and visits to some field sites. Those interviewed were from NGOs, government research institutes, MINADER, MINRESI, individuals, associations and/or CIGs. Although some of these stakeholders or key informants gave information willingly, some were reluctant and few did not respond. From the field visits, interviews of different stakeholders and review of literature (both primary and secondary), the innovations recorded were mainly focused on the following areas:

- New Varieties of crops and livestock (NCLV)
- Soil fertility improvement/management/enhancement (SFM)
- Processing and packaging especially for food and cash crops (PP)
- Agro-forestry techniques (AT)
- Pests and diseases management (PDM)
- Capacity building of stakeholders (CBS)
- Non-conventional livestock rearing (NCLR)
- Market improvement (MI)
- Agricultural shows, open and field days (AS)
- Organization of stakeholders within value chains (formation of groups, association or cooperatives)
- Irrigation scheme (IR)
- Seed production and marketing (SPM)
- Mutual health organizations (MHO)

Figure 6 shows that the first five areas where innovations focused on are: soil fertility management/improvement (SFM), capacity building of farmers (CBS), processing and packaging of food/cash crops and animal products (PP), new crop and animal varieties (NCLV), and non-conventional livestock rearing (NCLR). Considering the different areas where IV cases were recorded, SFM, NCLV and PP were at the top, followed by CBS and NCLR. Positively, SFM, NCLV and CBS were areas with highest IVs, while PP was an area with the highest potential cases. Overall, 104 IVs were recorded, of which 82 were mentioned as being positive and 22 as potential.

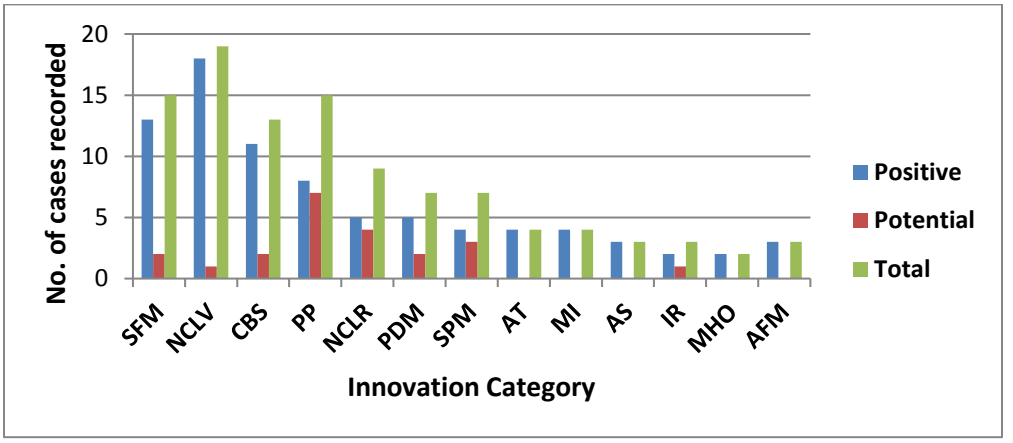

Figure 6: Frequency of areas from which innovations were reported

New crop and livestock varieties

Eighteen cases of new crops and livestock varieties were mentioned and, of these, 16 were from the crop production domain and 2 from livestock production. The new varieties for the crop production domain were from the following crops: plantains, maize, sorghum, soybean, haricot beans, cowpea, oil palm, rubber, cassava, yams, sweet potatoes, solanum potatoes, and NERICA rice. This is a reflection of the main food and cash crops in Cameroon, where most farmers or agro-entrepreneurs focus or invest on. Therefore, most crop production constraints arise from these crops. New varieties for the livestock production domain were cited only for 1 case (cattle), which is a conventional livestock highly consumed in the country. Some of the new varieties are commonly used throughout the country (national scale), while some are locally useful (some regions) and others like plantains are used within ECCAS (Regional scale).

Soil fertility management and improvement

A total of 15 cases of IVs were reported/mentioned and the total number of IVs in this area was the highest. This shows that as far as crop production is concerned, focus should not only be on improving crop varieties, but more emphasis should be on managing soil fertility or improving poor soils that are currently evident and reported as a result of application of farming practices that degraded or are degrading the soil. This has triggered most smallholder farmers or resource-poor farmers who cannot afford synthetic or conventional fertilizers to search for alternatives either from their own indigenous knowledge or from researchers. The IVs commonly used by smallholder farmers include cow dung, poultry dung, oil palm bunch residue ash and wood ash. The production and use of mycorrhizal biofertilizers and use of slurry were found as potential or promising IVs.

Capacity building of stakeholders

Of the over 13 categories of IVs gathered from this research, CBS was the 3rd in terms of number of cases gotten from literature and mentioned by KIs. This clearly shows the emphasis that has been laid on building the capacity of stakeholders within value chains. Of the different stakeholders, farmers or producers and agro-entrepreneurs are the two that have benefitted much. These stakeholders have benefitted through access to loans from micro-finance institutions, government/NGO grants (in cash or materials), and the most important and widely recorded aspect of training farmers on good agricultural practices or best practices for crop production. Although the many trainings carried out have been mainly theoretical, that of the Farmer Field School (FFS), especially for cocoa farmers is mainly practical and has been very effective; saving the farmer much in terms of cost of production. The establishment and functioning of rural or community libraries is gaining importance in some communities or areas.

Most stakeholders have benefitted from technical information on best practices or good agricultural practices as well as on recent agricultural research results. The Farmers' Voice Magazine has been on the lead in the entire country for over 20 years. Of recent, another magazine (*AgroDigest*) is taking the lead on disseminating agricultural research results in a very simple way, as well as pointing out the potential applications of these results. The government is also playing an important role in the aspect of training/grant support via the ACEFA and C2D-AFOP or other C2D programs. GIZ, IITA, IRAD, CIRAD, World Agroforestry Centre and many NGOs have contributed in building the capacity of many stakeholders in the country.

Of the various IVs recorded in the areas of CBS, two were found to be very promising and/or of high potential: voluntary insurance for the informal sector and establishing/operationalizing food/animal production centres or zones. The former will help farmers and other stakeholders to have pension at old age, while the latter IV will put in place modern infrastructure to take care of microfinance, warehousing, processing/packaging and an efficient marketing system.

Processing and packaging

Amongst the first four IV categories recorded or existing, processing and packaging is relatively recent and gaining more importance. This is an indication that the farmers in the country are or have met the objective of producing sufficient raw food. However, in spite of this, food self-sufficiency has not been attained because of post-harvest losses due to several factors such as pests, diseases, unfavourable temperature/relative humidity, inadequate storage facilities, etc. In addition, most foods have peak periods and after that they become very scarce. This has triggered another group of stakeholders (processors) to come up with ways of processing/packaging food and

animal products so as to increase their shelf life and therefore making them available at off seasons and to different parts of the world.

Out of 15 cases of processing and packaging IVs recorded, 7 are potential or promising while 8 are positive, widely used either locally, regionally or nationally. Innovations for PP are mainly in the crop production area, with 2 potential cases recorded for livestock (processing and packaging of snail meat and yoghurt/butter from fresh cow milk). The implication here is that much still need to be carried out in the livestock and fish production sectors. Besides, even with the rapid interest in PP, more still has to be done especially with respect to nutrient analysis information, traceability, expiry dates, as well as sanitation and hygiene norms. An interesting potential innovation for crops is the maize thresher and egusi peeling machine. Considering the laborious nature of hand-threshing maize and hand-peeling of egusi, these machines will help much in getting threshed corn and peeled egusi in large quantities within a short period of time.

Agroforestry techniques

The IVs in this category were mainly of two types: incorporation of fruit trees into agro-ecosystems and cultivation of NTFPs. These IVs were mainly encouraged and used in cocoa/coffee agro-ecosystems within forest zones of the humid tropic areas of Cameroon. These innovations were promoted mainly by the World Agro-Forestry Centre in collaboration with other organizations like GIZ, Ministry of Forestry, and IRAD. Since cocoa is a seasonal crop and world prices fluctuate, these IVs have enabled cocoa farmers to generate income during off-cocoa periods, especially with the sales of NTFPs that have high market demand. In addition, the cultivation of NTFPs help to preserve the forest.

Pest and disease management

Although pest and diseases have been cited as one of the major constraints to crop and animal production in the country, much effort have been put in place to allow farmers use synthetic pesticides to combat these biotic constraints. Although these chemicals have been successful in reducing pest/disease infestation/infections, there is increasing negative impact resulting from misuse, especially from small farmers, most of whom are illiterate and/or with inadequate or no knowledge on health effects of pesticides.

To reduce cost and minimize or stop health problems resulting from pesticide misuse, especially on short cycle crops such as vegetables, farmers and researchers have been trying new formulations based on botanical pesticides. This has triggered the use of plant powders, ashes and/or extracts believed or proven to have pesticidal effects. Although these botanical pesticides and their uses vary from one part of the country to another, some common plants used are hot pepper, garlic, wood ash, and lemon grass. Besides these, black pepper (*Piper spp*) has been shown by some Cameroonian researchers or scientists to be highly effective against weevils infesting sweet potatoes,

plantains, maize, cowpeas and beans. Furthermore, stakeholders have also put more effort in the area of combating post-harvest losses caused by insect pests on maize, beans and yams. Traditional clay pots with tight-fitting lids are used to store grains, while improved warehouses were cited for yams.

Non-conventional plants and livestock cultivation/rearing

Besides conventional livestock such as cattle, goats, sheep and pigs, farmers have been showing much interest in the rearing of non-conventional plants (e.g., spirulina and mushroom) and livestock (e.g., guinea pigs, rabbits, snails and grass cutters). For the non-conventional plants, much is being done for mushroom cultivation. However, because of its technical nature, many farmers do not venture here. In addition to this, the cultivation and marketing of spirulina (a single cell protein rich in minerals, proteins and vitamins) is worth mentioning—this alga is cultivated by an NGO. Generally, rearing and marketing of snails has witnessed a dramatic change compared to the 1980s and 1990s. Because of its high demand, many are now venturing into its rearing and marketing.

Market improvement

Although MI is not among the first four areas where IVs were recorded or mentioned, IVs here were found to be very important in boosting income of rural women, especially for crops such as cassava, vegetables and maize. Previously, these women and other farmers worked in isolation and, therefore, were easily exploited by unscrupulous middle men/women. Also, these women were not able to sell much since they were not able to supply in bulk. Currently, they are seriously forming groups working together to sell in larger batches and for fixed prices. They also make use of market prices of commodities published on print and audio-visual media.

Agricultural shows, open and field days

These shows are operated at national, regional (regions of the country) and divisional levels. National agricultural shows are once in about a decade, while the regional/divisional agricultural shows are usually annually. In addition to government-organized shows, international organizations and some local NGOs or organizations do organize shows/open days/field days from time to time. These shows/open or field days have been used as opportunities for the different stakeholders to meet and exchange experiences and contacts. It has also helped to expose producers to many bulk or specific buyers. Prizes and awards given during such shows have also helped to motivate farmers and agro-entrepreneurs and therefore boost agricultural production in the country. However, most farmers complain that the material awards given do not help them much, as they are traditional and do not contribute much in modernizing agriculture as emphasized by the government. The shows have also spurred producers and transformers/processors to put all efforts so as to show-case or produce products that are of high quality.

Seed production, processing, packaging and marketing

It is well known that any successful crop production starts with the availability of quality seeds or planting materials. Previously, with the exception of some exotic vegetables like cabbage, carrots and tomatoes, most farmers used traditional seeds or planting materials. Even though the seed sector is still not very well developed, some innovations have emerged that have improved the seed sector for crops such as plantains, maize, cocoa, beans, cocoyam and TAVs.

Rapid multiplication of plantains using the macro-propagation technique (PIF technique) that emerged from CARBAP has now become an essential component in the plantain value chain. Many persons now specialize in producing and supplying clean planting planting/banana materials using this technique. Large quantities are produced within very short periods using simple, available and cheap materials. These large quantities are packed in bundles, put in cartons and sent to neighbouring countries such as Gabon, Nigeria, Congo Brazzaville and the Central African Republic. Tissue culture is another rapid multiplication technique recently introduced for plantains and, although it produces large quantities of plantlets that are pest/disease free, the technique requires expert knowledge. This technique has also been used to produce cocoyam and potato planting materials. Although this tissue culture is widely applied in the large banana plantations, it is still to be widely used for smallholder farms. Marcotting, tissue culture and grafting have also been used to produce improved cocoa seedlings.

Furthermore, besides rapid multiplication techniques, processed maize and beans seeds in well labelled packages are also found in the markets. Recently, via the support of the CORAF/AVRDC project, IRAD is now processing and packaging seeds of TAVs such as amaranth, African nightshade, jute mallow, and African eggplant. Some individual farmers or entrepreneurs are also processing, packaging and marketing seeds of the moringa plant.

Organization of Stakeholders within Value Chains

Previously, stakeholders were scattered (not organized), but with the support from government and some NGOs, there are now several associations/groups in the form of CIGs, EIGs and cooperatives. These groups have been very successful for farmers and processors. The groups have benefitted the community since they now sell and buy in bulk.

Mutual health organization

This IV has been introduced in several rural and peri-urban areas in the country. Here, farmers and other stakeholders in different value chains register and benefit 70% twice per year. Presently, these registered persons are able to pay their hospital bills, which they previously were not able to.

Irrigation

This is commonly practiced by agro-industrial plantations and some wealthy farmers with large farms or plantations. However, some smallholders are now developing and using simple techniques to supply water to their crops and/or animals. The techniques recorded are:

- Water from bore holes distributed via pipes to farmers within a specific area – about 10km (a project funded by NOWEFOR in the Northwest Region)
- Creation of canals within marshy areas so as to make water available to different planting beds.
- Use of large polyethylene bags within dug holes to capture and store rain water for irrigation when needed.

These techniques are commonly applied by vegetable farmers, especially in the peri-urban areas.

Existing Agricultural Innovation Platforms in Cameroon

Like study 1, to get the different agricultural innovation platforms, the five agro-ecological zones in the country with distinct characteristics were considered (figure 1). The zonal headquarters of IRAD are found in each of these agro-ecological zones. In each of these IRAD research zonal centres, a term of reference (developed by the PARI Project Coordinator and the General Manager of IRAD) was sent to all the zonal IRAD chiefs of centres. From this term of reference, each zone chooses two focal persons (researchers) who are in charge of getting information concerning study 1 (inventory of agricultural innovations) and study 2 (information about platforms).

Generally, the focal persons used key informant interviews (KIIs), and review of some relevant documents such as newspapers, and annual reports of IRAD and delegations of agriculture in the zones. As for the KIIs, the informants were chosen from different stakeholders (farmers, agric extension officers, researchers, heads of agriculture and livestock delegations). Attempts were also made to contact and interview some facilitators of identified innovation platforms.

Therefore, a total of 48 IPs were recorded from the study with the highest number registered from Zone III and followed by Zone IV (figure 7). This shows that Zone III is the most experienced in terms of establishing IPs and/or associations for the agricultural sector. Generally, the IPs were established for crops, livestock and general purposes. The crops included cash as well as food crops, while livestock was conventional (cattle and chicken) and non-conventional livestock. The IPs for general purpose dealt on issues that involved both crops and livestock and other aspects such as environment and giving advisory/financial supports. From the figure, the highest number of IPs were established for crops.

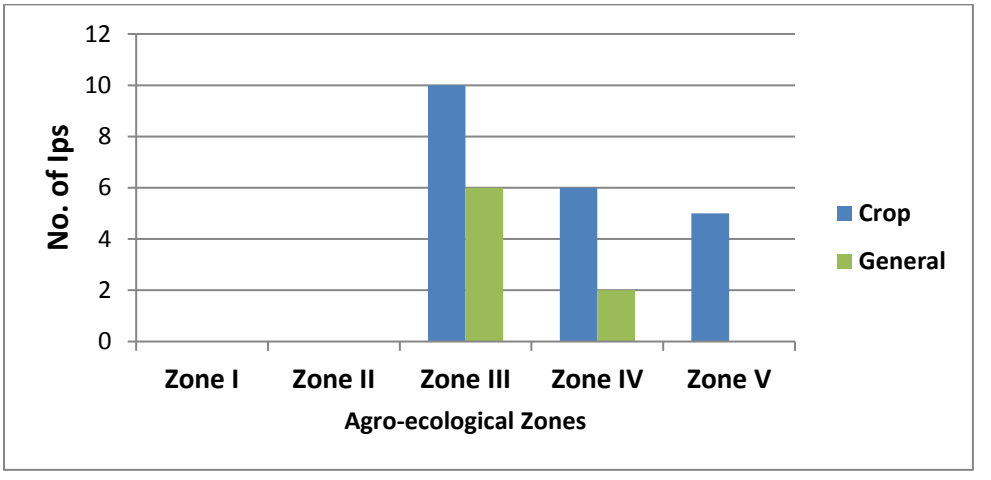

Figure 7: Total number of IPs recorded per agro-ecological zone and established for crops, livestock and general purposes.

Entry Points and/or Value Chains for Establishing IPs

As for the entry points for the IPs (figure 8), they were mainly from crops (plantains, cassava, traditional African vegetables, bananas, maize, beans, oil palm, rice, cocoa, and coffee). Plantains, cassava and maize were the first, second and third, respectively. This was not surprising as other reports and, most especially the FAOSTAT of the FAO, has repeatedly shown that these three crops are very important in the agricultural sector of Cameroon. For livestock, the entry points were focused on guinea pigs (cavies), goats, pigs, poultry and cattle/cow. Poultry, cattle/cow and pigs were the first, second and third, respectively. This shows the important role that these animals play in the diet and protein supply of Cameroonians, with cattle/cow most common in Zones I & II, pigs most common for Zones III & IV, while poultry was for all the Zones. Considering all the entry points or value chains for crops and livestock, poultry, cattle/cow meat, plantain, maize and pig/cocoa were 1st, 2nd, 3rd, 4th, and 5th, respectively. For crops and livestock, the entry points were as follows:

- Low yields as a result of using traditional varieties and production techniques.
- Low consumption of traditional African vegetables.
- Poor soil fertility
- Traditional methods of processing.
- Poor sanitation processing methods.
- Expensive and inadequate protein sources.
- Little or no training on best production practices.
- No knowledge on cow meat/cattle conservation.
- Cattle farmers not well organized.
- Poor health of small ruminants.

For the general purpose IPs, their entry points or reasons for establishing them were as follows:

- Organize agro-pastoral organizations
- Facilitate the obtaining funds for producer organizations
- Giving financial support to agro-pastoral organizations
- Marketing of produce of producers
- Provide access to markets
- Carry out lobbying and advocacy
- Training stakeholders on best practices and agribusiness
- Enforcing harmonization of prizes of agricultural commodities
- Encouraging processing of products or their transformation – adding value to raw materials
- Create awareness on climate change and pesticide misuses
- Transfer research results to end-users

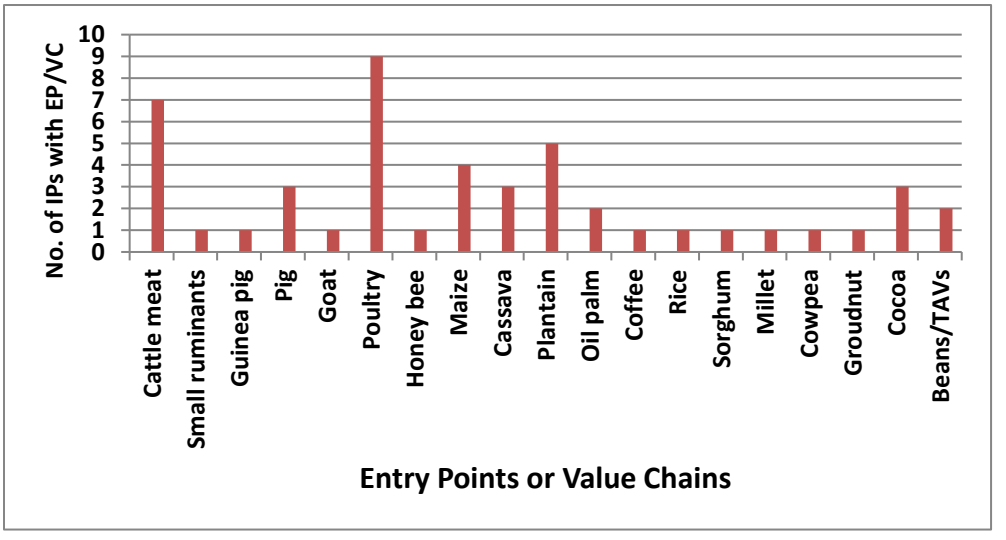

Figure 8: Crops and livestock from which entry points were considered before establishing IPs

Dates of Establishments of IPs and Stakeholders Involved

Of the 48 IPs that were recorded, only 29 had established dates that ranged from 1993 to 2015 (figure 9). Of these 29 IPs, 65.5% were established within the period 2011-2015, 27.6% within the period 2001-2010 and 6.9% within the period 1993-2015. The first reported case of IP establishment was 1993 at Ngoaundere (Zone II) and concerned the marketing and processing of cattle products. The next early establishment was in 1995 at Bamenda (Zone III). Although the first reported case of IP establishment was for cattle/cow, the number of IPs for this animal and livestock in general remain relatively very low even in Zones I & II, where cattle/cow rearing is one of the major activities.

As for the stakeholders involved in the IPs, with the exception of a few, most of the IPs had relevant stakeholders representing major stages of the targeted value chain. These stakeholders usually included seed suppliers, farmers/producers, traders/marketers, agricultural researchers, agricultural technicians/officers, chiefs of villages and policy makers (e.g., mayors, members of parliament, senior divisional officers, and divisional officers). Transporters, micro-finance institutions, and agrochemical dealers were rarely involved.

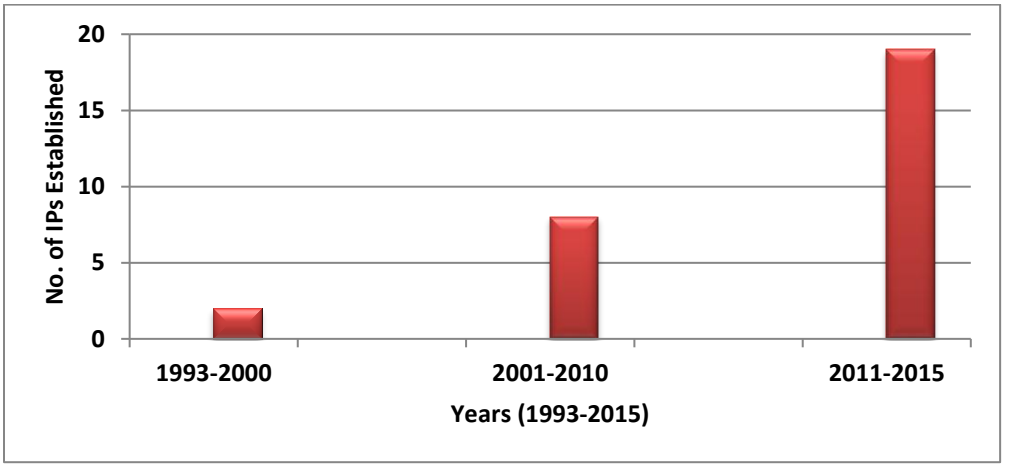

Figure 9: Number of IPs established within the periods 1993-2015

Funding Agents and Phases in IP Process

Although several funding agents were recorded and included local and international agents, six key agents were identified (figure 10). Of these six, in terms of number of IPs funded, CORAF/WECARD topped the list, followed by the government of Cameroon (via programmes such as ACEFA, PACA, AFOP coordinated by MINADER). Other funding agents include: French Development Agency (through C2D and ACEFA), FAO, Africa Rice, CFC, IRAD, SNV, HIVOS, Swedish government, CSI, VSO, GIZ, FARA and FIOH International. As for the phase of the IP process, of the 48 IPs recorded, 61% (29 out of 48 IPs) were still at the initial phase, 31% at the maturity phase, and 8% had indicators of being independent (figure 11).

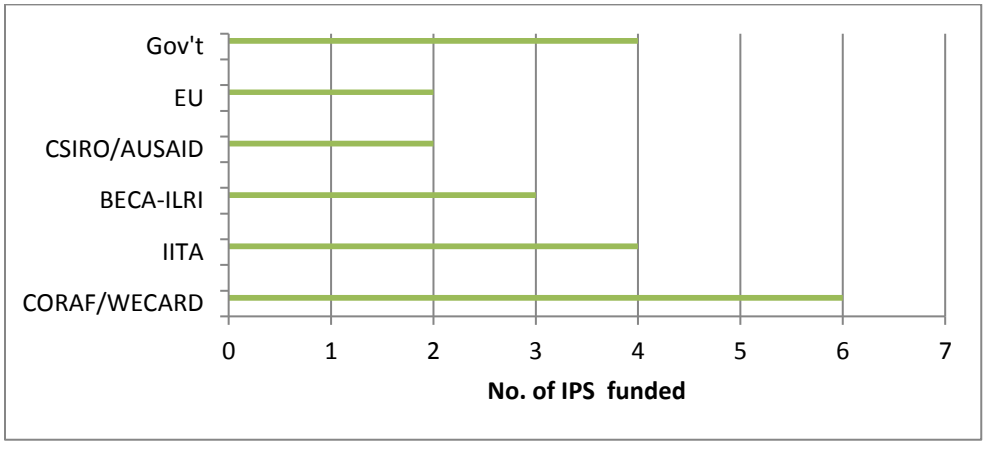

Figure 10: Key national and international funding agents for the IPs

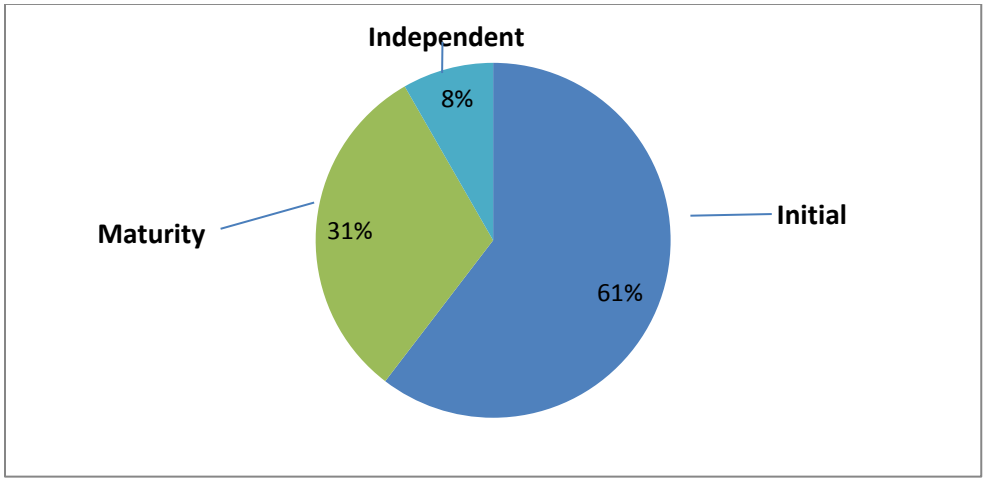

Figure 11: Percentage IP at different phases of the IP process

Opportunities addressed

Although all the IPs had specific issues or opportunities addressed based on the value chain or entry points targeted, generally the opportunities addressed were focused on: (i) encouraging the use of improved varieties, (ii) training stakeholders on best practices, (iii) processing, transformation and packaging of raw food, (iv) encouraging stakeholders to form associations or groups, (v) to facilitate access to market, and (vi) to improve access to finance or funds. The specific opportunities addressed for livestock, crops and general purposes are shown on table 3.

Table 3: Areas of intervention and opportunities addressed for IPs

Area of Intervention	*Opportunities Addressed*
Crops	- Rapid multiplication of plantains and bananas using macro-propagation technique. - Formation of central points especially at the Cameroon-Equatorial Guinea-Gabon borders, for the bulk sales/buying of plantains/bananas - Establishing large commercial farms (using improved varieties) for cassava, plantains, oil palm, and vegetables. - Seed multiplication, processing and packaging of traditional African vegetable seeds. - Participatory evaluation and selection of new and/or improved varieties. - Hygienic transformation of cassava to local products. - Training and application of simple cost-effective methods for managing pests and diseases. - Dissemination of improved varieties especially for cocoa, vegetables, cassava, plantains and maize.
Livestock	- Best practices for rearing cavies (guinea pigs) and goats. - Using animal dung as organic manure for cultivation of crops. - Alternative and rapid access to protein food sources and income. - Best techniques for the conservation of cattle/cow meat - Improved productivity of goats. - Organization of poultry farmers and harmonization of chicken prices. - Establishing incubators for the production of day old chicks - Improving processing of milk and its transformation to products such as yoghurt.
General	- Access to funding. - Organization of stakeholders into groups or associations - Improve access to markets - Trainings on best practices.

Achievements

The IPs recorded have the following achievements:

- In some zones (e.g., III, and IV), the IPs have played an important role to group agro-pastoral producers into professional groups and putting these groups to be affiliated to a single umbrella organization.
- Through some IPs, thousands of improved and/or clean planting materials have been disseminated to several targeted sites within the country. This has produced a spillover effect in some neighbouring countries like Congo, Gabon, Chad, the Central African Republic and Equatorial Guinea.
- Because of the presence of IPs, compared to 1990s and early 2000s, many farmers now produce more and sell quality products.

- They have played an important role of linking producers to buyers, i.e., ensuring better access to markets.
- In some places in the Northern Regions, mobile clinics for cattle/cows have been established.
- Some IPs are serving as sources offering financial support to farmers
- Have enhanced the capacity of farmers via trainings on best practices and providing material/equipment support.
- Helped to form powerful associations/groups with permanent memberships, especially for poultry and goat.
- Processed milk and its products such as yoghurt are commonly found in the markets.
- Production units with incubators set up for the production of day old chicks.
- Few IPs have promoted strong advocacy for establishing policies to reduce the impact of climate change.
- Functional warehouse for the storage of plantains and continuous sale to neighbouring countries such as Gabon and Equatorial Guinea.
- Rapid multiplication of plantains taught in some platforms has now become a very common practice by some smallholder farmers.
- A best practice hub for traditional African vegetables established at IRAD Ekona and has trained over 20 persons.
- Several isolated cavy or cattle/cow producers have been identified and organized.

Challenges faced by IPs

- Insufficient capital to install oil palm waste management plant.
- Difficulties for smallholders to transport palm oil bunches/fruits to processing sites usually due to poor-farm-to-market roads or no better means to transport.
- Advanced methods of harvesting, transportation, transformation and preservation are lacking
- At the end of most projects, since there is no follow up and powerful/serious steering committees were not formed, the IP stops.
- Lots of trainings still need to be carried out on agribusinesses.
- Insufficient reproductive stock for cavies and therefore longer period (8 months) to attain a marketable weight and size.
- Low or poor level of understanding of concept of IPs.
- In most IPs, the minorities are usually not included.
- Not able to buy refrigerated vehicles or to set up cold rooms
- Not able to extend IP to other non-target sites.

Sustainability issues

Since most IPs were established without training the members very well on the concepts of IVs and IPs, most members of the IPs just considered it as a project and therefore activities stopped as soon as the project stops. In addition, members were either not willing to carry out activities or come out with innovations that will help generate money or they were just ignorant. In some IPs, there was a total lack of technical training or support. In this case, members did not have the skills to carry out activities that would generate income and being discouraged they gradually left the IP.

In some cases, even though members were willing to carry out certain activities, they did not have sufficient funding/financial support even from member's contributions. Positively, some IPs were able to train and encourage their stakeholders to form strong associations or to be committed in the IP. Such commitments were evidenced from IPs that included plantains, cassava, maize and vegetable value chains. These platforms had steering committees that continue to direct the activities of the platforms.

STUDY THREE

Investments in Innovations for Agricultural Development and Food and Nutrition Security

INTRODUCTION

Poverty is a complex set of deprivations that reflects failures in many dimensions of human life- hunger, unemployment, homelessness, illness and health care, powerlessness and victimization, and social injustice (Fukuda-Parr, 2006). Despite the world producing enough to feed the entire global population, one person in eight persons go to bed hungry each night. This could be as a result of: poverty trap, lack of investment in agriculture, climate and weather, war and displacement, unstable markets and food wastage (WFP, 2015).

History has shown that the different rates of poverty reduction over the past 40 years had been closely related to differences in agricultural performance, particularly in the rate of growth of agricultural productivity (DFID 2004). This is due to the fact that poor people stand to benefit much more from an increase in agricultural incomes than from an increase in non-agricultural incomes, because many of the poor live in rural areas, and most of them earn their living on agriculture or agriculture-related activities. According to OECD (2015), agricultural production needs to increase by at least 60% over the next 40 years to meet the rising demand for food. However, due to increase in land and water scarcity, agricultural investment is therefore critical to induce output expansion and bolster incomes in rural areas, thereby enhancing global food security.

The agricultural sector is the mainstay of the Cameroonian economy and has the potential to improve on the country's growth and poverty reduction objectives. According to the FAO (2012) report, 48% of the working population in Cameroon still depends on agricultural and pastoral activities for their livelihood, and agriculture is responsible for 19% of GDP (2007), with 40% of the population living below the poverty line and concentrated primarily in the rural areas. Therefore, growth in Cameroon will require considerable investments in agricultural research and technology and in infrastructure.

However, according to Mclndoe-Calder (2012), the effects of investment on improving poverty cannot be taken for granted, but depends intrinsically on how each investment is implemented, given the particular challenge the investment hopes to overcome. Therefore, with renewed interest by government and donor agencies on agricultural development, there is a need for an assessment on how the sector is performing to see if their investment is worth its while. This report is aimed at assessing the state of national investment on agricultural innovation system in Cameroon, with the following specific objectives:

- Observing preliminary aggregate information on national agriculture and National Institute of Agricultural Research and Development – IRAD budget and spending (1995-2014)
- Assessing the impact of agricultural sector level expenditure measured by: growth rates of agricultural sector and subsectors, sustained growth in

productivity (yield/ha) of major crops over time and increasing attribution of growth in agricultural outputs to yield increase than area expansion, and

- The aggregate impact of research expenditure on crop varietal productivity

METHODS

Secondary data were collected from several sources. Budget and expenditure data were gotten from the Public Investment Unit of the Cameroon Ministry of Finance, crop production data were gotten from the FAO statistical database (FAOSTAT) and general agricultural information were from the World Bank Database. Nominal values were converted to real values and time series graphs were created using STATA version 12.

RESULTS

There is a widespread belief that agricultural success is systematically related to the huge budgetary expenditures for agricultural activities. According to Alabi (2014), every agricultural development needs government assistance. This assistance is necessary to improve inputs uses, infrastructures to connect them to markets, agribusiness credit and private sector investments to spur growth, facilities to reduce postharvest losses, and training and technology to cope with climate change. From the looks of things, Cameroon has been increasing its spending on agriculture (figure 12).

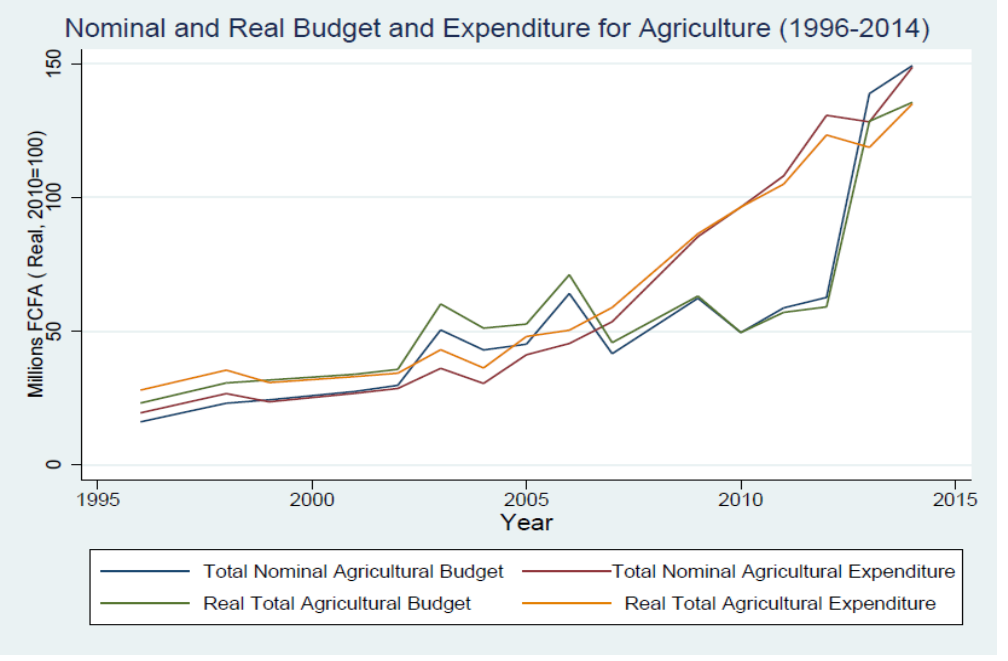

Figure 12: Nominal and Real Budgets and Expenditures for Agriculture (1996-2014)

Despite that agriculture is the backbone of the Cameroonian economy, there is still a profound lack of investment, as can be seen by the share of agricultural expenditure in the total budget expenditure (figure 13). Although there seems to be an upward trend in expenditure on agriculture, it has never reached the 10% minimum of the national budget, which was pledged by African leaders in the African Union's Comprehensive Development Programme for African Agriculture (CAADP) to mobilize resources for agricultural growth. This indicates that despite its importance to the economy, Cameroon still neglects investment in agriculture. For growth to be sustainable in agriculture amidst climatic and land variability, technological innovations through research are necessary to spur productivity and consequently income, which is the brain behind the renewed interest in agricultural development in poor countries.

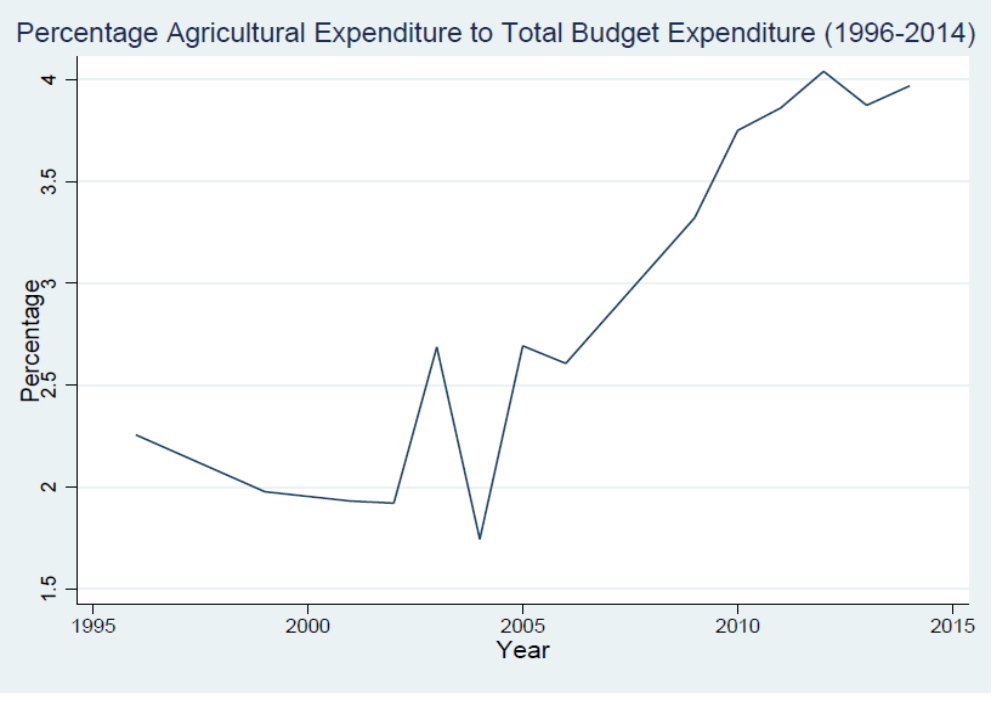

Figure 13: Percentage Agricultural Expenditure to Total Budget (1996-2014)

However, as depicted by figure 14, very little attention has been given to agricultural research. Most of government expenditure on agriculture is focused on crop production. Although a separate budget was instituted for agricultural research in 2003, the growth (figure 15) in investment has been so minimal. It is without doubt that in such a situation, research will be facing enormous challenges if there foreign direct investment in research is not big enough to upset the little contribution by the government.

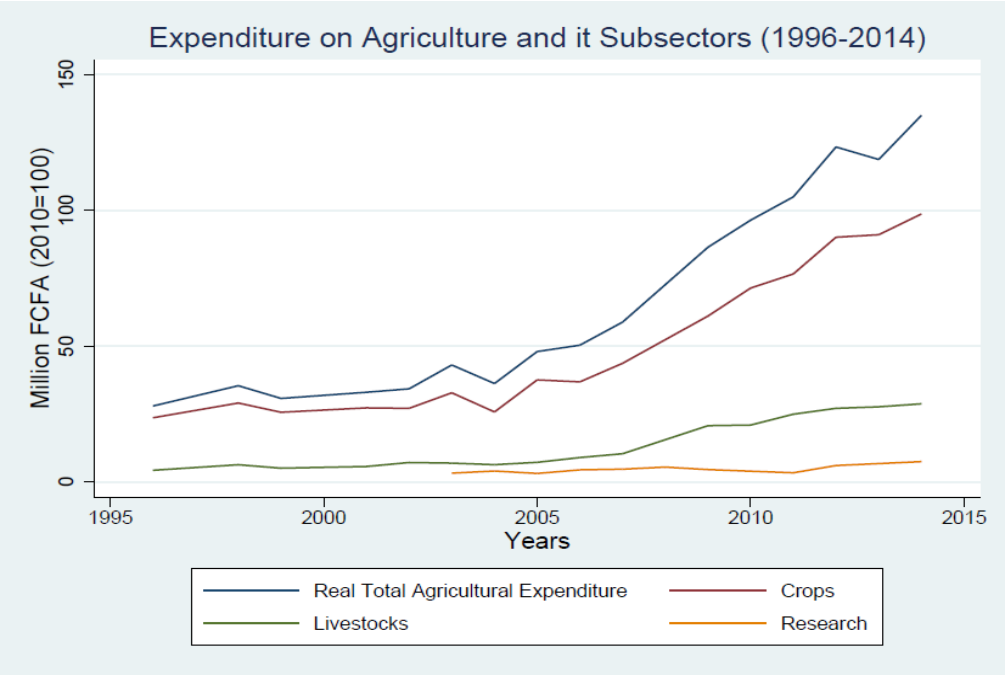

Figure 14: Expenditure on agriculture and its subsectors (1996-2014)

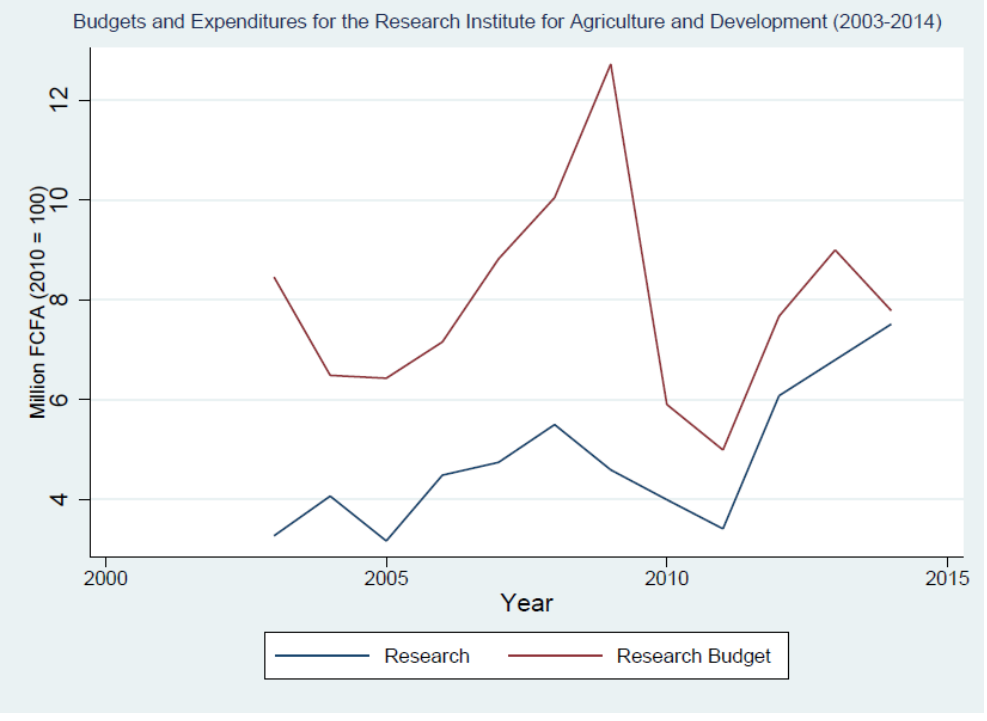

Figure 15: Budget and expenditure for the Research Institute for Agricultural and Development (IRAD) (2003-2014)

Evidence of Impact of Expenditure on Agricultural Sector and Subsectors

Anyanwu et al. (2010) stated that the GDP of a country is one of the primary indicators used to measure the health of that country's economy. Since it is positively correlated with the standard of living, it can be used to positively affect the lives of rural dwellers. It represents the total dollar value of all goods and services produced over a specific time period. The contribution of agriculture to the Cameroonian economy seems to be slowing down slightly. However, its percentage contribution is still above 20% throughout the period (figure 16).

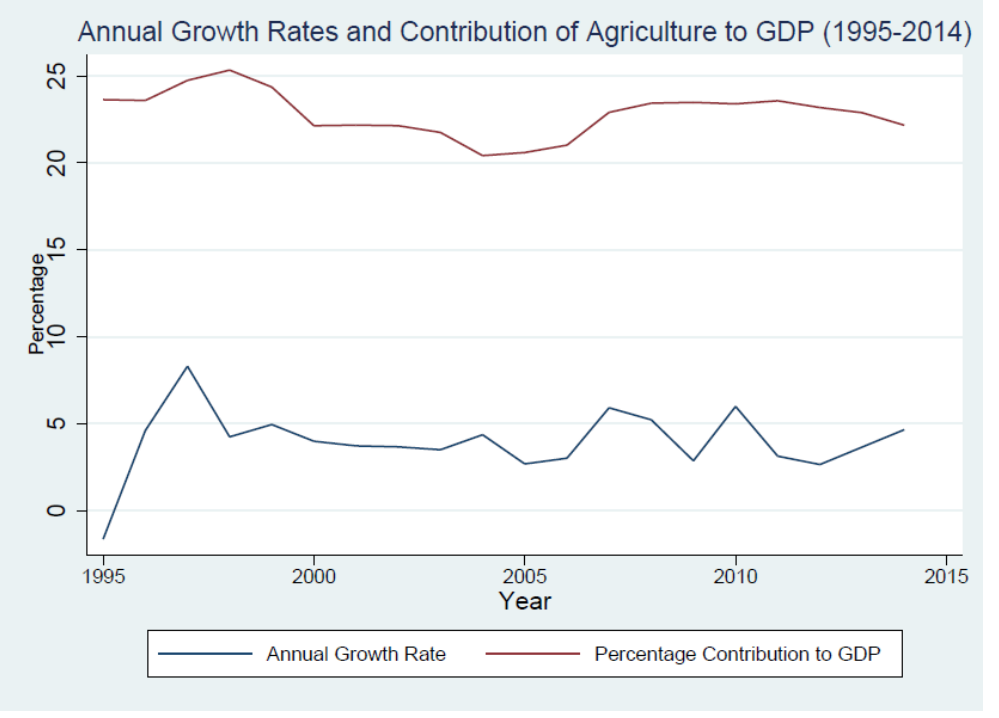

Figure 16: Annual growth rates and contribution of agriculture to the GDP (1995-2014)

According to Arias Segura (2010), the contribution of agriculture to GDP is, in fact, underreported, as the sector has strong linkages with the rest of the economy. When agriculture grows, so does the economy in general, speeding up the reduction of rural and urban poverty. This indicates that the direct and indirect contribution of agriculture to Cameroon's economy is far higher than what is reflected, thereby underpinning the importance of agriculture to the Cameroonian economy. The payoff from investments in agricultural research, development, extension and education comes in the form of sustained increase in agricultural productivity. Despite the timid increase in investment in agricultural research innovations, figure 17 shows that the partial productivity of land and labour to total agricultural production is increasing.

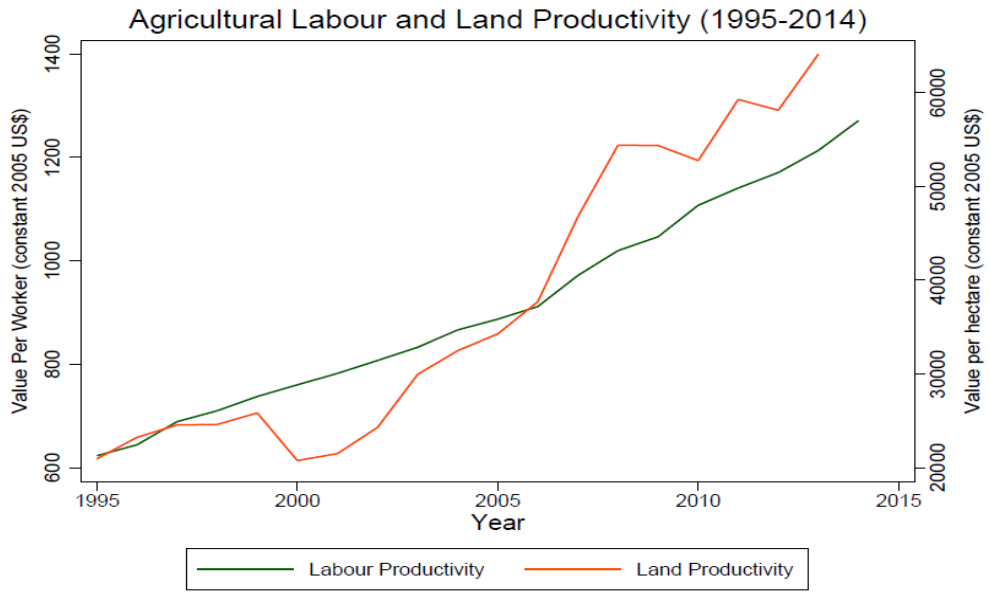

Figure 17: Agricultural land and labour productivity (1995-2014)

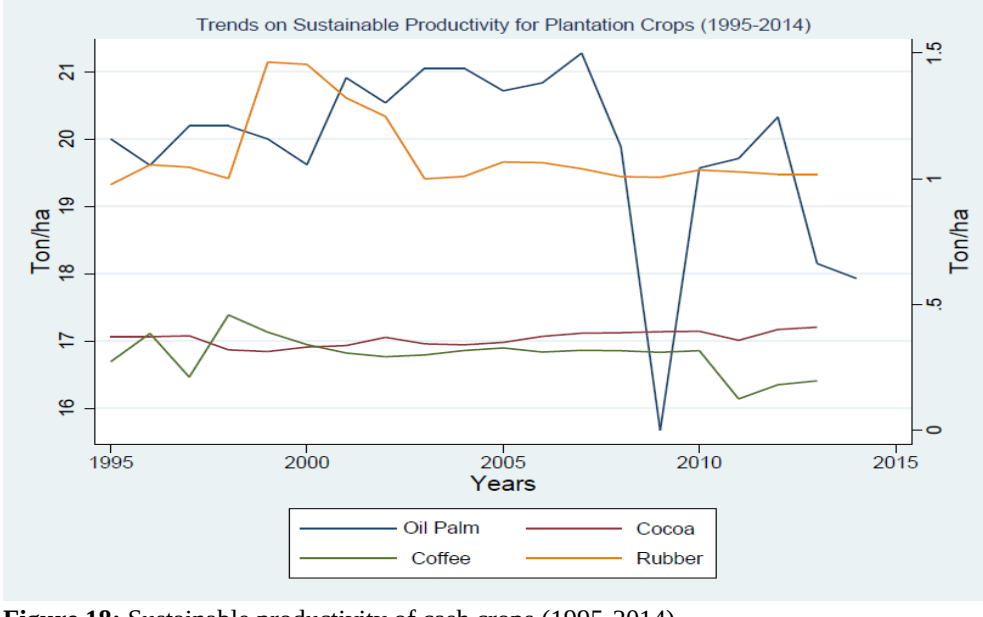

Figure 18: Sustainable productivity of cash crops (1995-2014)

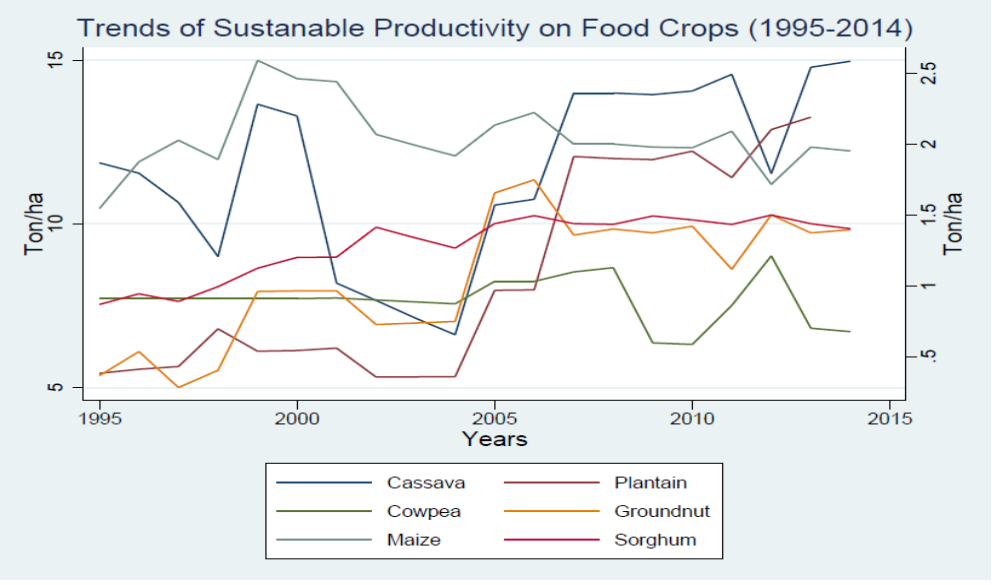

Figure 19: Sustainable productivity of food crops (1995-2014)

However, for cash production, a source of additional income for farmers, there is a negative trend in productivity (figure 18), while for food crops like cassava, plantain, groundnut and sorghum show a positive trend in productivity (Figure 19). However, Cervantes-Godoy and Dewbre (2010) stated that the trends in output relative to one input can be misleading in cases where the input mix is changing or, especially, where there are technical advances allowing increases in output for a given level of input use.

Conclusions and Recommendations

The overall study concludes that cassava, plantain, maize and cocoa are very important crops, while poultry, cattle/cow and pig are important livestock for food and income generation for the Cameroonian agricultural sector. Also, there are many IVs in the country, although many of these IVs have been developed in isolation (not developed within IPs) and have not been scaled out. Most of the IVs were developed from crops as compared to livestock, with relatively few that focus on poultry, cattle/cow and pigs; soil fertility management (SFM), processing & packaging (PP), seeds production and marketing (SPM), and new varieties of crops and livestock (NCLV) are important areas for development of more IVs with highest potential IVs in the PP and NCLR areas. Furthermore, it is concluded that:

- The number of IPs and their preferred value chains vary with agro-ecological zones, with Zone III having more experience.
- Many members or stakeholders in established IPs still do not understand the concept of IVs and IPs, and how these two concepts are linked. However, in spite of this poor understanding, there has been an increase in awareness between 2011 and 2015.

- Although entry points for the IPs varied with the different IPs, some common points were: (i) low yield as a result of using traditional varieties and/or traditional production techniques, (ii) poor soil fertility, and (iii) poor sanitation methods for processing and/or using traditional processing methods.
- Most stakeholders still consider IPs as projects with definite objectives, outputs, timelines and funding. The tendency here is that as soon as the funding stops or project comes to an end, activities of the IP also automatically come to an end – many IPs therefore start, remain or end in the first or initial phase of the IP process. Furthermore, most of the members of IPs focus mostly on reaping financial benefits from the donated funds or the kick-starting fund for the IP, with no interest on generating IVs.
- Many IPs do not have a steering committee and/or serious and committed facilitators.
- Major opportunities addressed were around market, cultivation practices, planting materials and improved varieties.
- The reaffirmation of the importance of agriculture in reducing poverty, especially in poor countries where a majority of the people in one way or the other depend on agriculture for their livelihood has renewed the interest of the government and donor agencies to increase investment in agriculture.
- Amidst climatic variability and land restriction, investment in research and innovation is seen as the potential for increase in production in the sector.
- From all perspectives, agriculture remains a stronghold on the Cameroonian economy. However, the expenditure of agriculture to the national budget is by far less than the committed 10% agreed upon by the African leaders in Maputo, with research getting the least in the agricultural subsectors. This is evidenced by the timid growth in the sector and also the downward trend in cash crop production.

Based on these conclusions, the study recommends the following:

- During all IP establishments, identified stakeholders should be trained on the IVs and IPs concept. Related ministries (e.g., Scientific Research, MINADER) should embrace and incorporate these concepts into their policy framework.
- There is an urgent need to establish more IPs in the livestock sector, and most especially for aquaculture so as to trigger the development of more IVs. Generally, IPs are needed if meaningful IVs are to be generated.
- Value addition is paramount to value chains of the following: poultry, maize, plantains, pigs, cassava, cattle/cow, and cocoa.

- To form or establish relevant/efficient IPs, steering committees (comprising committed persons directly involved in the value chain) with dynamic presidents and facilitators need to be put in place.
- It is imperative for Cameroon to increase its spending on agriculture so as to reduce the number of its inhabitants living below the poverty line. Because for this people to experience change in their livelihoods, there needs to be a steady growth in the agricultural sector, on which most of them depend.

Proposed Activities

Considering the importance of agriculture to the Cameroonian economy and following this situation analysis carried out in all the five agro-ecological zones in Cameroon, the following areas emerged as potential activities that could be carried out so as to improve the agricultural sector or to generate or develop useful innovations:

- Mechanization for smallholder farmers (development of smaller machines and their evaluation)
- Improved processing, packaging and marketing of locally produced foodstuff
- Integrated soil fertility management (on –farm evaluation of some promising soil fertility management techniques – biochar and a bioferticide)
- Evaluation of socioeconomic impact of selected promising innovations or technologies.
- Aquaculture development (setting up aquaculture community centres for the rearing of fish, processing, storage and marketing)
- Dissemination of protein-rich maize, improved beans and traditional African vegetables
- Sensitization/training of more stakeholders on the concept of IVs and IPs.
- Postharvest losses of grains and stored tubers/roots

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APPENDICES

Annex 1: Description of Innovations

(a) New Crop Varieties

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Hybrid plantains (e.g. CRBP 039, CRBP 968)	Crop production	Biological and biotechonological	Producers or farmers, Researchers, Extensionists	High pest and disease infestation and infection.	ECCAS/CEMAC	Mainly farmers in Cameroon, Congo Brazaville, Gabon, Central African Republic	Positive (highly resistant to black sigatoka disease)
Maize varieties (e.g. ATP-SR-Y, TP S6 31Y-Bbx9450, ATP-S6 21Y-2x4001, Cla 183x9450	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	To reduce toxicity resulting from alluminium and acid soils, and ultimately high yields. Market demand for some varieties	National	Mainy farmers or producers, processors or transformers	Positive (tolerance to acid soils, tolerance to aluminium toxicity, high yields (7.7 to 8.5 tons per Ha)
Sorghum varieties (e.g. Safari 40, Madjeri, Adjamari and Bougouri	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	Low yields	Northern Regions of Cameroon	Mainy farmers or producers, processors or transformers and consumers	Positive (high yields and many farmers using the varieties
Soya and haricot beans varieties (e.g. for soya = TGX 1835-10E and for haricot beans TY 3396-12, NITU, MEX-142, Eca pan, GLP-190, KJ4/3, MAC-55	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	High infection of diseases. Market demand	National	Mainy farmers or producers, processors or transformers and consumers	Positive (high tolerance to mosaic disease and anthracnose

Cowpea varieties (TVX3236, Vya, Lori, CRSP)	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	High pest infestation, low yields	National	Mainy farmers or producers, processors or transformers and consumers	Positive (high yields = 1667kg per Ha, resistant to striga weed
Cattle varieties (e.g. Holstein and Jersey breeds)	Livestock production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	Low milk production	Northwest and Northern Regions of Cameroon	Mainy farmers or producers, processors or transformers and consumers	Positive (8-12 L of milk per day compared to 1-2L per day from traditional breed
Cassava varieties (e.g. 8034, 8061)	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists, and consumbers	Low yield, very long crop cycle, high pest and disease	National	Producers or farmers, consumers	Positive (many farmers using the new varieties especially 8034 with 25-30 tons per Ha compared to 15-20 tons per Ha for local varieties, they are resistant to blight, mosaic and anthracnose)
Use of NERICA Rice variety	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists, policy makers and consumbers	Low yields of local varieties, difficulties in production in marshy areas	ECCAS/CEMAC	Producers, processors and consumers	Promising (few farmers testify higher yields)

(b) Soil Fertility Management/Improvement/Enhancement

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Leaf Nutrient Analysis or foliar survey	Crop production (mainly for oil palm plantations)	Agronomic and biotechnological	Commercial plantations, researchers	Under estimation of fertilizer application	Southwest and Littoral Regions of Cameroon	Agro-industrial oil palm plantations e.g. CDC, SOCAPALM, PAMOL	Positive (fertilizers only applied on recommendation – this reduces cost of production and negative effects on the environment)
Use of compost (mainly from harvest residues, grass, refined chicken dung, and some house wastes	Crop production (mainly for home gardens and family farms)	Agronomic	Farmers or producers, extensionists, consumers	Low yields, market demand for pesticide-free crops, high risk of pesticide contamination to small scale farmers	National	Home gardeners, family farm practitioners, consumers	Positive (relatively less chemicals used in home gardens and family farms)
Night paddock system (cattle pass out dung in a particular area for over 1 month, the area then used to cultivated vegetables)	Crop production (mainly vegetables such as tomatoes and African nightshade)	Agronomic	Farmers or producers, those rearing cattle,	High market demand for nightshades, low yields as a result of low soil fertility	Northwest Region of Cameroon	Vegetable farmers, those rearing cattle, and consumers	Positive (many farmers in the Babanki area of northwest are now using the system with increasing yields and income)
Use of biochar	Crop production	Agronomic /Chemical	Producers or farmers, researchers, extensionists	Poor soil fertility, negative environmental effects resulting from excess use of synthetic fertilizers	Kumba area of Southwest Region Cameroon	Producers or farmers, consumers	Positive (more women using the innovation to cultivate cassava, maize).
Production of mycorrhizal biofertilizers	Crop production	Agronomic /Chemical	Producers or farmers, researchers, extensionists	Poor soil fertility	National	Producers or farmers, consumers	Potential (experiments show it increases yield from 50-200%
Use of wood ash, chicken dung, bokashi,	Crop production (especially for	Agronomic	Producers or farmers,	Poor soil fertility, low yields, high pest	National	Producers or farmers, consumers	Positive (widely used in family farms and home gardens by women, higher

and oil palm bunch residue ash	vegetables, plantains, yams, and maize)		extensionists, researchers	infestation, high prices for synthetic fertilizers			yields obtained, in some cases pest infestation is reduced)
Use of slurry (waste matter from anaerobic decomposition of organic matter in a bio-digester which produces gas used as an energy source and for cooking)	Crop production (mainly potatoes and vegetables)	Agronomic	Producers, technologists, researchers	Poor soil fertility, high demand for pesticide-free vegetables	Northwest Region of Cameroon	Producers or farmers, consumers, owners of bio-digesters	Potential (few farmers have experimented with it, potatoes cultivated with slurry are dry and stay longer without rotting, compared to those grown with chemical fertilizers)

(c) Processing & Packaging

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Snail meat preservation via canning	Livestock	Technical and biotechnological	Researchers, technologists	Very high demand of snails out of the country	International	Those rearing snail meat Snail meat processors, consumers	Potential (can keeps 250g of fresh meat, enhances organoleptic qualities, guarantees hygienic quality and increases shelf-life)
Processing, packaging and sale of *Moringa oleifera*	Crop production	Technical and biotechnological	Farmers or producers, processors or transformers, researchers, technologists	High nutritional and medicinal importance	National	Farmers, transformers or processors, consumers	Positive (conscious of healthy living, many are consuming the processed product in form of powder, some people use powder of the seed to purify water)
Producing flour from plantain,	Crop production	Technical and biotechnological	Farmers or producers, processors or	Wheat flour very expensive (government	National	Farmers, transformers or processors, consumers	Potential (flour produced at the laboratory, and used for

sweet potato, and cassava			transformers, researchers, technologists	spending billion FCFA to import), need for different flour products with diverse nutritional composition especially for infants			the production of bread, cakes that are highly appreciated). Flour found to last longer than the food stuffs.
Processing and canning of tomatoes	Crop production	Technical and biotechnological	Farmers or producers, processors or transformaers, researchers, technologists	High market demand for tomatoes, scarce and expensive during certain periods	Practiced by some groups in the Center Region of Cameroon)	Farmers, transformers or processors, consumers	Potential (about 2 groups already canning and selling tomatoes)
Processing and packaging of pepper (hot pepper and black pepper – Piper spp) using local materials and equipments.	Crop production	Technical and biotechnological	Farmers or producers, processors or transformaers, researchers, technologists, processors, traders, consumers	High market demand, scarce at some seasons and very expensive	National	Farmers, transformers or processors, traders, consumers	Positive (common found in stores and some quantity exported out of the country. Pepper found in different forms e.g. cubes, liguid, powder)
Fulani and Bambui cheese, yoghurt & butter made from fresh cow milk	Crop production	Technical and biotechnological	Farmers or producers, researchers, extensionists, consumers	To increase shelf life of fresh milk, to consume fresh cow milk in other forms	National	Those rearing cows, processors, marketers, consumers	Positive (many people consuming yoghurt made in santa from fresh milk)
Transformation of cassava into garri, flour and starch	Crop production	Technical and biotechnogical	Farmers or producers, researchers,	High market demand for cassava products, most processing	Regional	Farmers or producers, processors, marketers consumers	Positive (cassava processing factories found in the South, Center and South west

			extensionists, consumers	by small farming groups focused mainly on transforming oil palm fruit to palm oil and kernel oil			Regions. Increase in cassava products that is even exported to neighboring countries)
Cocoa beans drying using improved samoan ovens whose construction costs about 1.8 million FCFA each	Crop production	Technical	Farmers or producers, researchers, extensionists, consumers	Use of obsolete cement ovens to dry cocoa beans leading to smoke-smelling cocoa	Littoral, Southwest, Center and South Regions of Cameroon	Farmers, processors or transformers, marketers, consumers	Positive (commonly used in the Southwest and Littoral Regions of Cameroon. Farmers testify that cocoa beans dried using the Samoan ovens dry faster, are of good quality, use little fuel wood, and has improved their income)
Small holder processing mills to transform oil palm fruits to palm oil, palm kernel oil and other by-products	Crop production	Technical and biotechnological	Farmers or producers, researchers, technologists, consumers	High market demand for palm oil. Only large agro-industries such as PAMOL, SOCAPALM and CDC had processing mills. At first small scale farmers had to pound cooked fruits before obtaining oil (not enough quantity produced)	Southwest, Littoral, Center, and South Regions of Cameroon	Farmers or producers, processors, marketers, factories using palm oil to manufacture products, consumers	Positive (many processing mills available to smallholders and functional. The mills are either mechanically or electrically driven. Increased revenue for some stakeholders in the value chain.

Locally made coffee haulers capable of hauling 15 tons of coffee in 12 hours	Crop production	Technical and biotechnological	Farmers or producers, technologists, processors	At first coffee was hauled only by cooperatives and they it was restricted only to members. Recent demand for Cameroonian coffee	Northwest and West Regions of Cameroon	Farmers or producers, processors, marketers, consumers	Positive (many individual farmers can now haul their coffee and this has resulted to less post-harvest loss, more coffee in the market and increase income)

(d) Agroforestry Techniques

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Improving cocoa – agroforestry landscapes (CALs) by intercropping with fruit and timber trees.	Crop production	Agronomic	Farmers, researchers, extensionists, consumers	Depending only on cocoa leaves most farmers with little or no money during off-season periods. Cocoa monocultures do not promote biodiversity	National especially in the humid tropics zones of Cameroon	Farmers, consumers of forest products	Positive (many cocoa farmers especially in the humid tropics are now incorporating fruit and timber trees into their CALs. Such trees include plantains, *Dacryodes edulis, Mangifera indica, Irvingia gabonensis, and Persea Americana*. These trees are important source of income during cocoa off-seasons.
Cultivating non-timber forest products (NTFPs)	Crop production	Agronomic	Farmers, researchers, extensionists, consumers	Depending only on cocoa leaves most farmers with little or no money during off-season periods. Cocoa monocultures do not promote biodiversity. High	National especially in the humid	Farmers, consumers of forest products	Positive (many cocoa farmers especially in the humid tropics are now incorporating NTFPs (such as Gnetum Africana, wild mangos, 'njangsa', and Piper spp) into

				market demand for NTFPs. Over exploitation from the wild and therefore depleting bioresource	tropics zones of Cameroon		their farms. These NTFPs are important source of income during cocoa off-seasons.
Forest Gardening (Replacement of eucalyptus plants with soil-enrichment plants)	Crop production	Agronomic	Farmers or producers, environment experts, researchers	Eucalyptus found to be a major cause of water scarcity where they are heavily planted. The need to improve soil fertility and at the same time have food for livestock	Northwest and Southwest Regions	Farmers or producers,	Positive (More farmers in the Northwest Region now boast of improved yields and higher incomes. They plant unique species such as acacia, Calliandra, Prunus Africana, and M. oleifera. These plants have nutrient-rich foliage and nitrogen-fixing capabilities. Foliage also used to feed pigs.

(e) Pest and Disease Management

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Use of pepper-garlic spray for the control of white fly	Crop production (mainly cassava and vegetables such as pepper)	Chemical	Farmers or producers, extensionists, researchers	High infestation of white flies on cassava and vegetables, leading to high losses. Classical insecticides expensive and dangerous if misused.	Southwest and Northwest Regions	Farmers, marketers, consumers	Positive
Use of fever grass, 'masepo' or tobacco leaves as botanical pesticides	Crop production	Chemical	Producers, extensionists, consumers	High infestation of sucking insect pests on crops, leading to high losses. Classical insecticides not easily accessible in most rural areas	National	Farmers, marketers, consumers	Positive

				and are expensive and dangerous if misused.			
Hygienic storage warehouse for yam farmers	Crop production		Producers, marketers, researchers, extensionists	Formerly, farmers packed their yams anywhere (bedrooms and kitchens) and in dirty areas. They had heavy losses due to pest and therefore selling at give away prices to avoid rotting due to lack of storage houses.	Northwest and Southwest Regions of Cameroon	Producers, marketers, consumers	Positive (farmers now have good places to keep yams until when prices are encouraging. They now earn good profit.
Use of clay pots or tight-fitting jugs to store grains	Crop production		Producers, marketers, researchers, extensionists	Generally, in rural areas, farmers keep their maize cobs on bans. Although they were free form weevils, they were not free from rats and other rodents.	National especially in rural maize producing areas in Cameroon.	Producers, marketers, consumers	Positive (more rural farmers use this technique to protect their grains or conserved them for some time.)
Use of medicinal plants to de-worm and boost immune system of pigs	Livestock production	Chemical	Those rearing pigs	High infestation of pigs with intestinal parasites. Inadequate veterinary services. Expensive synthetic medicines which are sometimes misused.	Southwest Region of Cameroon		Potential (still used on by a few pig farmers in the Buea area of Southwest Region Cameroon)

(f) Capacity Building of Farmers

Name	*Domain*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Agric Micro-finance institutions to support farmers or agro-entrepreneurs	Crop production	Farmers, agro-entrepreneurs, micro-finance organizations Financial experts	The need for farmers especially women to learn how to save and manage money. Also they need to have capital to start business or buy farm inputs	National	Farmers, micro-financial institutions, agro-entrepreneur	Positive (micro-finance institutions that specialize in helping farmers and agro-entrepreneurs are emerging. E.g. Key Farmers savings and loan credit union, Kumba)

Farmer Field Schools - FFS (mainly for cocoa, plantains and livestock)	Crop production and Livestock production	Farmers, processors, cocoa organizations (e.g. Telcar), researchers, extensionists, village heads	High market demand for cocoa and plantains coupled with little or no knowledge on appropriate and cost-effective production techniques. Misuse of agrochemical products	National	Farmers or producers, marketers, consumers	Positive (many FFS have been established especially in cocoa producing zones of the country as well as livestock zones in the Northwest Region. In these FFS, stakeholders have learnt how to ferment the beans, pesticide safety measures and rural agribusiness.
Voluntary Insurance for the informal sector especially farmers	Crop production and Livestock production	Farmers, agri-entrepreneurs, government (it established a decree in August 13, 2014 providing an opportunity for those in the informal sector to receive an old age pension.	At first only civil servants and other formal sectors benefitted from this service.	National	Farmers or producers, rural agro-entrepreneurs	Potential (established in 2014 and started registration in 2015 – no one has benefitted yet to testify. However, many in the informal sector praised the step taken by the government)
Program for the Improvement of the Competitiveness of Family Agro-pastoral Farms (ACEFA) Grants	Crop production and Livestock production	Farmers, rural or peri-urban agro-entrepreneurs, Non-Governmental Organizations (NGO), extensionists	Farmers in the rural area complained that they do not have start-up capital for their agro-business ideas or concepts. Need to support mainly development projects in agriculture.	National with focus on rural and peri-urban areas	Farmers or producers, consumers, the government	Positive (many grants have been awarded all over the country to support projects in the areas of maize production, plantain production and processing, livestock rearing, inland fishing, cassava production and processing)
Support Program for the Renovation and Development of Vocational Training in Agriculture,	Crop production and Livestock and	Farmers or producers, Youth groups, agro-entrepreneurs, extensionists, government (finances AFOP	Many unemployed youths. Most graduates or youths only interested in civil service. Few interested in agriculture had no formal training in agri-entrepreneurship and do not have start-up capital. At first, the	National	Youths and youth groups interested in agribusiness or in	Positive (through the C2D-AFOP many youths have been trained in agric schools. Upon graduation and defense of their projects, the youths have been supported financial and technically. An example is a female youth (Aimee Francoise Manga)

Livestock & Fisheries (AFOP)	Fisheries production	using funds of the Contract for Debt Relief & Development (C2D) between Cameroon and France.	government only focused on trainings.		crop/livestock production	who after training and financial support now owns a 6Ha cocoa farm.
Tractor assembly and support to farmers' groups, agric schools or colleges and research institutes	Crop production	Farmers, extensionists	Tilling of soil very tedious when carried out using hoes or other manual methods.	National	Farmers or producers, marketers, agric research institutes, agric schools/colleges or faculties, the government, the consumers, agro-industrial plantations	Positive (although many individual farmers are still to benefit from this service, related government institutions (e.g. research, universities), some non-governmental organizations and agro-industrial plantations have benefitted.
Food crop production centers or zones	Crop production	Farmers or producers, extensionists, micro-finance experts, engineers, technicians, government	Food crops are more costly in some rural areas compared to cities such as Douala and Yaounde. The need to have centers within each region that will help fight against food insecurity in the rural areas. The centres will include warehouses for inputs, tools, means of drying, warehouses for storage, means of transformation, a loan & saving scheme, and a marketing aspect for the farmers.	National	Farmers or producers, marketers, the government, consumers	Potential (good concept still to be demonstrated)
Library to help farmers boost production	Crop production	Farmers, NGOs, researchers, information and	Those farmers who can read do not have access to technical information or cannot afford.	National	Farmers, anyone in the rural	Positive (existing already in some communities. Some of the libraries

		communication experts			communities especially students, extension workers, school teachers	even have videos or CD-Roms on agric related issues.

(g) Non-Conventional Livestock Rearing

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Rearing of quails and marketing of their eggs	Livestock production		Livestock producers, feed suppliers, extension officers, veterinary doctors	Quail eggs found to have medicinal uses; its cholesterol-free egg has theurapeutic properties.	National (common in all regions except northern ones)	Farmers or producers, marketers, feed suppliers, fish farmers, consumers	Positive (many people are rearing quails now even though not on a very large scale. Some fish farmers are using the high-protein quail droppings to feed their fish. Some attempting to produce biogas from the droppings.
Cultivation and marketing of spirulina	Algae production	Biotechnological	Farmers or producers, NGOs, processors, researchers	Spirulina found to be a green alga which is rich in protein, calcium, iron, Beta-carotene, Vitamin B12, Vitamin K. It is a nutritional supplement for the prevention and treatment of certain	Center Region (heavily cultivated by Association of Volunteers for Development in Cameroon, Yaounde)	Farmers or producers, processors, marketers, consumers, cosmetic industries.	Potential (only heavily cultivated by one NGO and many people are not aware of its cultivation, processing, and economic as well as nutritional or medicinal uses. However, for now it is sold dried, in

				diseases. Also important in the cosmetic industry.			capsules, tablets, and powder)
Snail rearing and marketing	Livestock production	Biotechnological	Farmers or producers, marketers, extension officers, researchers	High rate of consumption of snails and now very expensive. At first all snails were collected from the wild or nature. Medicinal importance of snails emphasized and therefore high as well as ready market. Just to venture into something new	National (very common in the forest zones of the country).	Farmers or producers, marketers, consumers	Positive (the rate of rearing, marketing and consumption of snails has increased tremendously over the years. 18L bucket of snails costs up to 10,000FCFA in the dry season
Rearing and marketing of cane rats or grass cutters.	Livestock production	Biotechnological	Farmers or producers, marketers, extension officers, researchers	High consumption of grass cutters or cane rats, short supply of cane rats in the wild due to bush fires, hunting, cutting down of forests and bushes to farm lands	Southwest, Northwest and Littoral Regions	Farmers or producers, marketers, consumers	Potential (very few farmers rearing cane rats and at very small scales. However, many people like eating this meat)
Mush room cultivation using oil palm bunch residue (bunch whose oil and kernels have been extracted)	Crop production	Biotechnological	Farmers or producers, marketers, extension officers, researchers	Mush rooms rich in minerals and proteins. Large quantities of edible Mush rooms are scarce. Bio-resource for the cultivation is available and cheap in the oil palm production	National	Farmers or producers, marketers, consumers	Positive (there are farmers with very large cultivation chambers, and these cultivated mush rooms can be found in the market)

				zones. Market demand for mush rooms. Cheaper and profitable production methods.			

(f) Market Improvement

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Women working in groups to market their cassava products e.g. 'garri'	Crop production	Informational	Farmers or producers, NGOs, Extension Officers, Research, Consumers	Previously women worked in isolation, taking their products individually to the market.	National	Farmers or producers, marketers, consumers	Positive (most women cassava producers now work in groups – making and selling larger batches of their products. A few take the products to the market – saving time and making them more productive. They now sell in bulk to serve wholesalers who need large quantities at a time. Working in groups has stabilized their prices and prevented them from dubious middle persons.
Market Information			Farmers or producers, bulk	Previously farmers did not know the prices of	National		Positive (it has greatly helped linked farmers to buyers and

System (MIS) – Publication of market information	Crop and livestock production	Informational	buyers, Media (print & audio), Extension Officers, NGOs & some international organizations	their products in the different regions. Similarly, bulk buyers did not know different areas where products are much and relatively cheaper. It was also difficult to link farmers and buyers.		Producers, bulk buyers, transporters, print media, local government (councils)	therefore increasing income for the producers. Most do not have to move long distances to sell as the buyers buy at farm gates. Most people buy the Farmers Voice Magazine to get the market information.
Organized cocoa markets	Crop production	Informational	Producers, bulk buyers,	Previous producers worked and sold in a scattered manner and were exploited by middle men who bought at very low prices and then sold at very high prices.	Some Cocoa producing areas of Southwest e.g. Tombel Sub-Division	Producers, local government, bulk buyers	Positive (producers have specific days to sell their products and they do so with the same prices. This is also gives opportunity for quality of their products to be checked by extension officers)

(g) Agric Shows, Open & Field Days

Name	*Domain*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Organization of agric shows, open & field days. Organized mainly the Ministry of Agriculture & Rural Development, IRAD, and some	Crop & Animal production	Farmers or producers, agric officials, agric research institutes (national and international), media, consumers, politicians,	Previously it was difficult for people of different Regions or different parts of the country to know what other farmers and agro-entrepreneurs are doing. Traders did not also know specific areas where they	National (at certain time intervals, national agric shows are organized by the government in which the President of the Country is fully involved. In the	Farmers or producers, agro-entrepreneurs, marketers, media, local government or	Positive (many livelihoods have been improved in the rural and peri-urban areas of the country. Producers are now exposed to bulk buyers from all over the regions or country. Awards given during such shows,

international NGOs or organizations such as GIZ, IITA, ICRAF, AVRDC-World Vegetable Center		government representatives	could get specific products. Farmers did not also know specific areas or persons where they could sell in bulk.	different Regions, MINADER organizes regional agric shows. From time to time or as need arises, local and international organizations organize field days or open days	councils, Ministry of Agriculture, Consumers, telecommunication companies	have helped many farmers to produce more and increase income. Many agro-entrepreneurs especially on transformation of food crops have benefitted from financial and material support.)

(h) Seed Production, Processing/Packaging, and Marketing

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Rapid multiplication of plantain using macro-propagation (the PIF technique)	Crop production	Biotechnological	Farmers, researchers, agric extension officers	At first it was very difficult for plantain farmers to get plantain planting materials that are pest-free, in large quantities, potable and available in a short period of time.	National especially in all the seven regions where plantains are cultivated	Farmers or producers, seed producers, marketers	Positive (a relatively simple technique that is been used by all interested persons even in the rural areas. Thousands and even millions of plantain plantlets can be gotten in 3 months and easily transported to areas where there are just foot paths. PIF plantlets are gradually replacing the old traditional sucker planting materials that are usually infested with nematodes and borers. PIF planting materials are even well packaged and sent to neighbouring countries

							like Nigeria, Gabon, Congo, Central African Republic
Rapid multiplication of plantains/bananas using micro-propagation or tissue culture techniques	Crop production	Biotechnological	Farmers, agro-industrial plantations, researchers, agric extension officers	At first it was very difficult for plantain farmers to get plantain planting materials that are pest-free, in large quantities, potable and available in a short period of time.	National (but technique produced only by experts from IRAD and CARBAP)	Farmers or producers, seed producers, marketers, research institutions, agro-industrial plantations.	Potential and Positive. Positive (for banana plantations that are already using tissue culture plantlets). Potential (for plantain producers as research is still to prove that it can actually be meeting the demands of supplying planting materials continuously)
Vegetative propagation of cocoa using techniques such as seeding, cutting, marcotting, tissue culture and grafting	Crop production	Agronomic	Farmers, researchers, agric extension officers	At first, without these techniques, cocoa trees took longer periods before start producing pods and beans.	National	Farmers or producers, marketers, consumers	Positive (most farmers in cocoa producing zones are buying large quantities of improved cocoa seedlings mainly from vegetative propagation)
Multiplying, packaging and marketing of seeds of Traditional African Vegetables (TAVs)	Crop production	Biological	Vegetable farmers, seed producers, agrochemical retailers, researchers, agric extension officers	Inadequate seeds of TAVs in the market. The few available are not well packaged. Those in agro-chemical stores are mainly imported and most often when sowed they do not germinate.	Some regions of the country	Farmers, seed producers, agro-chemical retailers	Potential (multiplying and packaging of TAVs still at the research level.)

(i) Organization of stakeholders within value chains

Name	*Domain*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Formation of associations or groups (e.g. Common Initiative Groups – CIGs and Cooperatives	Crop and Animal production	Farmers, livestock rearers, marketers, agric extension officers	Formerly, stakeholders especially farmers were not organized and therefore were easily cheated or exploited by some middle men. Also, individually, they could not easily sell to bulk buyers or these buyers dictated prices for them	National (every part of the country, there are CIGs and Cooperatives which the government encouraged and is supporting technically and financially.	The farmers or other stakeholders in the value chain e.g. marketers. Also, the government, bulk buyers, and even local councils.	Positive (many stakeholders especially producers in value chains are now in groups or associations. Most are interested in producing together, fixing their prices, and linking to bulk buyers with little or no middle men interference.

(j) Mutual Health Organizations

Name	*Domain*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Health organizations that benefit farmers and other stakeholders	Crop production, livestock production	Farmers, marketers, transporters, micro-finance organizations, ministry of health, Non-Governmental Organizations	Individually, hospital or clinic bills are usually very high for the average Cameroonian especially those at the rural and peri-urban areas	National	Those farmers in the rural and peri-urban areas. Hospitals/clinics or health centers, banks or micro-finance institutions	Positive (many registered members or individuals contribute some amount of money annually and they or their family benefits twice per year as the MHO pays at least 70% of their hospital bills.)

(k) Irrigation

Name	***Domain***	***Type/Nature***	***Stakeholders Involved***	***Drivers/triggers***	***Scale***	***Beneficiaries***	***Effects***
Rural irrigation		Technological	Farmers, technologists,	Farmers could not produce much garden vegetables	Some parts of Northwest and	Rural farmers of vegetables, marketers,	Positive, especially in the Northwest Region where in NOWEFOR helped to supply

	Crop and livestock production		engineers, agric extension officers,	especially tomatoes during the dry season.	South west Regions.	consumers, local council, Farmer organizations such as NOWEFOR	water to over 100 farmers in a 10km area. Farmers now produce much vegetables during the off-season. A bore hole is used as the source of water and supplies over 5Ha of land).

Appendix 2: Detailed information from some relevant IPs

Innovation Platform (IP) I
Summaries for Major Innovation platforms

1. Plantain (FSTP Project)

Country	Cameroon/Gabon/Equatorial Guinea
IP Name	Plantain value chain
Entry Point	Low yields for plantains as a result of using traditional varieties and production techniques.
Location GPS Coordinate: IP webpage: Participating villages	Cameroon (Ambam), Gabon (Oyem), Equatorial Guinea (Bibiyem) Ambam, Oyem, Bibiyem
Date IP establishment	September 2009
Number of years activities on the ground	3 years
Facilitators Contact Name Bertrand Ndemba Mobile SkypeID Others c/o National Plantain Coordinator	
Partners	
Farmers	Individual and farmer organization in targeting villages, represented at IP management committee level
Private sector	Seed production, agrochemical companies
Policy makers	Senior Divisional Officer, Mayors, traditional leaders, MINRESI, CENEREST, MINADER, CNOP
Researchers	CARBAP, IRAD, IGAD
Extension	Agric extension officers from Oyem, Ambam, and Bibiyem

Country	Cameroon/Gabon/Equatorial Guinea
Micro financing institutions Others Total number of stakeholders (About 100)	
Opportunities addressed	Rapid multiplication of plantains using macropropagation Formation of a central point for the bulk sale of plantains Establishing larger farms
Achievements to date	IP established and functioned between 2009 and 2014 and ground rules set up for its functioning IP steering committee consisting of representatives of different categories of IP actors) set up. These had the opportunity to interact and exchange information. Farmers trained on good agricultural practices Farmers trained on rapid multiplication of plantains Improved hybrids of plantains cultivated and found in the markets
Challenges remaining	Need to put in place ways of sustaining the platform (for example putting in place ways of generating money for the platform, e.g., a processing machine for producing flour and packaging for sale in and out of the country) Linking producers to buyers Limited capacity of inputs dealers to satisfy farmers demands
Sustainability issues	The IP could not function after the project and therefore need to link farmers to private sectors especially microfinance institutions. Otherwise, establish a government owned farmers' bank Build capacity of farmers in cooperative formation.
Phase in IP process	Phase 1

2. Traditional African Vegetable (TAV Project)

Country	Cameroon
IP Name:	Traditional African vegetable value chain
Entry Point:	Low yields for traditional African vegetables as a result of using traditional varieties and traditional production techniques. Low consumption of traditional African vegetables
Location: GPS Coordinate: IP webpage: Participating villages:	South Region and South West Region Ebolowa, Muyuka-Ekona, Wotutu
Date IP establishment:	January 2014
Number of years activities on the ground:	1 years
Facilitators Contact Name Okolle Justin and Ashu Tambe Mobile: +(237)674534786 SkypeID Others	
Partners	
Farmers	Individual and farmers in targeted villages
Private sector	Agrochemical companies
Policy makers	Divisional officer, Mayors, traditional leaders, MINRESI, MINADER,
Researchers	IRAD, AVRDC-The World Vegetable Centre
Extension	Agric extension officers covering the targeted villages
Others (retailers) Total number of stakeholders (About 250)	

Country	Cameroon
Opportunities addressed	Seed multiplication, processing and packaging Production of improved traditional African vegetables
Achievements to date	IP established and functioned between 2014 and 2015 and ground rules set up for its functioning Improved varieties of traditional vegetables cultivated and found in the markets Farmers of Amaranth and African egg plant increase their income by selling more and good products with high demand Some farmers have started producing and packing their own seeds using best practices A best practice hub established in Ekona and has trained over 20 persons
Challenges remaining	Need to form registered cooperatives in the different target sites. Putting in place simple irrigation and water conservation systems so as to encourage cultivation during off season or during the rainy season More training needed on agribusiness Improve methods of harvesting, transportation and preservation or transformation Linking producers to buyers Limited capacity of inputs dealers to satisfy farmers demands
Sustainability issues	The IP needs more training on IP concept so as to move to phase 2 Build capacity of farmers in cooperative formation and management
Phase in IP process	phase 1

3. Dissemination of New Agricultural Technologies **(DONATA Project)**

Country	Cameroon
IP Name	Cassava value chain
Entry Point	Low yields of cassava due to use of traditional planting materials, poor soil fertility, and traditional production techniques. Traditional processing of cassava products accompanied with poor sanitation methods
Location GPS Coordinate:	Centre, East, South & Littoral Regions

Country	Cameroon
IP webpage:	
Participating villages	Centre, East, South & Littoral Regions (Nkong-Abok, Batchenga, Okola, Ngat, Gouekong, Lobo, Banyo, Mefomo, Kiki, Pouma)
Date IP establishment	2007
Number of years activities on the ground	8 years
Facilitators Contact: Name Dr. Ougene Nere Mobile: SkypeID Others	
Partners	
Farmers	Individual and farmers in targeted villages
Private sector	agrochemical companies
Policy makers	Divisional officer, Mayors, traditional leaders, MINRESI, MINADER, CNOP-CAM, RHORTICAM, CONAFIMAC
Researchers	IRAD, UNIVERSITY OF YAOUNDE II
Extension	Agric extension officers covering the targeted villages
Others (retailers)	
Total number of stakeholders (About 300)	
Opportunities addressed	Hygienic transformation of cassava to local products Increase cultivation of improved cassava varieties especially 8034 using improved production techniques Simple cost-effective methods for pest and disease management

Country	Cameroon
Achievements to date	IP established and functioned between 2007 and 2015 and ground rules set up for its functioning Over 20,000 improved clean planting materials distributed to targeted communities Improved varieties of cassava cultivated and found in the markets in form of raw materials or their products Farmers increase their income by selling more and quality products with high demand Some farmers have started cultivating their farms using best practices
Challenges remaining	Need to form registered cooperatives in the different target sites. More training needed on agribusiness Advanced methods of harvesting, transportation and transformation as well as preservation of transformed products Linking producers to buyers
Sustainability issues	The IP could not function after the project and therefore need to link farmers to private sectors especially microfinance institutions. Otherwise, establish a government owned farmers' bank Build capacity of farmers in cooperative formation and management
Phase in IP process	Late Phase 2

4. Cavy Innovation Platform (Cavy Project) funded by BECA-ILRI

Country	Cameroon
IP Name:	Cavy or Guinea Pig Innovation Platform
Entry Point:	Inadequate protein source
Location: GPS Coordinate: IP webpage:	NorthWest Region of Cameroon
Participating villages:	Bamenda
Date IP establishment:	March 2014
Number of years activities on the ground:	1.5 years

Country	Cameroon
Facilitators Contact: Name: Dr. Appolinaire Djikeng and Gyeh Stephen Mobile: 696901034 SkypeID Others	
Partners	
Farmers: Researchers :	Individual and farmers in targeted villages IRAD, BECA-ILRI, University of Dschang
Policy makers:	Divisional officer, Mayors, traditional leaders, MINRESI, MINADER, MINEPIA
Extension:	Agric and livestock extension officers covering the targeted villages, SIRDEP, HIC
Others (retailers): Restaurant owners, Marketers, Consumers Total number of stakeholders : 200	
Opportunities addressed:	Best practices for rearing cavies or guinea pigs Using waste or dung of the cavies as organic manure for crops Alternative and rapid access to food and income
Achievements to date:	Several isolated cavy producers identified and organized 03 traders identified, trained and are now supplying cavies to boarding schools, hotels and restaurants
Challenges remaining:	Insufficient reproductive stock Small litter size Longer period (8 months) to attain a marketable weight and size
Sustainability issues:	Stakeholders really cooperating Producers need more sensitization and capacity building so as to strengthen the group and link them to more buyers
Phase in IP process :	Late Phase 1

5. INNOBAP Plantain Project Funded by European Union

Country	**Cameroon**
IP Name:	Dissemination of new varieties of bananas and plantains
Entry Point:	Low yields due to use of local varieties and little or no training on best practices for plantain cultivation.
Location: GPS Coordinate: IP webpage: Participating villages:	Littoral and South Regions Ambam and Kombe
Date IP establishment:	
Number of years activities on the ground:	
Facilitators Contact: **Name:** Dr. Nkapnang Isabella **Mobile:** **SkypeID** **Others**	
Partners	
Farmers: Researchers : Policy makers: Extension: Others: Nursery/seed producers, transporters, bakery owners, Marketers, Consumers Total number of stakeholders : 200	Individual and group farmers in targeted villages IRAD, CARBAP Divisional officer, Mayors, traditional leaders, MINRESI, MINADER, Agric and livestock extension officers covering the targeted villages, SIRDEP, HIC

Country	Cameroon
Opportunities addressed:	Participatory evaluation and selection of improved/new varieties of plantains and bananas
Achievements to date:	Several stakeholders working together to select banana/plantain varieties that are good for consumption and for production of flour for baking bread and other related products. 05 varieties from Ambam and 04 varieties from Kombe were appreciated and adopted by the stakeholders.
Challenges remaining:	Maintenance of existing or established demonstration plots. Establishment and management of new plots of the selected or preferred varieties. Incorporating flour from the preferred varieties into the production of bread
Sustainability issues:	Plantain warehouse available at Ambam where producers and buyers meet. Stakeholders of the value chain grouped together. The two platforms formally recognized and institutionalized. Some CBOs, NGOs, CIGs and EIGs changed their objectives in order to specialize in the production and marketing and/or processing of plantains. A CBO took over the coordination from CARBAP.
Phase in IP process :	Late Phase

6. Development of Bovine Sector of Mayo-Louti funded by CORAF-APESS

Country	Cameroon
IP Name:	ADEFIB-ML
Entry Point:	Poor conservation of meat.
Location:	Maroua (Mayo-Louti), Extreme North Region
GPS Coordinate:	9o55.723'; 13o37.385'; altitude of 341
IP webpage:	
Participating villages:	Figuil, Guider, Mayo-Woulo
Date IP establishment:	March 2013
Number of years activities on the ground:	3 years

Facilitators Contact:
Name: Abakar Ahmadou
Mobile: 699555614
SkypeID
Others

Country	Cameroon
Partners	
Farmers: Researchers :	Individual and group farmers in targeted villages IRAD
Policy makers:	MINRESI, Ministry of Livestock,
Extension:	Agric and livestock extension officers covering the targeted villages
Others: Nursery/seed producers, transporters, bakery owners, Marketers, Consumers Total number of stakeholders : 200	
Opportunities addressed:	Techniques for the conservation of meat.
Achievements to date:	Farmers trained on good conservation practices
Challenges remaining:	Establishment of cold rooms. Purchase of refrigerated vehicles. Creation of veterinary pro-pharmacie
Sustainability issues:	
Phase in IP process :	Initial

7. CODREPRAM: Development and research for small ruminants

Country	**Cameroon**
IP Name:	CODREPRAM
Entry Point:	Improvement of small ruminants
Location:	Maroua (Mayo-Louti), Extreme North Region
GPS Coordinate:	9o55.723'; 13o37.385'; altitude of 341
IP webpage:	
Participating villages:	Figuil, Guider, Mayo-Woulo
Date IP establishment:	March 2013
Number of years activities on the ground:	3 years
Facilitators Contact:	
Name: Abakar Ahmadou	
Mobile: 699555614	
SkypeID	
Others	
Partners	
Farmers:	Individual and group farmers in targeted villages
Researchers :	IRAD
Policy makers:	MINRESI, Ministry of Livestock,
Extension:	Agric and livestock extension officers covering the targeted villages

Country	Cameroon
Others: Nursery/seed producers, transporters, bakery owners, Marketers, Consumers Total number of stakeholders : 200	
Opportunities addressed:	Techniques for the conservation of meat.
Achievements to date:	Farmers trained on good conservation practices
Challenges remaining:	Establishment of cold rooms. Purchase of refrigerated vehicles. Creation of veterinary pro-pharmacie
Sustainability issues:	
Phase in IP process :	Initial

Appendix III: Recorded Innovations

a. New Crop & Livestock Varieties

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Hybrid plantains (e.g. CRBP 039, CRBP 968)	Crop production	Biological and biotechonological	Producers or farmers, Researchers, Extensionists	High pest and disease infestation and infection.	ECCAS/CEMAC	Mainly farmers in Cameroon, Congo Brazaville, Gabon, Central African Republic	Positive (highly resistant to black sigatoka disease)
Maize varieties (e.g. ATP-SR-Y, TP S6 31Y-Bbx9450, ATP-S6 21Y-2x4001, Cla 183x9450	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	To reduce toxicity resulting from aluminium and acid soils, and ultimately high yields. Market demand for some varieties	National	Mainly farmers or producers, processors or transformers	Positive (tolerance to acid soils, tolerance to aluminium toxicity, high yields (7.7 to 8.5 tons per Ha)
Sorghum varieties (e.g. Safari 40, Madjeri, Adjamari and Bougouri	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	Low yields	Northern Regions of Cameroon	Mainly farmers or producers, processors or transformers and consumers	Positive (high yields and many farmers using the varieties
Soya and haricot beans varieties (e.g. for soya = TGX 1835-10E and for haricot beans TY 3396-12, NITU, MEX-142, Eca pan, GLP-190, KJ4/3, MAC-55	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	High infection of diseases. Market demand	National	Mainly farmers or producers, processors or transformers and consumers	Positive (high tolerance to mosaic disease and anthracnose

Cowpea varieties (TVX3236, Vya, Lori, CRSP)	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	High pest infestation, low yields	National	Mainly farmers or producers, processors or transformers and consumers	Positive (high yields = 1667kg per Ha, resistant to striga weed
Oil palm varieties							
Rubber varieties							
Cocoa varieties							
Cattle varieties (e.g. Holstein and Jersey breeds)	Livestock production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists	Low milk production	Northwest and Northern Regions of Cameroon	Mainly farmers or producers, processors or transformers and consumers	Positive (8-12 L of milk per day compared to 1-2L per day from traditional breed
Cassava varieties (e.g. 8034, 8061)	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists, and consumers	Low yield, very long crop cycle, high pest and disease	National	Producers or farmers, consumers	Positive (many farmers using the new varieties especially 8034 with 25-30 tons per Ha compared to 15-20 tons per Ha for local varieties, they are resistant to blight, mosaic and anthracnose)
Use of NERICA Rice variety	Crop production	Biological and biotechnological	Producers or farmers, Researchers, Extensionists, policy makers and consumbers	Low yields of local varieties, difficulties in production in marshy areas	ECCAS/CEMAC	Producers, processors and consumers	Promising (few farmers testify higher yields)

(b) Soil Fertility Management/Improvement/Enhancement

Name	*Domain*	*Type/Nature*	*Stakeholders Involved*	*Drivers/triggers*	*Scale*	*Beneficiaries*	*Effects*
Leaf nutrient analysis or foliar survey	Crop production (mainly for oil palm plantations)	Agronomic and biotechnological	Commercial plantations, researchers	Under estimation of fertilizer application	Southwest and Littoral Regions of Cameroon	Agro-industrial oil palm plantations, e.g., CDC, SOCAPALM, PAMOL	Positive (fertilizers only applied on recommendation – this reduces cost of production and negative effects on the environment)
Use of compost (mainly from harvest residues, grass, refined chicken dung, and some house wastes	Crop production (mainly for home gardens and family farms)	Agronomic	Farmers or producers, extensionists, consumers	Low yields, market demand for pesticide-free crops, high risk of pesticide contamination to small scale farmers	National	Home gardeners, family farm practitioners, consumers	Positive (relatively less chemicals used in home gardens and family farms)
Night paddock system (cattle pass out dung in a particular area for over 1 month, the area is then used to cultivate vegetables)	Crop production (mainly vegetables such as tomatoes and African nightshade)	Agronomic	Farmers or producers, those rearing cattle,	High market demand for nightshades, low yields as a result of low soil fertility	Northwest Region of Cameroon	Vegetable farmers, those rearing cattle, and consumers	Positive (many farmers in the Babanki area of northwest are now using the system with increasing yields and income)
Use of biochar	Crop production	Agronomic/Chemical	Producers or farmers, researchers, extensionists	Poor soil fertility, negative environmental effects resulting from excess use of	Kumba area of Southwest Region Cameroon	Producers or farmers, consumers	Positive (more women using the innovation to cultivate cassava, maize).

				synthetic fertilizers			
Production of mycorrhizal biofertilizers	Crop production	Agronomic/Chemical	Producers or farmers, researchers, extensionists	Poor soil fertility	National	Producers or farmers, consumers	Potential (experiments show it increases yield from 50-200%
Use of wood ash, chicken dung, bokashi, and oil palm bunch residue ash	Crop production (especially for vegetables, plantains, yams, and maize)	Agronomic	Producers or farmers, extensionists, researchers	Poor soil fertility, low yields, high pest infestation, high prices for synthetic fertilizers	National	Producers or farmers, consumers	Positive (widely used in family farms and home gardens by women, higher yields obtained, in some cases pest infestation is reduced)
Use of slurry (waste matter from anaerobic decomposition of organic matter in a bio-digester which produces gas used as an energy source and for cooking)	Crop production (mainly potatoes and vegetables)	Agronomic	Producers, technologists, researchers	Poor soil fertility, high demand for pesticide-free vegetables	Northwest Region of Cameroon	Producers or farmers, consumers, owners of bio-digesters	Potential (few farmers have experimented with it, potatoes cultivated with slurry are dry and stay longer without rotting, compared to those grown with chemical fertilizers)

(c) Processing & Packaging

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Snail meat preservation via canning	Food processing (Livestock)	Technical and biotechnological	Researchers, technologists	Very high demand of snails out of the country	International	Those rearing snail meat Snail meat processors, consumers	Potential (can keep 250g of fresh meat, enhances organoleptic qualities, guarantees hygienic quality and increases shelf-life)
Processing, packaging and sale of *Moringa oleifera*	Food processing (medicinal plant)	Technical and biotechnological	Farmers or producers, processors or transformers, researchers, technologists	High nutritional and medicinal importance	National	Farmers, transformers or processors, consumers	Positive (conscious of healthy living, many are consuming the processed product in form of powder, some people use powder of the seed to purify water)
Producing flour from plantain, sweet potato, and cassava	Food processing (Crop)	Technical and biotechnological	Farmers or producers, processors or transformers, researchers, technologists	Wheat flour very expensive (government spending billion FCFA to import), need for different flour products with diverse nutritional composition especially for infants	National	Farmers, transformers or processors, consumers	Potential (flour produced at the laboratory, and used for the production of bread, cake that are highly appreciated). Flour found to last longer than the food stuffs.
Processing and canning of tomatoes	Crop production	Technical and biotechnological	Farmers or producers, processors or transformaers,	High market demand for tomatoes, scarce and expensive	Practiced by some groups in the Centre	Farmers, transformers or processors, consumers	Potential (about 2 groups already canning and selling tomatoes)

			researchers, technologists	during certain periods	Region of Cameroon)		
Processing and packaging of pepper (hot pepper and black pepper – *Piper spp*) using local materials and equipments.	Crop production	Technical and biotechnological	Farmers or producers, processors or transformaers, researchers, technologists, processors, traders, consumers	High market demand, scarce at some seasons and very expensive	National	Farmers, transformers or processors, traders, consumers	Positive (commonly found in stores and some quantity exported out of the country. Pepper found in different forms e.g., cubes, liquid, powder)
Fulani and Bambui cheese, yoghurt & butter made from fresh cow milk	Food processing (livestock)	Technical and biotechnological	Farmers or producers, researchers, extensionists, consumers	To increase shelf life of fresh milk, to consume fresh cow milk in other forms	National	Those rearing cows, processors, marketers, consumers	Positive (many people areconsuming yoghurt made in santa from fresh milk)
Transformation of cassava into garri, flour and starch	Food processing (Crop)	Technical and biotechnogical	Farmers or producers, researchers, extensionists, consumers	High market demand for cassava products, most processing by small farming groups focused mainly on transforming oil palm fruit to palm oil and kernel oil	Regional	Farmers or producers, processors, marketers consumers	Positive (cassava processing factories found in the South, Centre and South west Regions. Increase in cassava production, which are exported to neighbouring countries)
Cocoa beans drying using improved samoan ovens, whose construction costs	Crop production	Technical	Farmers or producers, researchers, extensionists, consumers	Use of obsolete cement ovens to dry cocoa beans leading to	Littoral, Southwest, Centre and South	Farmers, processors or transformers, marketers, consumers	Positive (commonly used in the Southwest and Littoral Regions of Cameroon. Farmers testify that cocoa beans dried using the

about 1.8 million FCFA each				smoke-smelling cocoa	Regions of Cameroon		Samoan ovens dry faster, are of good quality, use little fuel wood, and has improved their income)
Small holder processing mills to transform oil palm fruits to palm oil, palm kernel oil and other by-products	Food processing and Crop production	Technical and biotechnological	Farmers or producers, researchers, technologists, consumers	High market demand for palm oil. Only large agro-industries such as PAMOL, SOCAPALM and CDC had processing mills. At first, small scale farmers had to pound cooked fruits before obtaining oil (not enough quantity produced)	Southwest, Littoral, Centre, and South Regions of Cameroon	Farmers or producers, processors, marketers, factories using palm oil to manufacture products, consumers	Positive (many processing mills available to smallholders and functional. The mills are either mechanically or electrically driven. Increased revenue for some stakeholders in the value chain.
Locally made coffee haulers capable of hauling 15 tons of coffee in 12 hours	Food processing and Crop production	Technical and biotechnological	Farmers or producers, technologists, processors	At first coffee was hauled only by cooperatives and then it was restricted only to members. Recent demand for Cameroonian coffee	Northwest and West Regions of Cameroon	Farmers or producers, processors, marketers, consumers	Positive (many individual farmers can now haul their coffee and this has resulted in less post-harvest losses, more coffee in the market and increased income)

(d) Agroforestry Techniques

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Improving cocoa – agroforestry landscapes (CALs) by intercropping with fruit and timber trees.	Crop production	Agronomic	Farmers, researchers, extensionists, consumers	Depending only on cocoa leaves. Most farmers with little or no money during off-season periods. Cocoa monocultures do not promote biodiversity	National especially in the humid tropics zones of Cameroon	Farmers, consumers of forest products	Positive (many cocoa farmers especially in the humid tropics are now incorporating fruit and timber trees into their CALs. Such trees include plantains, *Dacryodes edulis, Mangifera indica, Irvingia gabonensis, and Persea Americana*. These trees are important sources of income during cocoa off-seasons.
Cultivating non-timber forest products (NTFPs)	Crop production	Agronomic	Farmers, researchers, extensionists, consumers	Depending only on cocoa leaves. Most farmers with little or no money during off-season periods. Cocoa monocultures do not promote biodiversity. High market demand for NTFPs. Over exploitation from the wild and therefore depleting bioresource	National especially in the humid tropics zones of Cameroon	Farmers, consumers of forest products	Positive (many cocoa farmers especially in the humid tropics are now incorporating NTFPs (such as *Gnetum Africana*, wild mangos, 'njangsa', and *Piper spp*) into their farms. These NTFPs are important sources of income during cocoa off-seasons.
Forest Gardening (Replacement of eucalyptus plants with soil-enrichment plants)	Crop production	Agronomic	Farmers or producers, environment experts, researchers	Eucalyptus found to be a major cause of water scarcity where they are heavily planted. The need to improve soil fertility and at the same time have food for livestock	Northwest and Southwest Regions	Farmers or producers,	Positive (More farmers in the Northwest Region now boast of improved yields and higher income. They plant unique species such as acacia, Calliandra, *Prunus Africana*, and *M. oleifera*. These plants have

							nutrient-rich foliage and nitrogen-fixing capabilities. Foliage also used to feed pigs.

(e) Pest and Disease Management

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Use of pepper-garlic spray for the control of white fly	Crop production (mainly cassava and vegetables such as pepper)	Chemical	Farmers or producers, extensionists, researchers	High infestation of white flies on cassava and vegetables, leading to high losses. Classical insecticides expensive and dangerous if misused.	Southwest and Northwest Regions	Farmers, marketers, consumers	Positive
Use of fever grass, 'masepo' or tobacco leaves as botanical pesticides	Crop production	Chemical	Producers, extensionists, consumers	High infestation of sucking insect pests on crops, leading to high losses. Classical insecticides not easily accessible in most rural areas and are expensive and dangerous if misused.	Local	Farmers, marketers, consumers	Positive
Hygienic storage warehouse for yam farmers	Crop production		Producers, marketers, researchers, extensionists	Formerly, farmers packed their yams anywhere (bedrooms and kitchens) and in dirty areas. They had heavy losses due to pest and therefore selling at give away prices to avoid rotting due to lack of storage houses.	Northwest and Southwest Regions of Cameroon	Producers, marketers, consumers	Positive (farmers now have good places to keep yams until when prices are encouraging. They now earn good profit.
Use of clay pots or tight-fitting jugs to store grains	Crop production		Producers, marketers, researchers, extensionists	Generally, in rural areas, farmers keep their maize cobs on bans. Although they were free form weevils, they were	National especially in rural maize producing	Producers, marketers, consumers	Positive (more rural farmers use this technique to protect

				not free from rats and other rodents.	areas in Cameroon.		their grains or store them for some time.)
Use of medicinal plants to de-worm and boost the immune system of pigs	Livestock production	Chemical	Those rearing pigs	High infestation of pigs with intestinal parasites. Inadequate veterinary services. Expensive synthetic medicines which are sometimes misused.	Southwest Region of Cameroon		Potential (still used by a few pig farmers in the Buea area of Southwest Region of Cameroon)
Use of black pepper (*Piper guineense*) to reduce weevil infestation on beans and maize during storage.	Crop production						Potential (laboratory research has shown the high weevil mortality and non-mortality effects caused by black pepper). This needs to be tested on a large scale and be promoted)

(f) Capacity Building of Farmers

Name	Domain	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Agric micro-finance institutions to support farmers or agro-entrepreneurs	Crop production	Farmers, agro-entrepreneurs, micro-finance organizations financial experts	The need for farmers especially women to learn how to save and manage money. Also they need to have capital to start business or buy farm inputs	National	Farmers, micro-financial institutions, agro-entrepreneurs	Positive (micro-finance institutions that specialize in helping farmers and agro-entrepreneurs are emerging, e.g., key farmers savings and loan credit union, Kumba)
Farmer Field Schools - FFS (mainly for cocoa, plantains and livestock)	Crop production and	Farmers, processors, cocoa organizations (e.g. Telcar),	High market demand for cocoa and plantains coupled with little or no knowledge on appropriate	National	Farmers or producers, marketers, consumers	Positive (many FFS have been established, especially in cocoa producing zones of the country as well as livestock zones in the

	livestock production	researchers, extensionists, village heads	and cost-effective production techniques. Misuse of agrochemical products			Northwest Region. In these FFS, stakeholders have learnt how to ferment the beans, pesticide safety measures and rural agribusiness.
Voluntary insurance for the informal sector, especially farmers	Crop production and livestock production	Farmers, agri-entrepreneurs, government (it established a decree on August 13, 2014, providing an opportunity for those in the informal sector to receive a pension.	At first only civil servants and other formal sectors benefitted from this service.	National	Farmers or producers, rural agro-entrepreneurs	Potential (established in 2014 and started registration in 2015 – no one has benefitted yet to testify. However, many in the informal sector praised the step taken by the government)
Programme for the Improvement of Competitiveness of Family Agropastoral Farms (ACEFA) Grants	Crop production and livestock production	Farmers, rural or peri-urban agro-entrepreneurs, non-governmental grganizations (NGO), extensionists	Farmers in the rural area complained that they do not have start-up capital for their agro-business ideas or concepts. Need to support mainly development projects in agriculture.	National with focus on rural and peri-urban areas	Farmers or producers, consumers, the government	Positive (many grants have been awarded all over the country to support projects in the areas of maize production, plantain production and processing, livestock rearing, inland fishing, cassava production and processing)
Support Programme for the Renovation and Development of Vocational Training in Agricutulture, Livestock & Fisheries (AFOP)	Crop production and livestock and	Farmers or producers, youth groups, agro-entrepreneurs, extensionists, government (finances AFOP	Many unemployed youths. Most graduates or youths are only interested in the civil service. Few interested in agriculture had no formal training in agri-entrepreneurship and	National	Youths and youth groups interested in agribusiness or in crop/livestock production	Positive (through the C2D-AFOP, many youths have been trained in agric schools. Upon graduation and defense of their projects, the youths have been supported financial and technically. An example is a

	fisheries production	using funds of the Contract for Debt Relief & Development (C2D) between Cameroon and France.	do not have the start-up capital. At first, the government only focused on training.			female youth (Aimee Francoise Manga) who after training and financial support now owns a 6Ha cocoa farm.
Tractor assembly and support to farmers' groups, agric schools or colleges and research institutes	Crop production	Farmers, extensionists	Tilling of soil very tedious when carried out using hoes or other manual methods.	National	Farmers or producers, marketers, agric research institutes, agric schools/colleges or faculties, the government, the consumers, agro-industrial plantations	Positive (although many individual farmers are still to benefit from this service, related government institutions (e.g., research, universities), some non-governmental organizations and agro-industrial plantations have benefitted.
Food crop production centres or zones	Crop production	Farmers or producers, extensionists, micro-finance experts, engineers, technicians, government	Food crops are more costly in some rural areas compared to cities such as Douala and Yaounde. The need to have centres within each region that will help fight against food insecurity in the rural areas. The centres will include warehouses for inputs, tools, means of drying, warehouses for storage, means of transformation, a loan and savings scheme, and a marketing aspect for the farmers.	National	Farmers or producers, marketers, the government, consumers	Potential (good concept still to be demonstrated)

Library to help the farmers boost production	Crop production	Farmers, NGOs, researchers, information and communication experts	Those farmers who can read do not have access to technical information or cannot afford.	National	Farmers, anyone in the rural communities especially students, extension workers, school teachers	Positive (existing already in some communities. Some of the libraries even have videos or CD-Roms on agric related issues.
Dissemination of information on best practices for animal and crop production and processing, as well as other pertinent research issues	Crop and animal production and processing	Crop and animal production farmers, researchers, agric extension officers, print media journalists, print media marketers.				Positive (for over 20 years, the farmers voice magazine has been publishing technical information on best practices for crop and animal production. It has also been releasing market prices and existing or potential innovations. A recent magazine, AgroDigest, has been focusing on simplifying and disseminating agric research results and their potential applications)

(g) Non-Conventional Livestock Rearing

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Rearing of quails and marketing of their eggs	Livestock production		Livestock producers, feed suppliers, extension officers, veterinary doctors	Quail eggs found to have medicinal uses; its cholesterol-free egg has theurapeutic properties.	National (common in all regions except the northern ones)	Farmers or producers, marketers, feed suppliers, fish farmers, consumers	Positive (many people are rearing quails now even though not on a very large scale. Some fish farmers are using the high-protein quail droppings to feed their fish. Some attempting to produce biogas from the droppings.
Cultivation and	Algae production	Biotechnological	Farmers or producers,	Spirulina found to be a green alga which is		Farmers or producers,	Potential (only heavily cultivated by one NGO and

marketing of spirulina			NGOs, processors, researchers	rich in protein, calcium, iron, Beta-carotene, Vitamin B12, Vitamin K. It is a nutritional supplement for the prevention and treatment of certain diseases. Also important in the cosmetic industry.	Centre Region (heavily cultivated by Association of Volunteers for Development in Cameroon, Yaounde)	processors, marketers, consumers, cosmetic industries.	many people are not aware of its cultivation, processing, and economic as well as nutritional or medicinal uses. However, for now, it is sold in dried, capsules, tablet and powder forms)
Snail rearing and marketing	Livestock production	Biotechnological	Farmers or producers, marketers, extension officers, researchers	High rate of consumption of snails and now very expensive. At first, all the snails were collected from the wild. Medicinal importance of snails emphasized and therefore high as well as ready market. Just to venture into something new	National (very common in the forest zones of the country).	Farmers or producers, marketers, consumers	Positive (the rate of rearing, marketing and consumption of snails has increased tremendously over the years. 18L bucket of snails costs up to 10,000FCFA in the dry season
Rearing of guinea pigs							Potential
Rearing and marketing of cane rats or grass cutters.	Livestock production	Biotechnological	Farmers or producers, marketers, extension officers, researchers	High consumption of grass cutters or cane rats, short supply of cane rats in the wild due to bush fires, hunting, cutting	Southwest, Northwest and Littoral Regions	Farmers or producers, marketers, consumers	Potential (very few farmers rearing cane rats and at a very small scale. However, many people like eating this meat)

				down of forests and bushes to farm lands			
Mush room cultivation using oil palm bunch residue (bunch whose oil and kernels have been extracted)	Crop production	Biotechnological	Farmers or producers, marketers, extension officers, researchers	Mushrooms are rich in minerals and proteins. Large quantities of edible mushrooms are scarce. Bio-resource for the cultivation is available and cheap in the oil palm production zones. Market demand for mushrooms. Cheaper and profitable production methods.	National	Farmers or producers, marketers, consumers	Positive (there are farmers with very large cultivation chambers, and these cultivated mushrooms can be found in the market)

(f) Market Improvement

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Women working in groups to market their cassava products e.g., garri, vegetables, and maize	Crop production and access to markets	Information	Farmers or producers, NGOs, extension officers, researchers, consumers	Previously, women worked in isolation, taking their products individually to the market.	National	Farmers or producers, marketers, consumers	Positive (most female cassava producers now work in groups – making and selling larger batches of their products. A few take the products to the market – saving time and making them more productive. They now sell in bulk to serve wholesalers who need large quantities at a time. Working in groups has stabilized their prices and prevented them from dubious middle persons.

Market Information System (MIS) – publication of market information	Access to market	Informational	Farmers or producers, bulk buyers, media (print & audio), extension officers, NGOs and some international organizations	Previously farmers did not know the prices of their products in the different regions. Similarly, bulk buyers did not know different areas where products are much and relatively cheaper. It was also difficult to link farmers and buyers.	National	Producers, bulk buyers, transporters, print media, local government (councils)	Positive (it has greatly linked farmers to buyers and therefore increasing income for the producers. Most farmers do not have to travel long distances to sell as the buyers buy at the farm gates. Most people buy the Farmers Voice Magazine to get the market information.
Organized cocoa markets	Crop production and access to markets	Informational	Producers, bulk buyers,	Previous producers worked and sold in a scattered manner and were exploited by middle men who bought at very low prices and then sold at very high prices.	Some Cocoa producing areas of Southwest e.g. Tombel Sub-Division	Producers, local government, bulk buyers	Positive (producers have specific days to sell their products and they do so with the same prices. This is also gives opportunity for quality of their products to be checked by the extension officers)

(g) Agic Shows, Open & Field Days

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Organization of agric shows, open and field days. Organized mainly by the Ministry of Agriculture & Rural Development, IRAD, and some international NGOs or organizations such as GIZ, IITA, ICRAF, AVRDC-World Vegetable Centre	Crop and animal production		Farmers or producers, agric officials, agric research institutes (national and international), media, consumers, politicians, government representatives	Previously it was difficult for people of different regions or different parts of the country to know what other farmers and agro-entrepreneurs are doing. Traders do not also know specific areas where they could get specific products. Farmers do not also know specific areas or persons where they could sell in bulk.	National (at certain time intervals, national agric shows are organized by the government in which the president of the country is fully involved. In the different regions, MINADER organizes regional agric shows. From time to time or as need arises, local and international organizations organize field days or open days	Farmers or producers, agro-entrepreneurs, marketers, media, local government or councils, Ministry of Agriculture, consumers, telecommunication companies	Positive (many livelihoods have been improved in the rural and peri-urban areas of the country. Producers are now exposed to bulk buyers from all over the regions or country. Awards given during such shows, have helped many farmers to produce more and increase income. Many agro-entrepreneurs especially on transformation of food crops have benefitted from financial and material support.)

(h) Seed Production, Processing/Packaging, and Marketing

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Rapid multiplication of plantain using macro-propagation (the PIF technique)	Crop production	Biotechnological	Farmers, researchers, agric extension officers	At first it was very difficult for plantain farmers to get plantain planting materials that are pest-free in large quantities, potable and available in a short period of time.	National, especially in all the seven regions where plantains are cultivated	Farmers or producers, seed producers, marketers	Positive (a relatively simple technique that is been used by all interested persons even in the rural areas. Thousands and even millions of plantain plantlets can be gotten in 3 months and easily transported to areas where there are just foot paths. PIF plantlets are gradually replacing the old traditional sucker planting materials that are usually infested with nematodes and borers. PIF planting materials are even well packaged and sent to neighbouring countries like Nigeria, Gabon, Congo, Central African Republic
Rapid multiplication of plantains/bananas using micro-propagation or tissue culture techniques	Crop production	Biotechnological	Farmers, agro-industrial plantations, researchers, agric extension officers	At first, it was very difficult for plantain farmers to get plantain planting materials that are pest-free, in large quantities, potable and available in a short period of time.	National (but technique produced only by experts from IRAD and CARBAP)	Farmers or producers, seed producers, marketers, research institutions, agro-industrial plantations.	Potential (for banana plantations that are already using tissue culture plantlets). Potential (for plantain producers as research is still to prove that it can actually be meeting the demands of supplying planting materials continuously)

Vegetative propagation of cocoa using techniques such as seeding, cutting, marcotting, tissue culture and grafting	Crop production	Agronomic	Farmers, researchers, agric extension officers	At first, without these techniques, cocoa trees took longer periods before start producing pods and beans.	National	Farmers or producers, marketers, consumers	Positive (most farmers in cocoa producing zones are buying large quantities of improved cocoa seedlings mainly from vegetative propagation)
Multiplying, packaging and marketing of seeds of Traditional African Vegetables (TAVs)	Crop production	Biological	Vegetable farmers, seed producers, agrochemical retailers, researchers, agric extension officers	Inadequate seeds of TAVs in the market. The few available are not well packaged. Those in agro-chemical stores are mainly imported and most often when sowed they do not germinate.	Some regions of the country	Farmers, seed producers, agro-chemical retailers	Potential (multiplying and packaging of TAVs still at the research level.)
Rapid multiplication of coco yams							Potential
Rapid multiplication of solanum potatoes							

(i) Organization of stakeholders within value chains

Name	Domain	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Formation of associations or groups (e.g., Common Initiative Groups – CIGs and cooperatives	Crop and animal production	Farmers, livestock rearers, marketers, agric extension officers	Formerly, stakeholders, especially farmers, were not organized and therefore were easily cheated or exploited by some middle men. Also, individually, they could not easily sell to bulk buyers or these buyers dictated the prices for them	National (every part of the country, there are CIGs and cooperatives which the government encouraged and is supporting technically and financially.	The farmers or other stakeholders in the value chain, e.g., marketers. Also, the government, bulk buyers, and even local councils.	Positive (many stakeholders especially producers in the value chains are now in groups or associations. Most are interested in producing together, fixing their prices, and linking to bulk buyers with little or no middle men interference.

(j) Mutual Health Organizations

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Health organizations that benefit farmers and other stakeholders	Crop production, livestock production		Farmers, marketers, transporters, microfinance organizations, ministry of health, non-governmental organizations	Individually, hospital or clinic bills are usually very high for the average Cameroonian, especially those at the rural and peri-urban areas	National	Those farmers in the rural and peri-urban areas. Hospitals/clinics or health centres, banks or micro-finance institutions	Positive (many registered members or individuals contribute some amount of money annually and they or their family benefits twice per year as the

							MHO pays at least 70% of their hospital bills.)

(k) Irrigation

Name	Domain	Type/Nature	Stakeholders Involved	Drivers/triggers	Scale	Beneficiaries	Effects
Rural irrigation scheme	Crop and livestock production	Technological	Farmers, technologists, engineers, agric extension officers,	Farmers could not produce much garden vegetables, especially tomatoes during the dry season.	Some parts of Northwest and South west Regions.	Rural farmers of vegetables, marketers, consumers, local council, farmers' organizations such as NOWEFOR	Positive (especially in the Northwest Region where in NOWEFOR helped to supply water to over 100 farmers in a 10km area. Farmers now produce much vegetables during the off-season. A bore hole is used as the source of water and supplies over 5Ha of land).
Creation of water channels within marshy areas to supply water to planting bags							
Use of polyethylene embedded in dug holes to capture and store water							Potential