



RESEARCH
PROGRAM ON
Integrated Systems
for the Humid
Tropics



AVRDC
The World Vegetable Center



Humidtropics Program

Consultants' final report

A situational analysis of agricultural production and marketing, and natural resources management systems in the humid tropical zones of Cameroon

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Yaoundé, Cameroun

December 2014

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ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AGRI-STAT	Agricultural Statistics
AS	Action Site
APS	Agricultural Production Systems
AVRDC	World Vegetable Center
BUCREP	Bureau camerounais de recensement de la population
CDC	Cameroon Development Corporation
CEFAM	Centre de Formation de l'Administration Municipale
CFSVA	Analyse globale de la sécurité alimentaire de la Vulnérabilité
CIAT	Center for Tropical Agriculture
CIP	International Potato Center
COHERED	Council of Health Research for Development
CONAC	Commission Nationale Anti Corruption
DDADER	Divisional Delegation of Agriculture and Rural Development
EAFS	Extensive agroforestry systems
ECAM	Conditions de vie des populations et profil de pauvreté au Cameroun
EDS-MICS	Enquête démographique et de santé et à indicateur multiples (demographic and Health Survey)
EESI	Employment and informal sector survey
FEICOM	Fond spécial d'équipement et d'intervention intercommunale
FARA	Forum pour la Recherche Agricole en Afrique
FF	Family farms
FS	Field Site
HDI	Human Development Index
HEVECAM	Hévéa du Cameroun
HFZBR	Humid Forest Zone with Bimodal Rainfall

HFZMR:	Humid Forest Zone with Monomodal Rainfall
IAR4D	Integrated Agricultural Research for Development
ICIPE	International Centre of Insect Physiology and Ecology
IDOs	Intermediate Development Outcomes
IITA	International Institute of Tropical Agriculture
ILO	International Labour Organisation
ILRI	International Livestock Research Institute
INS	Institutes National des la statistique
IRAD	Institut de Recherche Agricole pour le Développement
IWMI	International Water Management Institute
MINEPAT	Ministere de l'Economie, de la Plannification et de l'Amenagement du Territoire
MINRESI	Ministère de la Recherche Scientifique et de l'Innovation
MINSANTE	Ministry of Public Health
MINADER	Ministère de l'Agriculture et du Développement Rural
MINSEC	Ministry of Secondary Education
MINPMEESA	Ministère des petites et moyennes entreprises, de l'économie sociale et de l'artisanat
NRM	Natural resource management
NTFPs	Non-Timber Forest Products
OECD	Organization for Economic Co-operation and Development
RAAIS	Rapid Appraisal of Agriculture Innovation Systems
RGPH	General Population and Housing Census
SA	Situation analyses
SDSR	Stratégie de Développement du Secteur Rural
SSA	Sub-Saharan Africa
TBS	Tableau de Bord Social
UNDP	United Nations Development Program
UNECA	United Nations Economic Commission for Africa

WFP	World Food Program
WUR	Wageningen University
TBS	Tableau de bord social sur la situation des enfants et des femmes au Cameroun
WHO	World Health Organisation

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EXECUTIVE SUMMARY

Humidtropics is a CGIAR Research Program led by IITA in partnership with CIAT, CIP, CIPE, IWMI, FARA, AVRDC, ILRI, ICRAF and WUR, in order to help poor farm families in tropical Africa, Asia and Americas to boost their income from integrated agricultural systems' intensification while preserving their land for future generations. In the Cameroon Action Site, the program is implemented in partnership with key actors of the environment and agricultural sectors. The situational analysis aims to provide a comprehensive overview of the national agricultural development system and its various political, social, economic and ecological components, highlighting the links, interactions and mechanisms that already exist or that are to be built or strengthened to improve sustainable living conditions and well-being of rural people. The information provided is based on a thorough analysis and capitalization of relevant official data from key institutional actors, national and international databases. Cameroon's Humidtropics Action Site cuts across 5 regions from which 13 divisions have been delineated and repartitioned into three Field Sites(s) (FS(s)) as:

- FS-1 : Lékié, Nyong et So'o, Mefou et Afamba and Mefou et Akono (Centre region)
- FS-2 : Fako and Meme (South West region); Moungo (Littoral region)
- FS-3: Menoua, Bamboutos and Haut-Nkam (West region); Momo, Mezam and Ngokentunjia (North West region)

The results of the situational analysis target 5 major aspects highlighting respectively: i) the characteristics and factors of human and rural development indicators; ii) the situation, efficiency and sustainability of production systems; iii) the situation of agricultural policies and markets; iv) the state of the art on the use and management of natural resources and environment; v) the challenges of sustainable agricultural development and sustainable management of natural resources and environment, taking into account the opportunities and constraints in the Action site. According to the relevance of data collected, each result is presented at one of the four following levels of analysis: Action Site; Region; Field Sites (FSs) and Division.

Starting with population, there are 21917602 inhabitants in Cameroon in 2015 with 49,6% of men and 50,4% of women and the annual growth rate of 2.5%. The projections suggest that in 2035, the growth rate will be at 2.1% and the population around 34000000 inhabitants. The **population density** is higher in the FSs ranging between 17.1 in the Centre region to 74.5 in the West region than the national value (16.4 inhabitants/km²). The majority of the population in the Humidtropics sites practice subsistence agriculture.

Examining **poverty and undernourishment** by social categorization, livestock breeders, natural resources exploiters and civil servants populations are more likely to eat acceptable diets (87%, 81%, and 80%

respectively) than farmers, daily job and petit trader's population (72%, 70%, and 76% respectively). **Income poverty** is still high with the average monthly income of the main job of the various members of the household being 124800 CFAF (250USD) in urban areas and 55600 CFAF (111USD) in rural areas.

The **health system** is comprised of the state sector and the private sector. With respect to **education**, school attendance rate is generally high in the FSs with very low repeat rates at primary school. As per **infrastructure**, the situation of some variables is somewhat worrying especially with regards to access to improve sanitation and good drinking water that were very low (35% and 27% respectively).

Migration is most common in FS 3 than in the other field site with migrants moving to the SW region to work in plantations or to Centre and Littoral in search of better livelihoods opportunities.

The national agricultural policies and strategies are voluntarist but still lack adequate, concrete and decisive actions to develop and scale-up innovations capable to bring sustainable agricultural and rural development. The **financial sector** is characterized by weak saving over liquidity of banks with only 14.4 credits account per 1000 inhabitants lower than the level for low-income countries and only 355 accounts per 1000 inhabitants contrary to 423 counterpart countries with the same level of development.

Agricultural markets especially for food crops and horticultural products, are largely small scale, disorganized and self-motivated. Since in Cameroon there is no clear delineation of agricultural market practically, structurally and institutionally, urban areas, food markets and public spaces like road sides are the main markets of agricultural products as per our definition.

Human development characteristics presented above constitute the framework within which production systems, environment and natural resources management systems are implemented by rural actors.

The production is insured by three types of producers: family farms (FF) structured around the family unit and each cropping less than 5 ha; the medium-sized agricultural enterprises that are more or less integrated to agro-industrial complexes; the agro-industrial companies specialized in cash crop.

Access to factors of production is variable. The current way to access to rural land by indigenes is inheritance in the Action Site although purchasing is becoming very common in FS 2 and 3. The acquisition of land through gifts is scarce and more on a temporal bases in unsaturated areas. Renting is also common especially in FS 3 for vegetable crop production. Agricultural capital is mostly mobilized by selling previous harvest and through thrief and loan. The manpower is sought on a temporary basis during peak periods of

work. But, permanent wage work is most often used in animal production in FS 3. Some small farms employ permanent workers especially in the cocoa sector. Access to water is through natural source.

The main production systems in the FS of Cameroon cover food crops, industrial crops, ornamental horticulture, fruits and vegetable crops, livestock and fish production.

Food crops are now playing an important role in the management, strategy and income of farms. Most traditional food crops have become the main cash crops due the increasing of urban demand and nowadays. They are progressively replacing industrial cash crops, in the FS with high density of population, or in the FS well connected to markets. **Maize, Plantain, Cassava** are the most important food crops in terms of quantities produced and consumed. Maize is produced within the whole Action Site, with high interest with 300 000 tons produced in West region and 130 000 tons in each of other regions. Cassava is mostly produced in Centre (1200 000 tons) and Southwest (431 000 tons/ha) and Littoral (311 000 tons) regions and is processed into “cassava sticks” (FS 1) and “gari” (FS 2 and 3). Plantain production is leading by the Centre region (832 200 tons), the Littoral region (428 000 tons) and the West region (205000 tons). **Irish potato, cocoyam, taro and yam** are highly appreciated and demanded but the production is low. **Rice** is among the most consumed food but local production is marginal (27 000 tons in the NorthWest and less than 10 000 tons in others). Looking at protein rich foods and nitrogen fixing crops, beans is mostly produced in West (131 000 tons; 1.45 t/ha) and Northwest (130 000 tons; 1.14 t/ha). Groundnut is the typical crop of women mostly produced in the action site (56 251 tons in Centre region and less than 8 000 tons in each of other regions). Soybean with an average of 2 tons/ha in all FSs is still in promotion as high protein source for children and high protein and energetic food for poultry production. Groundnut and Earthpea (Bambara groundnut) are marginally produced but well involved in traditional food systems. **The value of fruit production** (excluding bananas) are highest in Centre (24%) and Littoral region (21%) and secondarily in West (18%) and South West regions. Regarding vegetables, three Regions contribute for over 70% of the value of production: West region (30%), North and Centre regions (20% respectively). Tomato is produced mostly in West while Banana is mostly produced in Centre and Littoral. Pineapple is intensively produced in Centre region 87 000 tons; 46 tons/ha and Littoral (60 000 tons; 32 tons/ha).

Industrial cash crops are produced both by agribusinesses, private producers and family farms through intensive systems, extensive systems and extensive agroforestry systems. Cocoa and coffee involve over 600,000 farmers and activities related to these sectors benefit directly or indirectly about 6 million people. The robusta coffee is grown in FS2 while arabica coffee is in FS3. At the farm level, the coffee and cocoa

production systems are highly diversified with other commodities since CFAF devaluation and liberalization of coffee-cocoa sector. At the plot level, coffee is grown mostly as sole crop in FS2 or in association with other plants including trees in FS3. Cocoa is usually grown in extensive agroforestry systems (EAFS). In FS 1 and 2. The production of palm oil in Cameroon was 326,940 tons in 2010 for 112,430 ha cultivated mostly by agro industries and private producers. The rubber production in Cameroon has decreased to reach 56,000 tons in 2012, and still dominated by industrial plantations.

Animal farming in the Action Site regards mainly ruminants, pigs, poultry. Integration of cattle on farms is still marginal, as well as the practice of ranching (some ranch exist in FS 3). Intensive livestock systems are practiced mostly in urban and peri-urban. Cattle are much higher in upland areas such as West, Northwest, Southwest and in low pest pressure areas (especially in Field Site II and Field Site III). Small ruminants are encountered in the whole Action Site and reared in small numbers (1-5 heads) per farm. The rearing of pigs and poultry is practiced following extensive, semi intensive (providing concentrates) or intensive (modern farms located in urban and peri-urban) systems. The rearing of unconventional species emerges in suburban areas. Traditional farming is limited by diseases and epidemics.

Non-timber forest products (NTFPs) are part of the natural resources used by households in the Action Site. They are collected by almost all small rural producers of FS 1 and FS 2. However, they are not yet managed sustainably. **Indigenous people hunt and use bushmeat** for self-consumption or marketing with an estimated annual volume of bush meat in the humid zone of Cameroon is around 1233.26 tons. In 2011, the proportion of bushmeat biomass consumed varies from 34% to 63% while the remaining part is sold.

Regarding the management of natural resources and environment, it is worth noting that the annual rate of deforestation has increased from 0.6% for the period 1990 –1995 to 1% for the period 2000-2005. **The main contribution of agriculture to deforestation and degradation** of forest is through shifting cultivation, expansion of annual cash crops systems, increasing of industrial and private plantations, etc. This deforestation leads to low carbon storage. **Climate change** has become evidence in the action site. It modifies cropping calendar and the volume of rainfall and watercourse.

After analysing the characteristics of development, the production systems and environment and natural resource managements systems, it appears that **the major constraints to sustainable agricultural and rural development** include the following: strong pressure of parasites and disease; weak and ineffective national seed system; poor management of soil fertility; lack or low promotion of technics and systems of ecological intensification of agricultural production; low capacity of extension services and development

agencies supporting family farms; poor access to needed factors of production; poor access to inputs (fertilizers, improved seed) and to improved technologies; low technical and organizational capacities of actors of value chains; weak organization of value chains and markets; etc..

The following key points have been identified as potential entry points of the program:

- Enhance the seed systems and facilitate access of farmers to improved varieties of seeds
- Conceive, adapt and disseminate improved agricultural technics and innovative systems comprising crop-livestock integrated systems and agroforest systems, to insure sustainable management and conservation of forests and natural resources both in family farms and industrial farms
- Improve the management of diseases and pests as well as sanitary quality of food in intensive production of fruits and vegetables
- Improve access and good utilization/combination of both organic and chemicals inputs
- Facilitate access to credit and technologies for production of high opportunity crops
- Improve post-harvest technologies and practices to reduce products losses and improve quality
- Develop a rigorous assessment of mixed farming systems including the agroforestry systems in order to highlight the trade-offs between high ecological interest but low yields of these systems
- Develop adequate typology of farms that is accurate to support the sustainable intensification
- Develop adequate mechanisms to connect the different existing markets (local, national and transboundary) with diverse production systems and sites, in order to supply the high demand.
- Support the improvement of livestock systems and practices in rural areas including organization of livestock farmers and facilitation of their access to improved breeds, feed and veterinary products.
- Identify, conceive, adapt and disseminate sustainable urban and peri-urban production systems and develop mechanism to prevent, control and improve the sanitary quality of products.

To achieve these challenges, the Humidtropics program should in addition to classic research and on-farm research, conceive, implement and promote more innovative approaches of research such as action-research, integrated agricultural research for development (IAR4D), innovation platforms, etc.

At the time of this situational analysis four important **national surveys** were ongoing - The 2014 ECAM survey, 2014 Agricultural survey, the 2014 Food security and vulnerability survey. It is important that during the next two to three years the variables and indicators already developed should be completed and updated using results from these surveys. As well, further field exercises should be carried in specific contexts at early stage of implementation of Humidtropics program, to build specific indicators related to markets and their characteristics, and to agroforest systems and crop-livestock integrated systems.

I. INTRODUCTION

1.1 Background

The humid and subhumid tropics with 2.9 billion people on about 3 billion hectares of land are critical to global food supplies, essential for the maintenance of global biodiversity, and vital to the mitigation of greenhouse effects gasses. The intensification of agricultural systems in these areas offers the best potential for poverty alleviation, especially for women and other vulnerable groups, and helps meeting the increasing world food demand. Despite this huge potential, majority of the rural poor reside in these tropics which continue to be associated with poor household nutrition and soil fertility depletion. To critically address the later issues, CGIAR (Consultative Group for International Agricultural Research) has developed, together with partners, a Humitropics research program on Integrated Systems, which seeks to transform the lives of rural poor in the humid lowlands, moist savannas, and tropical highlands in tropical Americas, Asia and Africa. Humitropics program provide a new integrated agricultural systems approach, a single research-for-development plan, and a unique partnership platform for better impact on poverty and ecosystems integrity.

The program is being implemented by a partnership comprising the International Institute of Tropical Agriculture (IITA) as the leading organization, the International Center for Tropical Agriculture (CIAT), the International Potato Center (CIP), Biodiversity International, the International Water Management Institute (IWMI), the International Centre of Insect Physiology and Ecology (ICIPE), the Forum for Agricultural Research in Africa (FARA), the World Vegetable Center (AVRDC), and the Wageningen University (WUR).

Although referred to as a global program, the Humitropics is being implemented in specific agro-ecological locations made of target sites within larger geographical divisions called Action Areas. Cameroon is one of such action sites that falls under the West and Central Africa Action Area.

1.2. Situation Analysis

The main objective of the "situation analysis" were to give a panoramic view of the agricultural development systems and its components, while describing the interlinks and relationships existing between them in the Cameroon Action Site.

The specific objectives were to :

- Provide a broad overview of generic rural and human development characteristics of the households, infrastructure, and the institutional and policy context in which rural development is occurring.□
- Identify the stakeholders and institutions that are involved in the value chains of selected commodities
- Provide an overview of the agricultural production systems in terms of importance, structure, technology and productivity.

- Characterize the marketing system for these commodities at national and at the first administrative level below national
- Discuss the implications of the current production and marketing systems on natural resources and the environment.

II. METHODOLOGY

2.1. Intervention sites

The “Action Site” is located at the intersection of five administrative regions, which fall within three of Cameroon’s five agroecological zones namely, the Humid Forest Zone with Bimodal Rainfall Regime, the Humid Forest Zone with Monomodal Rainfall Regime and the Western Highland Zone (Figure 1).

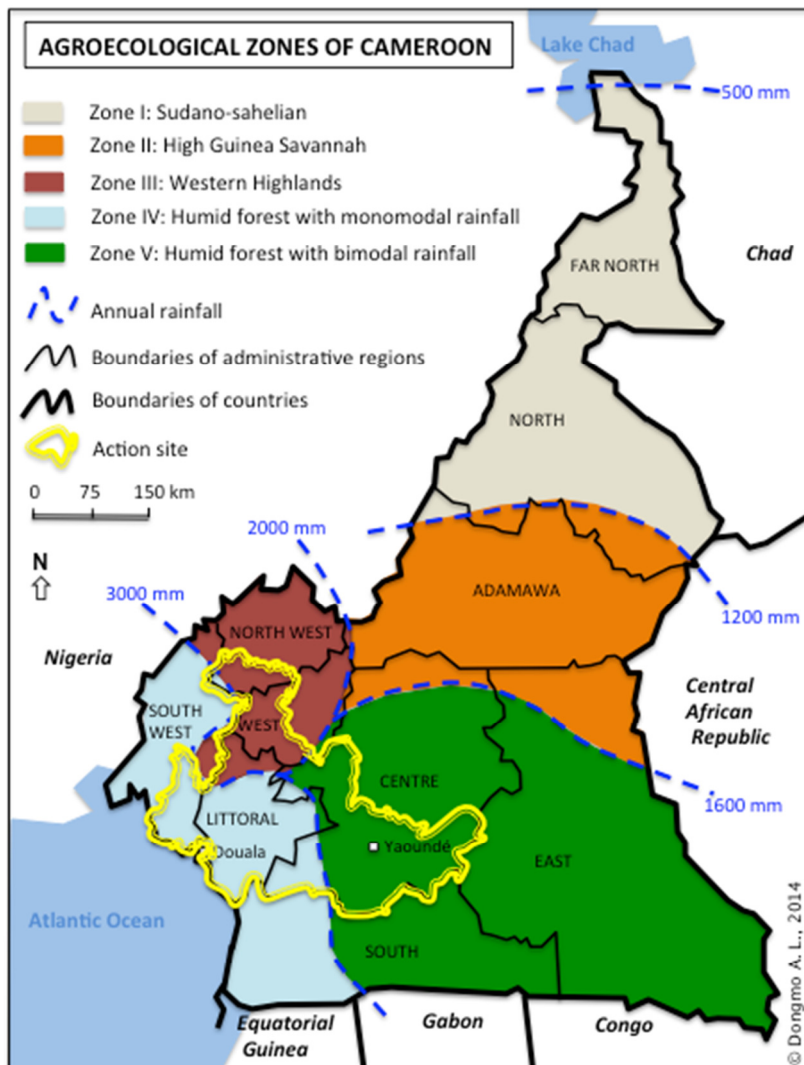


Figure 1: The Action Site within the agroecologic and administrative structure of Cameroon

From this Action Site (AS), 13 divisions are delineated and grouped into three Field Sites (FS):

- Field Site I (Centre region): Lekie, Mefou and Afamba; Mefou et Akono; Nyong et So'o
- Field Site II (South west and Littoral): Meme; Fako; Mounjo
- Field Site III (West and Northwest): Menoua; Bamboutos; Haut-Nkam; Momo; Mezam; Ngoketunjia

2.2 Data collection

The situational analysis relies on the compilation and synthesis of existing data, statistics, and reports collected from the main official sources at different complementary levels: local, divisional, regional, national and international.

The main providers of required data were services, institutes, projects and programs, as well as NGO in charge of agricultural and rural development, of management of natural resources and environment, of management of national and international database, etc.

Major national surveys that informed the design of variables and indicators and data collection were:

- Household conditions and poverty profile 2001, 2007 and 2011 (ECAM 1, 2 and 3)
- Comprehensive food security and vulnerability (CSFVA) 2007 and 2011
- Demographic and health study on multiple indicators (Enquête Démographique et de Santé et à Indicateurs Multiples (EDS-MICS)) 2011
- Employment and informal sector survey 2005 and 2010 (EESI and EES2).
- Population census in 1976, 1987 and 2005 (1^{ere}, 2^{eme} and 3^eRGPH (General Population and Housing Census)).
- Third edition on the situation of women and children in Cameroon (Troisieme edition du tableau de bord social sur la situation des enfants et des femmes au Cameroun (TBS 3))
- Statistical Year book for MINSEC, MINEDUC, MINDAFF and INS
- 2nd Survey on the monitoring of public expenditures and the level of recipients' satisfaction in the education and health sectors in Cameroon (PETS2)

The required secondary data were mainly collected from:

- Divisional and regional delegations of Ministry of Agriculture and Rural Development (MINADER), Ministry of Planning and Regional Development (MINEPAT), Ministry of Livestock, Fisheries and Animal Industries (MINEPIA); Ministry of Environment and Nature Protection (MINEPDED)
- National and international research and development organizations that include PNDP for council development plans, IRAD, IITA, ICRAF, FAO, WFP, IMF, INC, IRGM, BAD, OCDE, UNDP, WHO and the World Bank.
- National Institute of Statistics (INS) and Regional Centre of Demography and Development (IFORD)
- National and international agricultural database and relevant websides

In addition, primary data were collected through:

- Key informant interviews were held with opinion leaders and key stakeholders with knowledge regarding certain aspects where data was not available.
- A workshop held in Mbalmayo where select representatives and stakeholders were involved and were able to give their opinion on the items proposed.

2.3. Data analysis and presentation

Data for the three field sites were computed for all the indicators using percentages, averages and sums from regional and divisional level data. The regional level data was intended to inform the audience on the general situation in the region. Humidtropics Cameroon Field sites (FS) specific data was computed or extrapolated based on data from the divisional level because the FS were composed of a group of divisions.

At the divisional level, it was difficult to find some socioeconomic data for most of the variables and therefore for the FS. As such, in some cases, aggregates from council level data were used to first compose divisional level data and then FS data.

In so doing, the situation analysis was based on the following logic chain:

- Do a thorough analysis at the level of the 13 administrative divisions primarily concerned by the study;
- Complete and discuss the data of field site with those of other divisions under the Action Site
- Using data of regional level when they appear more relevant and likely to inform some indicators;
- Present the results and draw conclusions for the entire Action Site.

The presentation of each section or sub-section of results included at least 2 of the 4 following aspects according to their relevance and to avoid redundancies:

- Recent developments and current situation;
- Key issues and constraints;
- Issues and major challenges.
- Opportunities

III. DEVELOPMENT OVERVIEW

3.1. Population

3.1.1. Population density

The population of Cameroon has increased significantly between 1974 and 2015, resulting in very high population density in some Regions the country (Table 1, Table 2). During this time scale, the initial

population of the Regions involved in Humidtropics program was multiplied by 87.7 and only by 28.7 for other Regions of the country.

Table 1: Evolutionary trends of density of population in administrative regions of Humidtropics program

	1976	1987	2005	2009	2010	2012	2015
Cameroon	16.4	22.5	37.5	40.6	41.6	43.7	47.0
Centre	17.1	24.0	44.9	49.7	51.1	54.1	59.4
Southwest	24.4	33.0	51.8	53.6	54.5	56.2	60.4
Littoral	46.2	66.8	124.0	137.4	141.5	150.0	163.5
Northwest	56.7	71.5	99.9	102.8	104.3	107.2	112.8
West	74.5	96.4	123.8	126.7	128.5	132.1	137.3

Source: BUCREP, 2010. *Rapport de présentation des résultats définitifs, 3^{ème} RGPH, République du Cameroun.*

According to the third general population and housing census (RGPH) (BUCREP, 2010): the Cameroon's population was estimated at 17463836 inhabitants in 2005 (BUCREP, 2010).

Table 2: Area and evolutionary trends of the population of Cameroon and Regions

	Area (km2)	Population						
		1976	1987	2005	2009	2010	2012	2015
Cameroon	*466050	7663246	10493655	17463836	18927701	19406100	20386799	21917602
Humidtropics regions	145803	4748552	6419614	10373386	11110561	11365725	11885504	12799880
Centre	68953	1176743	1651600	3098044	3425914	3525664	3730784	4098592
Southwest	25410	620515	838042	1316079	1362795	1384286	1427076	1534232
Littoral	20248	935166	1352833	2510263	2782372	2865795	3037633	3309558
Northwest	17300	980531	1237348	1728953	1779204	1804695	1855199	1950667
West	13892	1035597	1339791	1720047	1760276	1785285	1834812	1906831
Other Regions	320247	2914694	4074041	7090450	7817140	8040375	8501295	9117722
East	109002	366235	517198	771755	794963	801968	815472	832869
South	47191	315202	373798	634655	681397	692142	713538	745198
Adamawa	63701	359334	495185	884289	984241	1015622	1080500	1183551
North	66090	479158	832165	1687959	1968481	2050229	2222161	2410936
Far North	34263	1394765	1855695	3111792	3388058	3480414	3669624	3945168

* The total area of Cameroon is 475,650 km2, of which 466,050 km2 of land area and 9,600 km2 of sea area
Source: BUCREP, 2010. *Rapport de présentation des résultats définitifs, 3^{ème} RGPH, République du Cameroun.*

Since then, many national strategy papers have reported this data with a lot of mixed results. For instance the total population as reported by the role of human capital (2013) as 20138637 inhabitants, INS (2010) as 19406100 inhabitants, ADB (2009) as 19100000 and Worldbank (2013) as 20000000 inhabitants. The expected population of Cameroon in 2015 is 21917602 (BUCREP, 2010).

3.1.2. Population structure

According to INS (2011a), the population structure by sex shows that men constitute 49,6% while women constitute 50,4% in 2010 (Table 3). Following the age structure, 43,7% of people are found between the age 0-14 years, 53,1% from 15-64 years and 3,3% are 65 years and above in 2010 (Table 4).

Table 3: Distribution of the population by age group and gender

	Average size of households	Average age	Gender (%)		Age groups (%)	
			Male	Female	10 years and above	65 years and above
EESI 1 (2005)	4.5	21.8	49.4	50.6	67.6	3.0
RGPH 3 (2005)	4.6	22.1	49.4	50.6	ND	3.4
ECAM 3 (2007)	4.4	21.9	49.0	51.0	69.4	3.5
EESI 2 (2010)	4.4	21.7	49.6	50.4	68.7	3.3

Source: INS (2006); BUCREP (2010); INS (2008); INS (2011a)

The region involved in Humidtropics program represents 58% of the national population in 2015 (Table 2). According to 2005 data, the Humidtropics Field Sites record a total population of 3332567 inhabitants making up 19% of the national population and 32% of the regional population of that period (Figure 2).

Table 4: Structure of population by age group according to location and gender (2010)

	Age groups					Proportion of 10 years and above
	0-5 years	6-14 years	15-64 years	+65 years	Total	
Administrative regions involved in Humidtropics program						
Littoral	16.5	21.7	57.3	4.5	100	72.5
Southwest	15.0	23.0	59.5	2.5	100	74.0
West	20.1	26.3	48.8	4.9	100	68.0
Northwest	16.7	27.5	49.8	6.0	100	72.5
South	16.8	20.5	58.7	4.1	100	74.2
Centre	19.6	24.1	50.6	5.8	100	69.1
Location						
Urban	17.0	20.4	60.7	2	100	74
Rural	21.7	25.9	48.3	4	100	65.4
Gender						
Male	20.7	24.8	51.5	3.0	100	67.1
Female	19.1	22.8	54.7	3.5	100	70.3
Whole country						
	19.9	23.8	53.1	3.3	100	68.7

Source: INS 2011a. Second survey of employment and the informal sector in Cameroon (EESI 2)

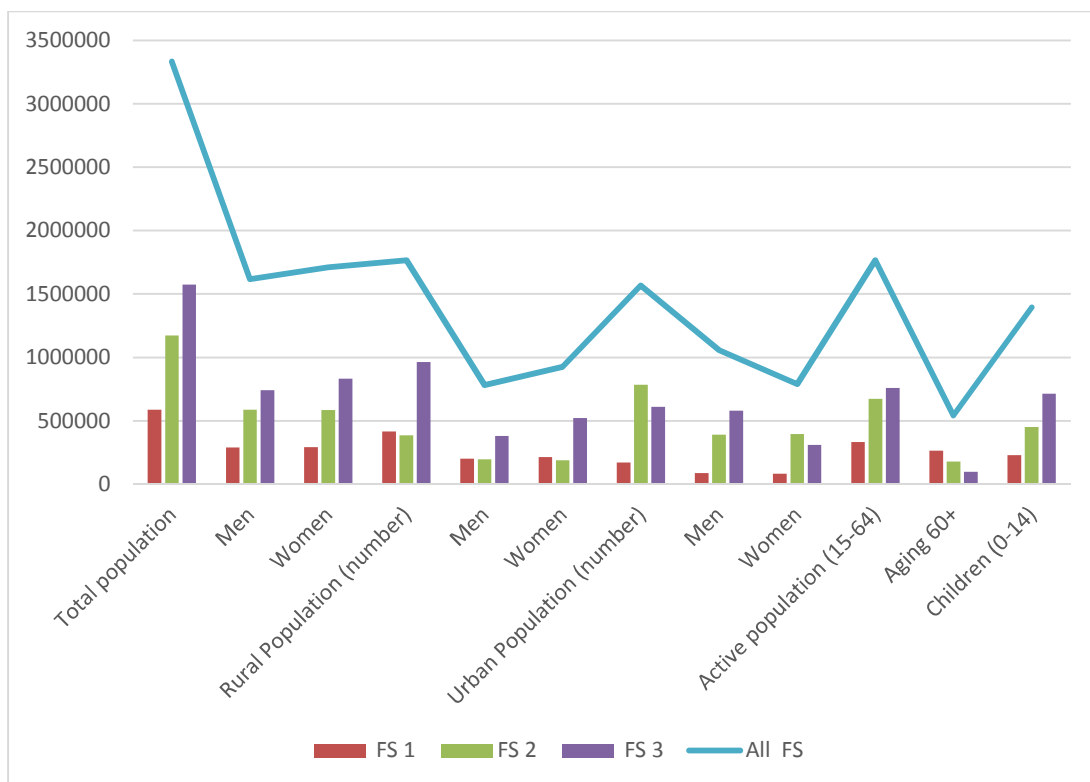


Figure 2: Population data of the Humidtropics Field sites. Source: Computed from BUCREP, 2010 (2005 RGPH data).

3.1.3 Trend in population growth

The average annual growth rate of the population was estimated in 2005 at 2.7% (Table 5). This growth rate is reducing slowly and everything being equal, the population of Cameroon will double itself by 2030 (MINEPAT, 2009).

Table 5: Trends in future population growth

From 1976 to 2009			From 2010 to 2035		
Date	Population	Average growth rate for the period	Date	Population	Average growth rate for the period
01/04/1976	7663246		01/01/2010	19406100	2.6
01/04/1981	8830288	2.9	01/01/2012	20386799	2.5
01/04/1987	10493655	2.9	01/01/2015	21917602	2.5
01/04/1992	12098891	2.9	01/01/2020	24628282	2.4
01/04/1997	13903307	2.8	01/01/2025	27538142	2.3
11/11/2005	17463836	2.7	01/01/2030	30647180	2.2
01/01/2009	18927701	2.7	01/01/2035	33955398	2.1

Source: BUCREP, 2010 (2005 RGPH data)

The annual population growth rate as well as urbanization rate varies among Regions (Table 6)

Table 6: Evolution of population growth rate from 1976 to 2005 and urbanization rate in 2005

Regions	Population growth rate (%)		Urbanisation rate (%)
	1976-1987	1987-2005	
Centre	3.1	3.4	71.9
Littoral	3.4	3.4	92.6
South-West	2.8	2.5	42.5
North –West	2.4	1.8	37.1
West	2.4	1.4	46.6
Cameroon	2.9	2.8	48.8
<i>Source : MINPROFF, 2012.</i>			

3.1.4. Challenges of population growth

In one hand, the population increase presents an opportunity for agricultural development through increase of food demand. In other hand, the population growth is also accompanied by a high rate of urbanization driven by rural exodus. Accordingly, the proportion of agricultural assets within the population is decreasing while the food demand of urban population is increasing.

There will be no proper solution without sustainable intensification of agriculture and development of post-harvest technologies. As well one major challenge of the national government is to design adequate infrastructural mechanisms to support agricultural development.

3.2. Employment opportunities

Labour and employment statistics in Cameroon are complex and vary depending on the source and purpose for which the data was generated. First the informal sector is big and in some cases it is difficult to draw a line between the formal and the informal sector (ESSI & 2). Agricultural employment which is largely informal is even more complex to capitalize and define. Although the unemployment rates are high and the measurement parameters vary depending on the methodology, according to the international labor organization (ILO), the unemployment rate in Cameroon was 3.8% in 2010. There is slight a drop as compared 4.4% observed in 2005. Women (4.5%) are more affected than men (3.1%). However, underemployment rate is very high and stands around 70.6% (MINPROF, 2013). According to ECAM 3 (INS, 2011c), 43.1% of employed active people are poor. Although poorly defined, the agricultural sector and the informal sector employs 92% of the active population compared to 8% in the public sector. In qualifying employment, variables were defined to look at gender repartitions, variations in different sectors, type and nature of jobs and age repartition (Figure 3).

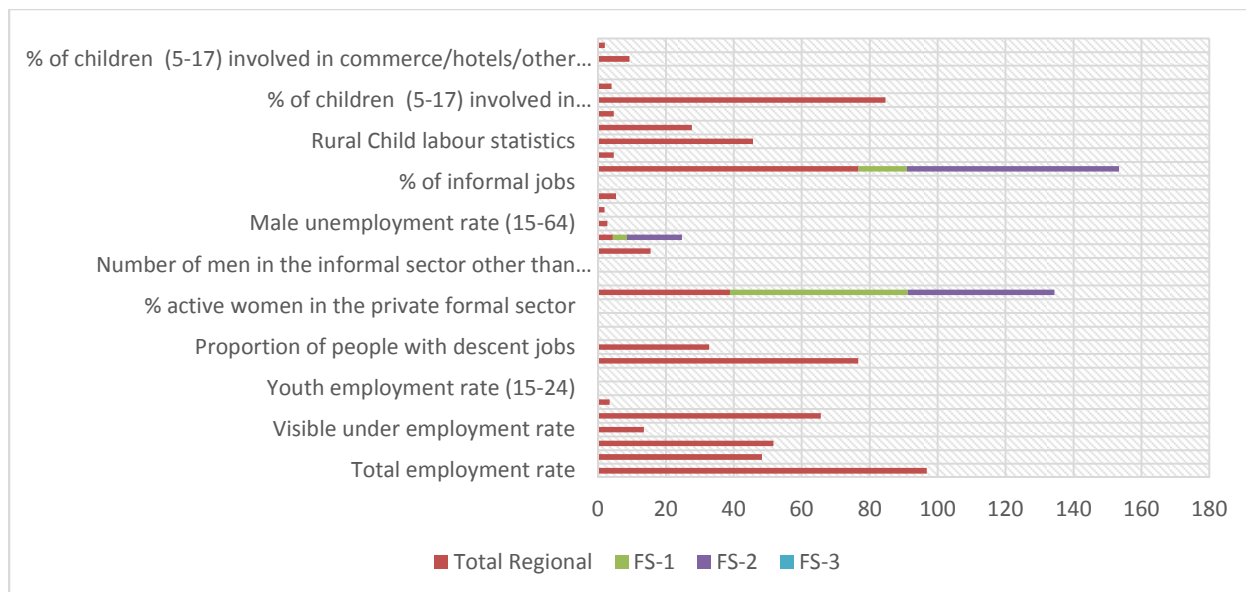


Figure 3: Employment statistics and variables

Source: INS, 2009 (TBS 3 data), DSCE-Projet, 2010, INS, 2008 (ECAM 3 Data)

The majority of the population in the Humidtropics sites practice subsistence agriculture for a living. In the NW and West regions, 80% and 90% respectively of the population are involved in agriculture although few of these households have large farm holding and few grow cash crops in these regions. MINADER (2012) of Agricstats No 17 report estimates that there are about 1.2 million smallholder farms, with total cultivated area per farm being between 1.5 and 2 hectares (first and second plantings seasons combined).

The indicator on employment in the agricultural sector could be evaluated using variables as the % of households in all sectors on agricultural productions activities excluding food processing and marketing. The involvement of poor and rich households in agriculture needs to be examined to investigate potential possibilities of investment in agricultural production and in developing the value chain. In this section, it would be important to start by bringing out a detail and clear definition for the informal and formal sector and how agriculture fits into these concepts. Then it would be necessary to characterize agricultural employment along the value chain and design tools to measure the employment variables at the level of divisions. The ministry of employment is also planning a large survey to capitalize employment sources and statistics in Cameroon during this year of 2014. Such an activity would help to inform some of these variables later.

3.3. Gender issues and factors

Under decree No 2011/408 of 9 December 2011 to organize the government of Cameroon, MINPROFF is responsible for the preparation and implementation of government measures relating to the promotion of women's rights and family protection. Through MINPROFF, statistics on gender and women has been designed through many national efforts as the MINPROFF, 2011 statistical year book which provide

information that can help assess, describe and analyze the situation of women in all fields in Cameroon as well as the situation of women and family. Prelude to this, special census has been carried out in the country since 2001 to evaluate the situation of women and children (TBS 1, 2 and 3) and the achievement of the Millennium Development Goals (MDG). Summarizing from all these reports, key issues arising on gender show that:

Looking at education, between 2010 and 2011, the enrolment rate of children 6 – 11 years was around 78% and there was a drop by two points for girls of this age (MINPROFF, 2013). During this period, secondary enrolment dropped from 49.3% to 45.9%. The national primary enrolment for boys (82.1%) is higher than that of girls (77.5%) but the SW and Littoral regions have slightly higher enrolment for girls (95% and 96.3%) than boys (93.9% and 93%). There is a marked significance in the ratio of female to male primary enrolment (86) which indicates that many more males are enrolled in primary school than girls. More boy children (79%) also had a net primary attendance than girls (65%) (MINPROFF, 2013). We mention in passing here that girl children are usually made to stay at home to tend their younger siblings than their boy children counterparts.

Between 2007/2008 and 2009/2010 school years, there was a growing number of girls in vocational training centers. It went from 1120 in 2007/2008 to 1540 in 2009/2010 that is a growth rate of 37.5%. The three specialties that attract girls in order of importance are Computer sciences, building and carpentry. They are less interested in mechanics. Generally, the most popular diplomas among women teachers in vocational training centers are equivalent to secondary and high school level certificate. According professional diplomas, the data of 2009/2010 show that, teachers of vocational training centers mostly had mid-level certificates. Women (4.5%) are more affected by unemployment than men 3.1. Since it is an urban reality, women living in urban areas are more affected than women living in rural area. In 2010 under employment rate stood at 70.6%. There is a drop by 5.2 points compared to the year 2005. Moreover, as in 2005, it remains higher among women than men as the rate declined by 5.6% point over the period 2005-2010 among women.

According to the 2009 general census of enterprises conducted across the country, nearly one third of business managers were women. The most concerned sub-sectors are, in descending order, other tertiary and trade where the proportions of women business promoters/managers are 38% and 29% respectively, on average, a company run by a man employs 5 persons as against 2 for a company run by a woman; this shows that businesses run by women are mostly small size businesses.

In analyzing information concerning youths who benefited from PAJRE-U support in 2007 and 2008 and the number of trainees supervised within the literacy programmed in 2009, the first indicator noted a considerable increase from 184 to 720 between 2007 and 2008. The number of women has increased fivefold between the two years (54 in 2007 and 236 in 2008). The total amount of support provided to women increased from 32108600F to 175596300F between 2007 and 2008. The analysis per regions reveals that in 2008 women from the West (49%) and the NW (30%) benefited most from PAJER-U

support. Generally speaking the number of learners admitted to the national literacy program in 2009 was 38554, that is, 14697 men and 23857 women. This significant representation of women in this programmed was observed in six regions of Cameroon. The west region had the highest number of learners (women and men), (9,012) and the highest number of women (7436).

On housing, in 2011, in all 15 to 49years old women, the proportion of those having a house with land title and those with land and land title is very low; that is respectively 2.7% and 2.8%. As far as female heads of households are concerned, 20.1% of them hold a land title in 2011. This percentage reflects a 4.1% improvement in the land ownership of women heads of households in 2011 as compared to 2010. With regard to house ownership, 68.2% of female headed households are homeowners in 2011. This proportion is higher in the North and Far-North (84.7%) and lowest in the regions of South-West (48.6%), center (55.6%) and littoral (58%).

Across the country, the proportion of female farm manager declined by 2%point between 2005 and 2010; it increased from 30.4% to 28.4% in 2010. Analysis by regions shows a very pronounced drop in the west regions, that is, 14 points. In 2010, the Far-North and Littoral regions had the lowest proportions of women farm managers; 12.2% and 13.5% respectively.

3.4 Health, nutrition and food security

3.4.1. Health and nutrition

The Cameroon's health system is comprised of two sectors; the state sector and the private sector. The state provides a greater share of the health services and is administratively managed by the ministry of health. However, other support or down line support state actors in the health sector include the ministries of higher education in charge of training of health staffs, and the ministry of scientific research and innovation in charge of health research. The ministry of health's operations at the central level is handled by its four departments which include: planning, surveys and statistics, and public health comprised of preventive medicine and public hygiene departments.

The Cameroon health policy was developed in cognizance of the WHO health objectives which principally aims to provide health services to cover fundamental needs. The nation's public health objectives include: balancing the geographical distribution of health infrastructure, ensuring better supplies of pharmaceutical products, preventing infant and child mortality rates, improving hospital and first aid capacities, and extension of health and nutrition training programs for women. We observed that little data on Cameroon health system exist at the national level. However, we were able to obtain Cameroon's health data mostly from WHO documents. As concerns health infrastructure and facilities, reference specialized hospitals are found in the capital cities of Yaoundé and Douala. Every regional capital city of the nation has a government regional hospital while district hospitals are found at the divisional capitals with health centers available in the sub-divisional rural communities.

Predominant reported diseases are mainly malaria, diarrhea, HIV and opportunistic diseases related to HIV like tuberculosis, and occasional cholera out breaks (INS, 2011d). Tuberculosis incidence/100,000 population/year is recorded at 170 and 190 in 2000 and 2008 respectively (INS, 2011d). However, data on HIV/AIDS is not publicly reported probably because the disease is still attached to taboos and associated stigma. This stigma in itself renders many patients unwilling to report their cases in the hospitals. Also, for confidentiality reasons, it would be difficult to obtain data that represents the total patient number and incidence in hospitals. HIV/AIDS mortality rate /100,000 populations is 240 (WHO, 2010). Its prevalence is higher among women (6.8%) than men (4.1%) in all regions of the nation and more among the 15-49 active age groups (COHRED, undated, INS and UNDP, 2008). HIV prevalence ratio of 1.7 between women and men is recorded nationally. Cameroon's HIV/AIDS prevalence is 5.1% (see Annex 1). This prevalence rate is higher than that for the continent which is 4.5% (Worldbank, 2013, INS, 2011d (EDS-MICS)). The most affected regions are NW, SW and center regions with prevalence of 11.9 and 5.2, 11 and 5.1, and 6.8 and 2.2 percentages for women and men respectively. Data also indicate the less educated and poorest quota of the population are less infected than the more educated and economically stable population. Data indicate malaria to be prevalent in about 50% of the national population on average with higher prevalence values of 61.3% observed in the Western region. Malaria incidence was most prevalent in the 0-14 age group (77%) compared to the 15-59 and 60+ age groups prevalence of 58% and 15% respectively (INS, 2011d). On average, annual national expenditure on health is estimated at 12774 FRS CFA. The percentage of women who receive prenatal care from skilled health personnel at the national level ranged from 63-84.7% at the national level. A higher percentage of women received prenatal care from skilled health personnel in the regional capitals than in the divisional capitals and the center region had the highest percentage of women who had access to skilled health personnel. The percentage average levels of satisfaction with health services ranged from 39.1% in the Littoral province to 55.5% in the NW Province. At the national level the level of satisfaction with health services was 46.9% (INS and UNDP, 2008). Average national distance to the nearest health center is 5.6km. Littoral region had the shortest distance of 4.2 while the Center region had the furthest distance to the nearest hospital which is 7.9km (Annex 4).

Both male and female life expectancy at birth is 53 years. The HIV/AIDS pandemic has however reduced the life expectancy to about 49 years. The most sexually active age bracket between 15 years and 49 years is the most affected by the HIV pandemic. This is a big challenge most especially in the agricultural communities where this age group makes up the bulk of the active population involved in agricultural activities. The maternal mortality ratio/100,000 live birth ranges from 600-690 (INS, 2008, WHO, 2010). National adult mortality rate per 1000 is recorded at 400. National annual morbidity rate is 25.4% and the West region has the highest morbidity rate of 30.9%. The national under-five mortality/1000 ranges from 127-154 while the infant mortality rate/1000 is about 95. The main causes of under-five mortality include malaria (19%), Pneumonia (18%), diarrhea (16%), and HIV/AIDS (5%) (INS, 2011d). These statistics on the number of hospitals at the level of the field sites was computed from council development plans.

Despite all political efforts put in place by the government to alleviate food insecurity and malnutrition, the country is still confronted by malnutrition issues especially the under-five vulnerable group. Malnutrition resulting from unbalanced and insufficient diets in proteins, carbohydrates and vitamins often translates to retarded growth and infectious related diseases. Records of under-five children at the national level show that 30.4% are affected by chronic moderate malnutrition while, 12.6% (INS and UNDP, 2008, INS 2011, WFP et al., 2011) of these children are severely affected. Malnutrition rates of under-five children are higher in the rural areas (38.1%) than in the urban areas (20.5%) (WFP and MINADER, 2007, WFP et al., 2011). The number of children affected by retarded growth varies from 7.3% in urban areas to 16.7% in rural areas. The cities of Douala and Yaoundé record 4.1% retarded growth.

Looking at the Humidtropics sites, it is observed that the SW region and the NW regions are the most affected by retarded malnutrition/retarded growth with levels of 35.9% and 14.6%, and 33.4% and 14.8% for moderate and severe malnutrition for the SW and NW regions respectively. It is worth noting that although the North region is not a site of the Humidtropics, the highest moderate chronic and severe malnutrition in the nation is predominantly in this region with levels of 43.3% and 21.5% respectively (Figure 4).

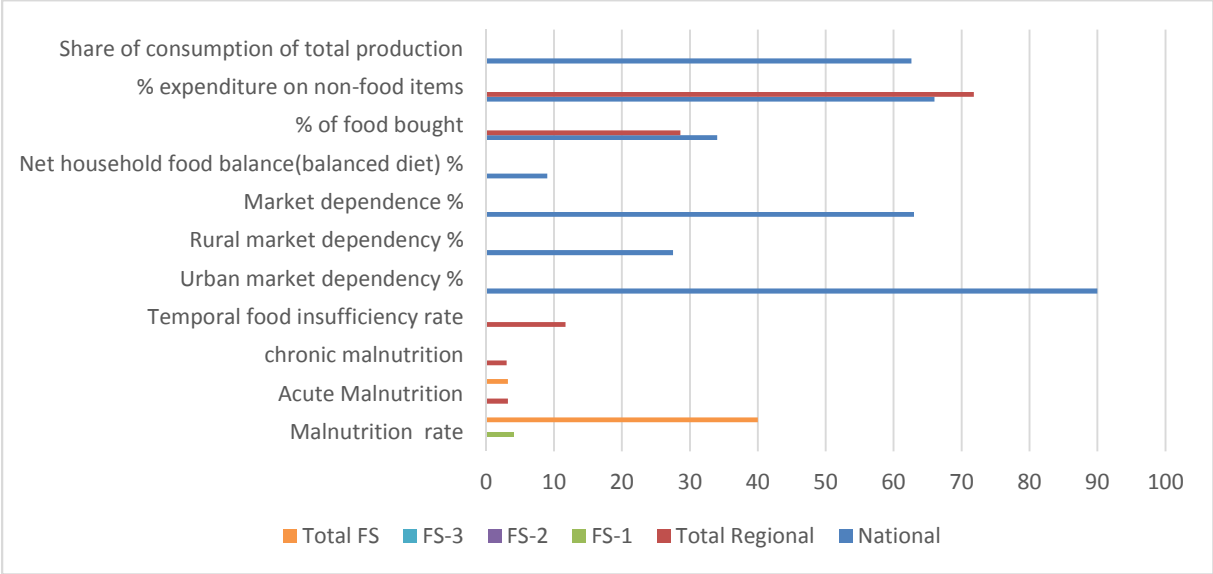


Figure 4: Dietary practices.

Source : WFP and MINADER 2007, World Bank 2011 and INS, 2008

3.4.2. Poverty and food security

According to ECAM 3 (INS, 2008) a household is poor when the adult equivalent of income of the household is less than 738 FCFA per day or 22,454 FCFA per month (a threshold based on prices in Yaoundé). The main indicators used in measuring poverty - poverty incidence or poverty rate which is the ratio between poverty line and average household expenditure, the depth of poverty or poverty gap which measures the difference between the poverty line and the average household expenditure. The severity of poverty and poverty line are measured in Cameroon at the national and regional level disaggregating between gender, sector of activity, educational level, household size, location etc. On the socio-economic plan, the incidence of poverty decreases with the educational level of the family. The annual consumption expenditure per household measured in adult equivalent stands at 1.44 millions FCFA; meaning 439787FCFA per adult equivalent per year. There are high disparities in adult equivalent in budget consumption between regions, urban and rural areas and between gender. Other aspects of poverty are illustrated using variable on education, health, gender, nutrition and employment.

MINEPAT and UNDP (2013) reports that looking at the various categories of the population, farmers constitute 22% of households with 93.5% living in rural areas. They buy 57% of the food they consume in their households and 34% if from their production and the rest from gifts. Their household expenditure level is low at <12000 CFA. Private sector employers constitute 12.5% of households with 86.4% in urban areas and high dependence on markets 93%. Average expenditure stands at 30000FCFA/person/month. On their part, traders make up 7% of households with 72.9% in urban areas. 89% of food is bought with an average expenditure per household member per month at 24000 FCFA. Public sector employers constitutes 10.4% and 76.7% being urban. They highly depend on markets for food products as they buy 92% of their food and spend >30000FCFA per person per month. Petty jobs like drivers constitute 9.8% of households with 72.6% in urban areas and spend about 18700F/person/month. Small traders make up 7.3% of households and 73.2% in urban areas. They depend on the market at 88%.

The growth of the agricultural and rural sector could constitute the motor of growth in Cameroon and in attaining food security. The main policy tool that is used in the promotion of this sector is the rural development strategy document of 2006. It is estimated that food needs will double by 2015 in Cameroon and there is a need to modernize the production capacity in major agricultural sectors. Also the 2035 vision intends to shift the agricultural production system to the second generation agriculture. Generally, the sites selected for the Humidtropics activities in Cameroon are the most favorable in terms of climatic conditions and food availability at the local level and therefore less poor compared to the rest of the country. Thus most if not all indicators on poverty and food security are supposed to show a better trend compared to the national data (Annex 2).

Rural communities depend mostly on starchy food type for energy source especially because they expend physical energy to work in the fields.

Households with acceptable balanced diets eat varied diets that include all the food nutrients, mainly carbohydrates in the form of cereals and tubers accompanied by proteins while incorporating legumes and vegetables including milk products at least 2-5 days of the week. About 74% of the national population on average eats acceptable balanced food. The region with the most acceptable diets eaten by the population is the SW region with 76% followed by the West Region with 74%. The NW region has the lowest acceptable diets (59%) among the benchmark regions. NW region also has the highest population (18%) of individuals who feed on poor diets followed by the Center region (17%).

Livestock breeders, natural resources exploiters and civil servants populations are more likely to eat acceptable diets (87%, 81%, and 80% respectively) than farmers, daily job and petty trader's population (72%, 70%, and 76% respectively). These later groups have small revenue and earnings which are hardly stable and this puts them in very vulnerable and food insecure positions. Well-being index also affect the level of balanced food consumption. The higher the level of income and well-being of the population, the higher the level of acceptable food consumption by the population. About 34% on average of total revenue is used to purchase food in Cameroon households while 66% is used for non-food expenditure. NW, West and SW rural communities spend a higher portion of revenue (32%, 31%, and 30% respectively) on food than the Littoral (26%) and Center Region (24%). Cereals, legumes, vegetables, fruits, meat/fish, sugar, milk, oil are the diverse dietary varieties consumed in all benchmark sites. Globally data was available for national and regional level but not for divisional level.

The food security apparel is principally based on production, which focuses to increase food quantity at the local level. However, food quality is becoming an even parameter wherein food security definition now incorporates the aspect of nutrition following the evaluation on the state of undernourishment in the world in 2012. Thus, there is need to refocus the food production system to adequately consider this aspect at all levels of food security indicators. Processing is still very limited with major processing industry being the beer industry. This is a major weakness in the food security policy in Cameroon.

3.5. Education and literacy

Education was the largest and most complex variable with indicators that were largely informed even at the lower administrative level like the divisions and councils (Annex 3). The number of schools depends on the number of councils present in the field sites. FS-3 has the most council, and as such has many schools compared to the other sites. Comparatively, the classroom/pupil ratio and the desk/pupil ratio is also higher for FS 3 than the other field sites. This indicated that the number of schools still do not meet the needs of the population in this area. School attendance rate is generally high in the FS with very low repeat rates at primary school.

The percentage of school enrolment is higher in the urban areas than in the rural areas with pupil teacher ratio higher in the rural communities than in the urban areas. Higher pupil teacher ratio in the rural communities translates in poorer quality of education granted in the rural communities. Lack of sufficient

teaching staff in rural areas is because most teachers prefer living in the urban locations than in the rural communities and usually abandon their duty post or sort to be transferred from the rural communities to urban cities. The pupil teacher ratio for the FS sites ranges from 32-50 pupils/teacher. Primary enrolment rates for Cameroon range from 51.5% in the Extreme North Region to 95.8% in the South region. The national average primary enrolment is 79.8%. The national primary enrolment rates is lower than that of all the bench mark regional sites. The primary enrolment rates for the Centre, SW, Littoral, NW and West regions are 95.5%, 94.4%, 94.6%, 91.3%, 95.5% respectively. The primary enrolment is representative of the 6-14 years age group.

Also primary enrolment increased nationwide ever since primary education was decreed for Cameroon nationals as a target to meet the MDGs declaration in 2005. On average national expenditure on education per house hold in benchmark sites is 4.7%. An equivalent average of 47,490 FRS is spent annually per child on education. The SW region spends the highest amount (48,582 FRS), per child annually on education while the Center region spends the least 32360FRS. However, the NW and West regions spend the greatest share of income (5.2% each) in education compared to the Center and Littoral regions that each spend 4.3% and the SW region that spends 5% of revenue on education.

The average distance to nearest primary school is between 1.2Km in the West and NW region to 1.7 Km in the Center region. Gender disparity in basic education has not really improved since the 1990s. The disparity gap is wider as we move up the educational ladder in the Cameroon educational system. This further translates to gender disparity in professional careers and the political arena. Secondary school enrolment rates are lower than for the primary level and equally follow the same trend of more boys' enrolment than the girls (figure 8).

Limited data is available for university enrolment rates. However, the center and West regions have university enrolment rates of 86% and 95.2%. Adult education completion rates range from 72.6% to 89.2% for the NW and Center regions respectively. Higher figures for completion rates for the Center region can be explained by the fact that the region houses the capital city; therefore, the population is exposed to many more development and training activities than the other regions. Significant differences in educational achievements in Cameroon are reported. Less completion rates are observed in the rural areas than the urban areas. The West and NW regions record higher primary completion rates of 98% each than the rest of the benchmark regions but have the lowest rural completion rates. The west region also had the highest repeats rate of 13.8% while the SW region has the least which is 6.9%. In 2010, the rate of school dropout stood at 7.4% nationally with higher percentage for the west and Littoral regions (16.3%)

The literacy rate of the younger generation especially for children between 6-14yeras is higher than that of adults (Figure 5). The literacy rate of children 6-14 years ranges from 83.8- 97.6%, while that of adult ranges from 72.6 in the NW region to 89.2 in the Center region. Adult literacy rates are also affected by the location of the populations. Adult literacy rates for urban areas are higher than that of its rural counterparts.

National adult literacy rate for urban areas is 89.1% while that of rural areas is 58.9. Literacy rate of men is also higher than that of females in field sites (Figure 5).

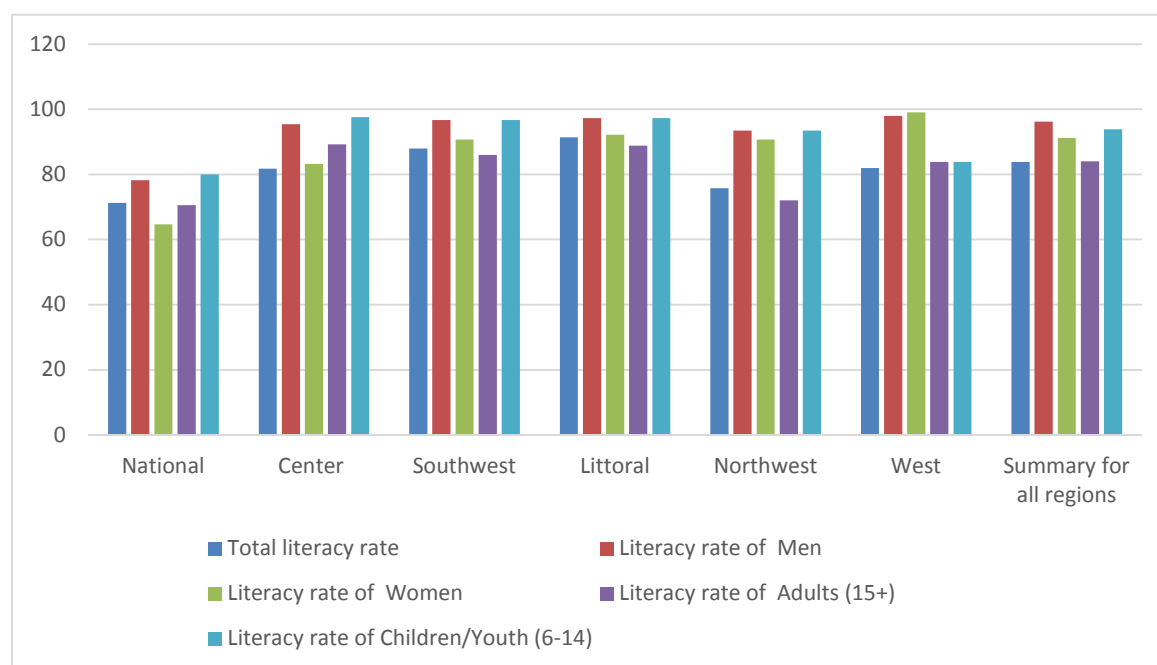


Figure 5: Literacy rate

3.6. Wealth and incomes

Locally, the average monthly income of the main job of the various members of the household is 83700 CFAF at national level, 124,800 CFAF in urban areas and 55,600 CFAF in rural areas.

Table 7: Monthly income from main job, and distribution (in %) of income from employment by group and by institutional sector and area of residence (year 2010)

	Sector of main job					Location		Whole
	Civil service	Public company	Formal Private	Informal private	Family Agriculture	Urban	Rural	
Average income (CFAF)								
Monthly	145400	142200	129300	50500	13800	70400	23400	39400
Hourly	1 069.0	755.3	632.8	295.6	111.9	412.8	169.7	252.3
Income Class (CFAF)								
(0-28500)	12.0	10.0	12.4	46.9	84.0	38.1	76.2	63.2
(28500-47000)	4.6	10.8	14.2	20.3	7.6	17.6	9.8	12.5
(47000-94000)	13.4	23.7	30.0	19.5	5.9	21.0	8.0	12.4
(94000-188000)	40.4	25.5	24.3	9.1	1.9	14.1	4.1	7.5
(188000-376000)	27.6	24.3	11.4	3.1	0.6	7.3	1.5	3.5
(+376000)	2.0	5.7	7.7	1.1	0.1	1.9	0.3	0.9
Total	100	100	100	100	100	100	100	100
Source: INS, 2011b (EESI, Phase 1 data) and INS, 2011c (ECAM 3 Data).								

The average monthly income ranges from 13,800 FCFA in the family agricultural sector to 145 400 FCFA in Civil Service with households heads working in the family agriculture having the lowest income (39,900 FCFA) (INS 2011b (ESS 1 data). The average monthly income from main job at the country level was of 39,400 FCFA in 2010 (Table 5). This represents an increase in nominal value of 12,600 FCFA compared to 2005 reflecting some improvement in the income of the main job during this period.

The informal sector (family agriculture and informal private sector), which employs 90.5% of workers, has the lowest levels of pay. Most of the workers of family agriculture (84,0%) earn less than 28500 Fcfa monthly (INS 2011b, Common wealth report 2013).

3.7. Infrastructural development (Access to Electricity, Water, Roads)

Infrastructure assessed included household equipment; radio, television, bikes and access to social amenities including water and electricity, improved sanitation, general household classification of HDI, road network, community halls, slaughter slabs and markets (Figure 6 and Annex 4). Most data on infrastructure was recorded from the council development plans.

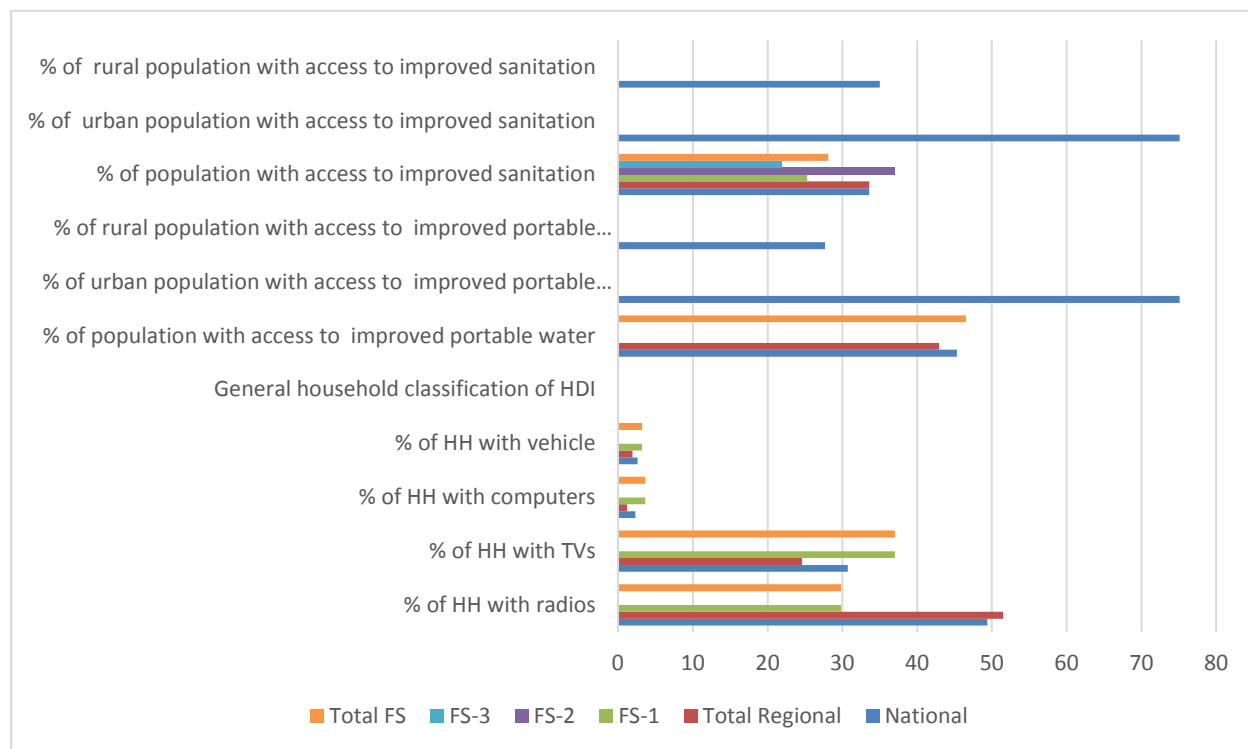


Figure 6: Assessment of infrastructural development in FS

Source: INS 2008, MINEPAT and INC 2011, MINPROFF, 2013.

The general household classification of Human Developed Index (HDI) for Cameroon was 0.495 (Rank 150) in 2013. HDI signifies the level of household development in terms of HDI (household facilities) and

impact on standard of living and development. The situation of some variables are somewhat worrying especially with regards to access to improve sanitation and good drinking water that were very low (35% and 27% respectively). Such data signifies an unhealthy population that is vulnerable to food security and sanitation problems (Worldbank 2014). The level of road and rail infrastructure was still very low and calls for concern as farm to market roads are still a big concern. Thus farmers are unable to maximize the sales of the farm products due to absence of roads. These values were later aggregated for rural and urban households and expressed in percentages.

3.8. Ethnicity and Migration

Cameroon has about 250 ethnic groups (MINEPAT and INC, 2011). FS 1 has forest ethnic groups that are mostly the Beti, Bafia and Ewondo ethnic groups. FS 2 is characterized by people with a mixed system and greatly influenced by European explorers – the Douala, Bakweri and Bafau. The main ethnic groups of FS 3 have a strong dynastic chieftaincy structure of leadership. They are the Bamilékés in the West region, and Metta, Bafut, Mankon and Nso in the NW region (MINEPAT and INC, 2011).

Migration is most common in the West and the NW region than in the other field sites. This is because of the high population density in these regions and the lack of access to land. Migrants from these two regions move to the SW region to work in plantations or to big cities of the Centre regions (Yaoundé) and the littoral region (Douala) in search of better livelihoods opportunities like education, business, employment, farming space and fertile land for agriculture. Only about 32.7% of the populations live in their location of origin. The main reasons for migration are mainly family reunion (53.3%) and the search of jobs (25,1%) (Table 8).

Table 8: Ethnicity/Migration status of households

Indicator/Variable	National	Total Regional	FS-1	FS-2	FS-3	Total FS
Number of ethnic groups	250	39	24	9	12	15
Number of religious groups			18	10	10	13
Number of villages			1328	551	1177	3056
Net migration (thousands)				168	259	427
% of migrant population	60	58	51	81	61	64
% of HH with at least a member that have migrated since 2001	59	32	21	46	34	34

Source: INS, 2008, Worldbank, 2011, MINEPAT and INC, 2011

Other reasons for migration include work, education/training, employment, search of autonomy, logging, join/meet family members, household and health problems (poverty). Some people also migrated out of the country mainly to other African countries and to the Western world.

Table 9 : Reasons for migration

Indicator/Variable	National	Total Regional	FS-1	FS-2	FS-3	Total FS
Work	26	30				
Education/training	4	12	41	43	70	51
Employment	22	21				
Health problems	2	3				
Search of autonomy	14	15				
Logging	18	10				
% Emigration of members of HH	27	29				
Percentage destination of emigrants						
Africa	49	34				
Europe	39	28				
America	9					
Others	3	2				

Source: INS, 2008, Worldbank, 2011, MINEPAT and INC, 2011

IV. PRODUCTION SYSTEMS

4.1. Production's environnement

The natural water potential of the Action Site is huge and the landform and soils are contrasted with:

- Lowlands including basins (Atlantic, Congo) with main rivers Wouri, Nkam, Noun, Sanaga; Sangha, Dja
- Plateaus among which the southern Cameroon plateau with an average elevation of 650 m;
- Highlands with volcanic landforms and mountains: Mount Bamboutos (2,740 m), Mount Manengouba (2,396 m) and ends on the Atlantic coast with Mount Cameroon (4,095 m).
- Basins (atlantic and congo) and a coastline (320 km long for the whole country)
- Soils with diverse properties and potentialities according to French classification (Annex 5)

Five agroecologic zones have been characterized according to the combination of orography, climate, soil, vegetation, farming systems and natural resource management practices (Figure 1). The main characteristics of the field sites were gathered through literature review while the challenges and opportunities have emerged during focus groups discussions and interviews with key stakeholders

Field Site I, located in Humid Forest Zone with Bimodal Rainfall (HFZBR)

Main characteristics of HFZBR

- The climate is subequatorial with two rainy seasons (March-June and September- November) and two dry seasons. The average annual rainfall is between 1600 to 2000 mm and the annual mean temperature between 24°C and 25°C (Waterloo et al. 2000).
- The landform is of south-Cameroon plateau, dominated by a succession of convex hills with elevations ranging between 650 and 900 m, and interfluves. There are also small plains (less than 150 m wide).
- The lands are made of red forest soils moderately or highly saturated (less fertile), located in the Centre, South and East regions. The peri-forest savannah lands are situated in the transition zone between forest and savanna (Tonga, Ebebda, Ntui, Nanga Eboko and Bertoua.), with average farming potentialities (Martin and Segalen, 1966, Vallerie, 1971).
- Most of the upland soils (about 95%) are Ferralsols and Acrisols. Less developed poorly drained Fluvisols and Gleysols, occupy the swampy drainage ways (about 5%) (FAO-ISRIC 2006; Yemefack and Tchienkoua, 2010).
- The population density is low (50 inhabitants/km² in Centre region), and a bit higher near Yaoundé.
- Shifting agriculture and selective industrial logging are the most important land use activities.
- The bi-modal rainfall pattern defines two growing seasons, each one fitting in one rainy season
- Most agricultural farms are smallholdings but there are some larger plantations owned by local elites who are natives of a village, living in the cities. Animal husbandry is limited to rearing of few goats, fowls, pig and sheep.

Challenges

- Facilitate and secure access of youth and women to land.
- Develop sedentary farming systems, more intensive, improving incomes and less destructive of natural resources.
- Integrating rural communities in the management and conservation of various natural resources and biodiversity products.
- Facilitate the connection between the production areas and the urban centers.

Opportunities

- The area has great potential for tree and fruit.
- Opportunities exist to improve farm incomes and families by increasing and diversifying
- The proximity of Yaoundé that is a consumption center is a major asset.

Field Site II, located in Humid Forest Zone with Monomodal Rainfall (HFZMR)

Main characteristics of HFZMR

- The climate is considered as a hot and humid equatorial one, with monomodal rainfall with an average of 2500 to 4000 mm (maximum of 11000 mm at debunscha village), relatively short dry season (3-4 months) and average temperature of 22 to 29 ° C (kengue et al., 2008).
- The vegetation consists of the montane forest on the Manengouba mountains, the coastal forest on the entire Atlantic coast from Mundemba sector (in its northern part) to Campo (South), mangroves (Tiko, Douala) or species on sand spits between Kribi and Campo.
- The soils are derived from volcanic ash of Mungo area (very fertile), recent volcanic ash from Mount Cameroon (fertile), coastal yellow soils covering the town of Tiko, Nkompina and Nkapa towns until the Wouri plain (low fertile); the yellow soils on acid rock covering Edea, Kribi, Mamfe and Mundemba (low fertile) (Martin and Segalen, 1966, Vallerie, 1971). The soil groups encountered are Ferralsols, Acrisols, Andosols, Cambisols, Fluvisols, Gleysols, Leptosols and Plinthosols are in the area (FAO-ISRIC 2006; Yemefack and Tchienkoua, 2010).
- Approximately 53% of the cultivable surface is been used, among which about 60% are dedicated to industrial oil palm plantations, rubber and banana.
- Some traditional plantations consecrated to the same crops are been developed around most of these agro-industries in which they are more or less integrated (SOCAPALM, CDC, HEVECAM...).
- There are many Non-Timber Forest Products (NTFPs).
- The conversion of some vast forest areas to commercial plantations (oil palm, rubber, tea, bananas at industrial level, coffee and cocoa by small holders) has increased the pressure on forest land resource.
- The livestock is made of poultry, pigs, sheep and goats. Fishing is practiced in rivers and sea

Challenges

- Preventing and managing the risks of industrial pollution on fish stocks.
- Conservation of the mangroves that are breeding grounds for many aquatic species.
- Preventing land grabbing by the expansion of industrial plots (palm oil, etc.).
- Supporting changes in practice to replace the destructive extensive agriculture natural resources through intensive and agro-ecological systems.
- Accompany and support the involvement of youth in agriculture to reduce rural exodus

Opportunities

- High biodiversity potential.
- Possibility of integrating farmers in the REDD process.
- Non-timber forest products are very useful for households.
- Develop agroforestry systems (eg in cocoa plantations).
- Good prospects for cocoa worldwide.

Field Site III, located in the Western Highlands Zone (WHZ)

Main characteristics of WHZ

- The climate is mountainous type: 8 months of rainy season (mid-march to mid-november), 4 months of dry season, 1500 to 2000 mm of rainfall; average temperature of 19°C (Kengue et al., 2008).
- The dominant vegetation is: montane (1800 to 3000 m) and sub-montane forests (800 to 2200 m), highland savannas and prairies, and wooded savannas and dry clear forests.
- They lands are consisted of brown or red soils on moderately fertile basic rock; red or ocher soils on acid rock (infertile); black soils on volcanic ash in Foubot Bafoussam and Dschang (fertile); alluvial, colluvial or waterlogged soils in " Santchou plain" (Martin and Segalen, 1966, Vallerie, 1971). They are classified as Andosols, Cambisols, Ferralsols, Fluvisols, Gleysols, Leptosols, Plinthosols, Umbrisols (Yemefack and Tchienkoua, 2010). The landscape is dominated by the groves integrated to dwellings and farms
- Population density is very high in the order of 137 inhab. / Km² and over 86% of the usable land is enhanced by a continuous cropping system alternated by rare fallow.
- Family farms are often landscaped groves and generally have less than 2 ha in size.
- The use of inorganic fertilizers is becoming rare due to the devaluation of the CFA franc. Therefore, organic manure is widely used.
- A semi-intensive farming with two annual cycles is practiced.
- The rearing of large animals (e.g. cows....) is carried out in the high lands.

Challenges

- Manage the strong human pressure on resources.
- Develop joint management systems for space and resources usage, in order to prevent and regulate conflicts over land and resources.
- Develop innovative systems for soil conservation and fight against erosion problems.
- Support the diversification of production systems that are being developed since coffee crises.
- Develop synergies between the different forms of land use such as agriculture and livestock at different scales

Opportunities

- Emergence of commercial food and openness to domestic and transboundary market favors the intensification of cropping systems
- Tree has an important place in the landscape and in agro-ecosystems. Cropping systems are based on the crops' association and rotation.
- Several factors are favorable to the development of sustainable agricultural systems: agroforestry systems; cropping systems on cover;
- Supportive environment for the development of integrated farming livestock at the territory level (concerted and integrated management of ruminant livestock and crops within the shared space) and at farm level (integration of monogastric livestock to produce manure for crops and use cereal as feed).

4.2. Factors of production

4.2.1. Land use system

The main following categories appear as land usage patterns by producers:

- The best lands with high agricultural potential (fertile) are used for a set of demanding crops such as coffee and cocoa, banana. The coffee accepts high altitudes while cocoa and banana are better suited in low-lying areas.
- The average quality lands (moderately fertile) are used for special cash crops (textile plants, sugar cane) and semi-intensive food crops under normal rotation.
- The lands with low agricultural potential (infertile) are used for the cultivation of perennial such as palm oil tree and rubber in the lowlands, and tea in highlands. In highlands, they are used for growing irish potatoes while in other altitude they are used for a variety or food crops in extensive system (when access to land is not limited) or in semi-intensive system with proper rotations.
- The flooded waterlogged lands are used for rice cultivation or used for grazing.
- The other unflooded lands of very low fertility are used for extensive farming or for various shrubs cultivation.

4.2.2. Land tenure system

Cameroon's formal law classifies land as private, public or national. Private lands can be owned by individuals and corporate entities, groups or the state. In order to be deemed private, the land must be titled and registered. Public land (e.g., highways, parks, waterways) is land held by the state for the benefit of the people of Cameroon. All other land is classified as national land, which includes most unoccupied land, land held by communities under customary law, informal settlements and grazing land (GOC Land Law 74-1 1974; GOC Land Law 74-2 1974).

Rural land is generally subject to customary law, which is based on an evolving set of accepted principles, with some local variations. Under customary law, traditional local leaders (fon, lamido) serve as trustees and land administrators. Individual families receive rights to use land, and rights are heritable generally through the male line. Although land has become highly individualized in many areas, customary law generally prohibits individuals from selling their land outside the community (Fombad 2011).

The formal law recognizes the following tenure types: ownership, usufruct rights and leaseholds. Under customary law, households generally have individualized rights to agricultural plots, and these are considered to be ownership. The head of household has rights to lease, loan and bequeath the land. In some areas, landholders are permitted to sell land held under customary law; in other areas, land sales are restricted to transactions within the family or lineage

Historically, women's land ownership was limited in Cameroon. In some areas where land was abundant, women were permitted to own land. But in most parts of the country, women have traditionally accessed land through their natal families and husbands. Upon marriage, most wives farm their husbands' land. Wives are often considered the owners of crops and often control crop production and any income generated from the production, but in most cases they do not own the land (rapporté par USAID country profile : Property rights and resource governance. Cameroon).

4.2.3. Access to land, water, labour and capital

The current way to access to rural land is inheritance (in the Action Site), clearing the forest (in low saturated forest area in the Action Site). Everywhere, purchasing the land is mostly done by non-native and small agricultural businessmen (retired civil servants, young migrants). The gift of land out of family circle has become very scarce except in unsaturated area where it is associated to authorization given by the chief to somebody to create new plots in the forest for his family (Table 10, Box 1).

Women are involved in multitasks such as clearing, ploughing, planting, transplanting, fertilizing, weeding, harvesting, storage, and animal feeding.

The capital is mostly mobilized by selling old crop and grants. Credit and tontine (informal credit groups where members share savings and default risk so as to obtain credit on a rotating basis) are mobilized for production of commercial crops but this way is still very marginal.

The manpower is sought on a temporary basis during peak periods of work. But, permanent wage work is most often used in animal production. Some small farms employ permanent workers. The average being one permanent worker per farm.

Table 10: Mode of acquisition of land, capital and labor

Factors of production	West/NorthWest	Southwest/Centre
Land	Inheritance; Gift Purchase	Inheritance Gift Purchase Clearing the forest
Capital	Tontine Sale of old crop Credit Grants	Tontine Sale of old crop Credit Grants
Labor	Family labor Manpower employee Mutual help	Family labor Manpower employee Mutual help

Access to water is mostly through natural source. Even in urban and sub-urban agriculture, the land cultivated is mostly situated in lowland area (Asaa Nguegang, 2008).

Box 1: Case study on access to land

In cocoa farming systems in the Centre Region (Chi Bemieh Fule, 2013):

- Most of the farmland (87.5%) was acquired through heritage while 7.5% was bought and 5.0% was donated by the state to young farmers.
- Labour in this region is basically provided by the family (57.0%), while the rest (43.0%) is hired.
- There are various forms of hired labour, ranging from community work (members of a particular group help out each member on his farm), seasonal labourers (usually needed for clearing, pruning and harvesting) to permanent labourers (recruited as farm managers).
- The standard wages include 30,000 CFA F/hectare for clearing, 60,000 CFA F per hectare for cutting down trees and 60,000 CFA F per hectare for staking.

In rural area of the NorthWest Region, land is a critical resource for women for food production (Engwali Fon, 2011):

- For 68-74% of women surveyed, access to arable small-scale land is mostly from family and soliciting
- For 53% of women surveyed, the primary source of land for arable small-scale agriculture was as a gift

In urban areas of Yaounde, access to land by producers is through inheritance (24% of surveyed producteurs), rental (24%), purchasing (14%) or exploitation of unbuilt public or private areas. In suburban areas of Yaounde the access to land is mainly through rental (35%) and heritage (30%) (Asaa Nguegang, 2008).

4.2.4. Trends, problems and Challenges

Major trends

- The increasing in food demand causes a rise of price of arable land prices in the saturated areas (West and Northwest regions). To exploit large size farms a majority of young farmers and small investors are currently obliged to migrate towards forest and peri-forest zones (Centre, South, East).
- In forest areas opened up, strategies of land grabbing are developed by some farmers through establishment of perennial and semi-perennial crops (palm grove, rubber plantations) after clearing the forest.
- Lack of capital and inputs bring many farmers into diversification and strategies of minimizing the risks.
- Private industrial investment on land is also progressing (logging, mining, plantations) and could result to land grabbing at expenses of smallholders.
- The creation of agricultural bank is going on to facilitate access to credit by farms market-oriented and could result to the increasing of the size of farms and the use of farm labor

Problems

- The lack of maps of land use at divisional level appears to be a gap to well plan sustainable agricultural development.
- Low consideration of endogenous systems of classification of land use and natural resources management as tools appropriated for agricultural planning and evaluation.
- Problems of degradation of plant and animal biodiversity related to "mining" of resources in wetlands and forests.
- Low valuation of water throughout the year due to the lack of suitable equipment
- Risk of conflict in areas of high pressure on land (Field Site III) or in areas where land is shared by different stakeholders groups (farmers, ranchers, etc.).
- Risk of loss of production factors associated with natural resource degradation or land grabbing
- Natural resources degradation, soil erosion and overgrazing due to agro-climatic or human-induced factors in the Field Site III.

Challenges

- Facilitate access of women and youths to arable land
- Reduce the cost in procedure and duration for obtaining land titles
- Develop endogenous systems and tools for sustainable management and evaluation of land use and natural resource for different farming systems within the whole action site. In that vein, the cropping sequences and land use of farmers have been described in shifting cultivation (Kanmegne, 2004, Yemefack, 2005). A typical one is essep, banana farm, afup owondo, and cocoa plantation.
- Creation of agricultural banks and facilitate access to credit to smallholders, youth and women

4.3. Typology of main agricultural producers

Three types of producers exist and they use 6 major types of strategies: survival strategies; fallback strategies; risk mitigation strategies; strategies of extensive land accumulation; intensification strategies; business strategies.

4.3.1. Family farms (FF)

They are structured around the family unit. Peasant production units are generally small (less than 5 hectares), and essentially use family labor. Productivity is generally low due to the lack of capital, the low use of quality inputs, and the importance of the part of the production for own consumption. Several subtypes are found following the strategies developed:

- Extensive FF with 4 main strategies: i) survival strategies centered on food crops when they have no other workaround; ii) fallback strategies (abandoning some crops, retraining or diversification of off-farm activities); iii) risk mitigation strategies when access to land is not a constraint; iv) land accumulation strategies.
- Semi-intensive FF : their strategy is based on diversification and intensification of market-oriented food commodities.

Main constraints

- Part of the population active in agriculture often has here a very low level of basic and technical education.
- Difficulties related to labor are felt at all stages: clearing, production, harvesting, transport because of the use of rudimentary techniques or practices (low use of tools and modern inputs).
- Agricultural practices (slash and burn agriculture, often have negative effects on natural resources such as soil and the forest).
- The financial saving capacities of farmers are usually insignificant and access to loan remains difficult.
- Insufficient access to the market for remote areas and lack of communication channels that makes the use of inputs and marketing (high transport costs, post-harvest losses) very difficult.
- The collapse of certain commodity chains (coffee in FS III) that used to be the financial backbone of farmers.

Opportunities

- Producers increasingly organized
- Food merchant Development
- Structuring of chains with traders who sometimes come and buy locally
- Development of micro finance institutions even though their services are not yet well adapted to small farms

4.3.2. The medium-sized agricultural enterprises

The farms of medium size are more or less integrated to agro-industrial complexes. Generally, they have specialized in a single production. These are farms managed by senior executives or skilled producers with significant resources (land, capital). They implement production techniques encouraging the use of mechanization and modern inputs (seeds, fertilizers, pesticides, etc.), use a hired labor and produce primarily for the market (local and international).

Their operation is based on intensification strategies and business strategies. It is also found extensive accumulation strategies (for some elites in the areas of non-agricultural frontier).

Main constraints

- the isolation of some production areas (FS I in particular);
- the lack of appropriate financing tools;
- the unavailability or inaccessibility of inputs;
- the unavailability of labor;
- the disorganization of marketing channels;
- the low ability to conquer international markets.
- the difficult access to land;
- the promoters' insufficient knowledge in terms of technical and economic management.
- the insufficient stakeholders' professionalisation.
- the lack of information on prices of external markets.
- the insufficient training of stakeholders on international issues of products and niche markets

4.3.3. Agribusiness

The agro-industrial companies in Cameroon are modern farms specialized in the production of palm oil (and palm kernel), bananas, rubber, sugar cane and tea. The companies concerned drain major national and foreign capital, provide employment for tens of thousands of permanent and temporary employees in their production activities and processing and widely involved in national exports. They have important spillover effects on the peasant economy through the supervision of village (traditional) plantations located in the periphery and the income from their rural employees partially reinvested in other agricultural products.

4.4. Productivity of main commodities

The productivity is presented at regional level below. The details tables of production per region and per division can be viewed in annex (from Annex 6 to Annex 19).

4.4.1. Food crops

The production and yields of food crops differ highly between regions (Figure 7, Figure 8 and Figure 9)

Starchy crops

- Maize, Plantain, Cassava are the most important in terms of quantities produced and consumed
- Maize is produced everywhere with high interest with 300 000 tons produced in West region and 130 000 tons in each of other regions.
- Cassava is mostly produced in the following regions: Centre (1200 000 tons), Southwest (431 000 tons/ha) and Littoral (311 000 tons). The cassava is processed into “cassava sticks” and “gari”
- Plantain production is leading by the Centre Region (832 200 tons), Littoral (428000 tons) and West (205 000 tons)
- **Irish potato, cocoyam, taro and yam** are highly appreciated and demanded but the production is low.
- Rice is among the most consumed food but local production is marginal: 27 000 tons in NorthWest, less than 10 000 tons in others.
- Yields of maize are very low: average of 2 tons/ha in 2010 while the potential of varieties promoted by MINADER is around 6 tons/ha (varieties CMS 8704; 8501; CMS 9015) and 10 tons/ha (CLH 103).
- The yield of cassava is 22 tons/ha in Mungo and less than 16 tons/ha in other regions.
- The yield of plantain is around 13 tons/ha in Centre and Littoral and around 8 tons / ha in other regions

Protein crops

- Bean is almost produced in West (131 000 tons; 1.45 t/ha) and Northwest (130 000 tons; 1.14 t/ha)
- Groundnut is the typical crop of women mostly produced in Centre region (56 251 tons in Centre region and less than 8 000 tons in each of other regions). The yield is around 1 ton/ha.
- Soybean (average of 2 000 tons/region) is still in promotion as high protein source for children and high protein and energetic food for poultry production.
- Ground nut and Earth pea (Bambara groundnut) are marginally produced but well involved in traditional food systems

Fruits and vegetables

- Tomato is mostly produced in West while banana is mostly in Centre, Southwest and Littoral regions.
- Pineapple is intensively produced in Centre (87 000 tons; 46 t/ha) and Littoral (60 000 tons; 32 t/ha).
- There is a great variation of yields between regions for the same crop.

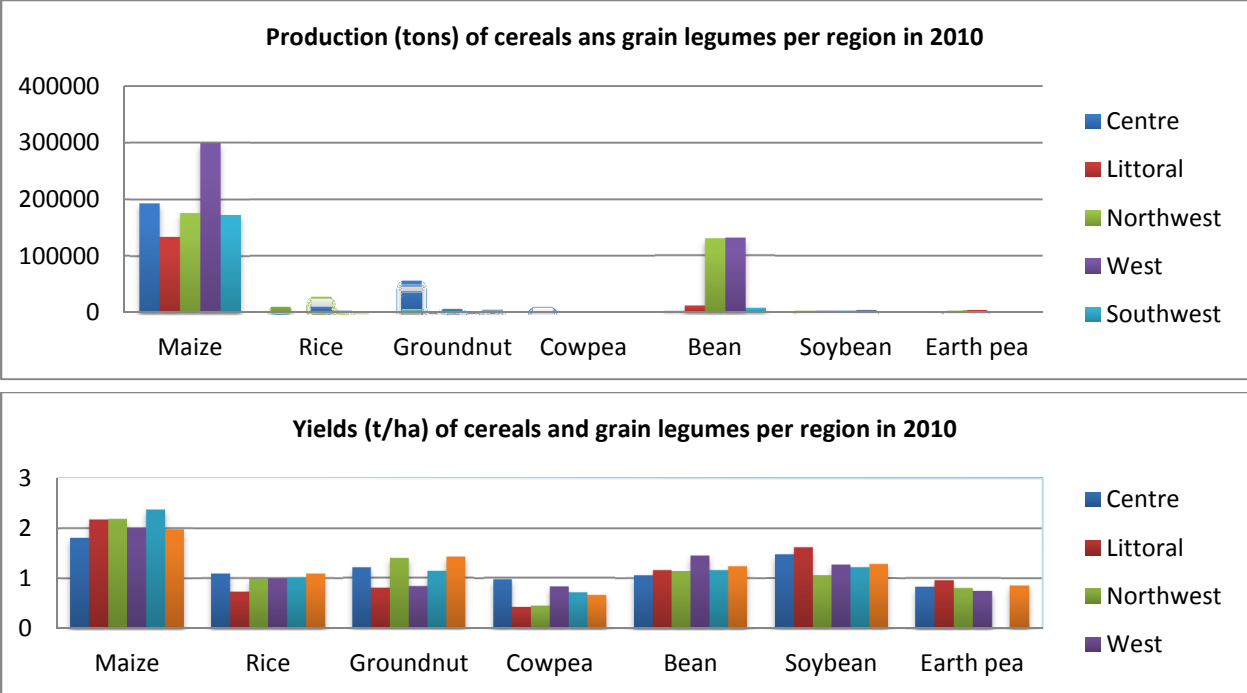


Figure 7: Production and Yields of cereals and grain legumes per region in 2010

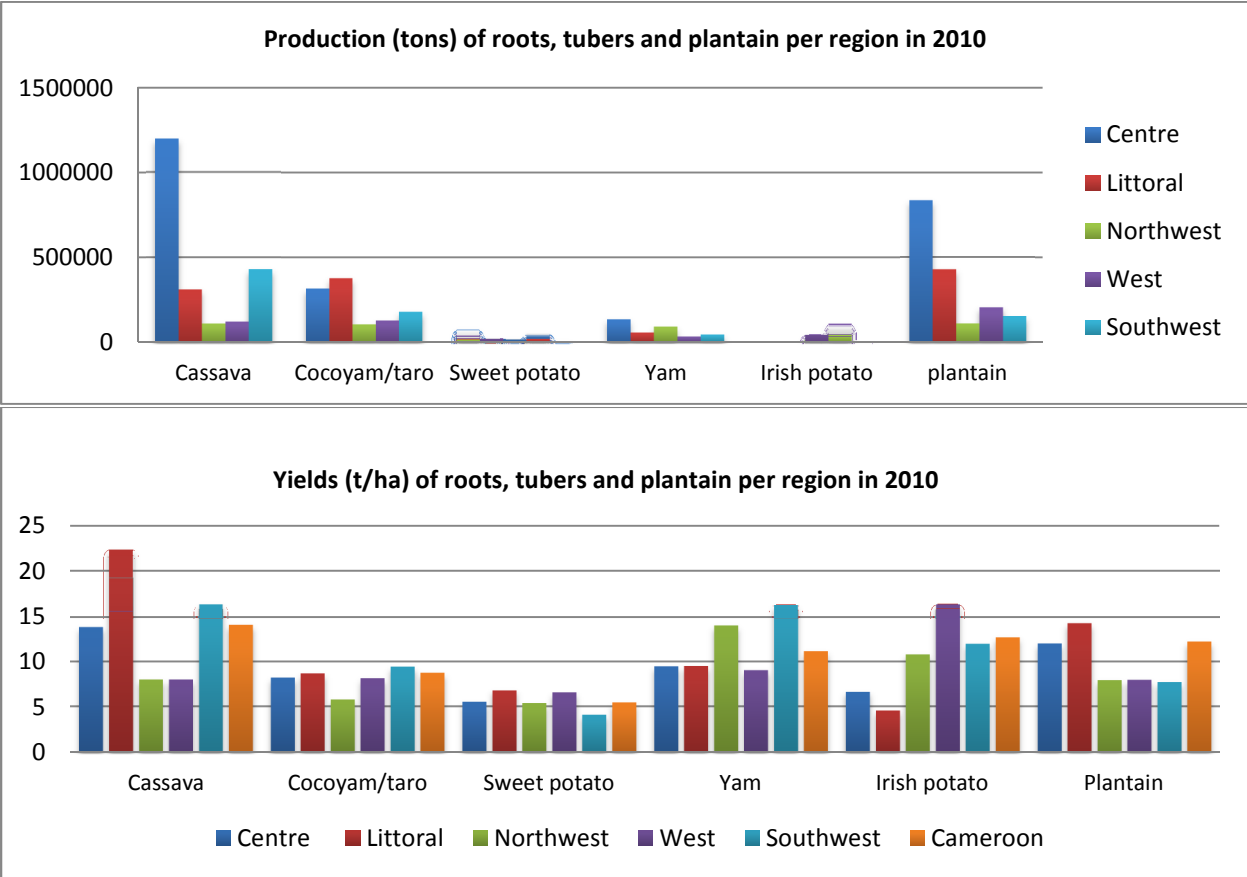


Figure 8: Production and Yields of roots, tubers and plantain per region in 2010

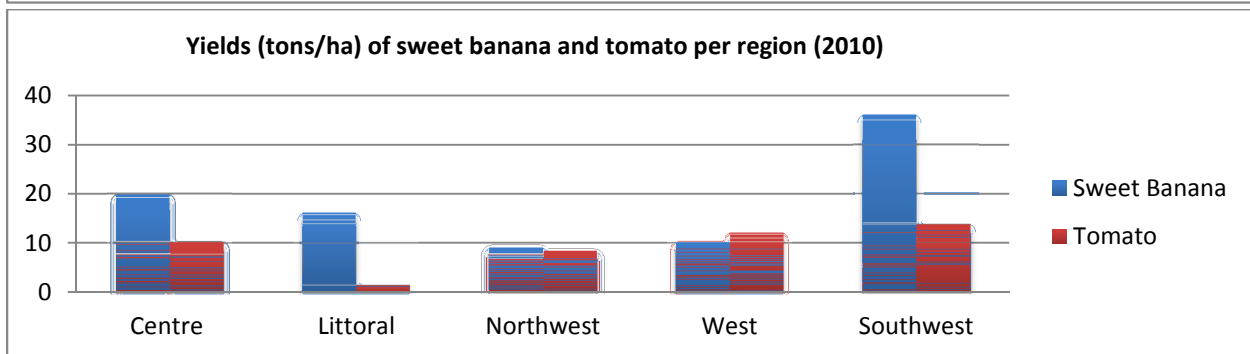
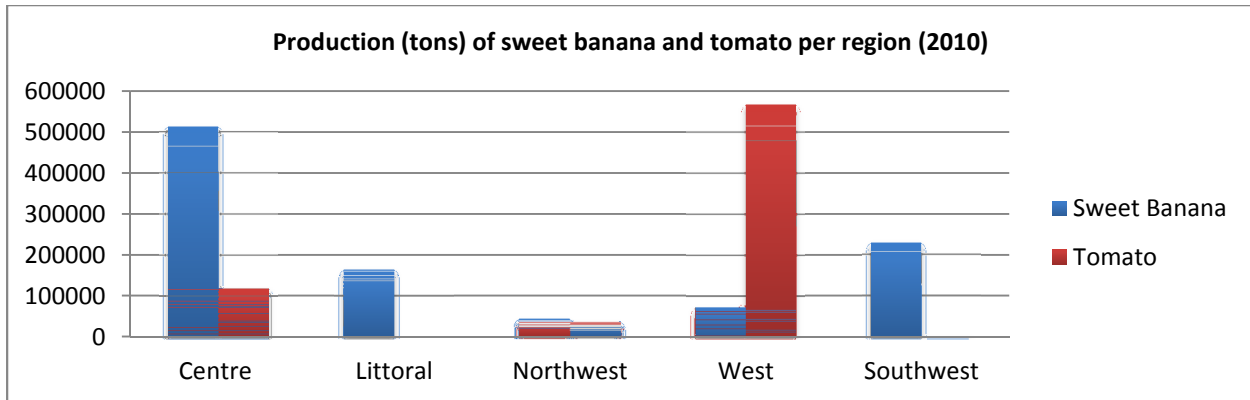


Figure 9: Production and Yields of sweet banana and tomato per region in 2010

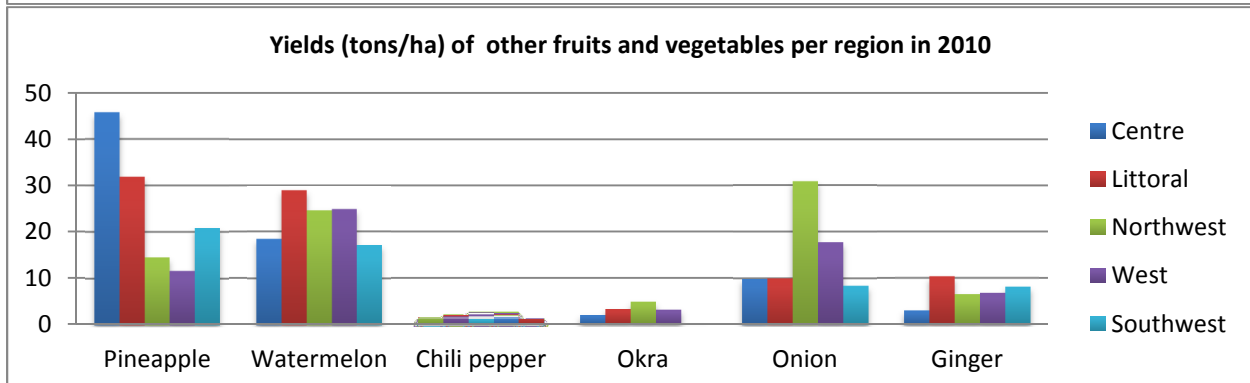
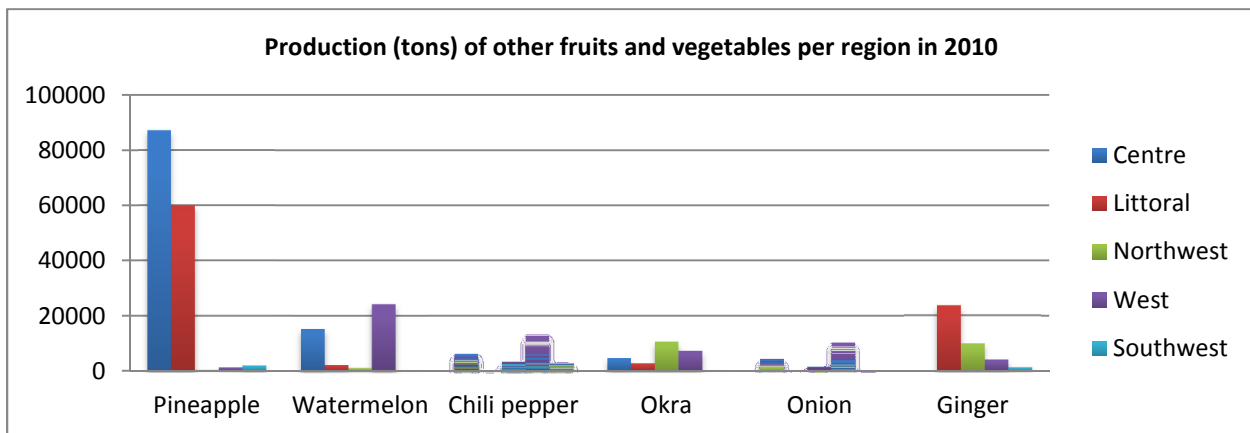


Figure 10: Production and Yields of other fruits and vegetables per region in 2010

4.4.2. Cash crops

Diverse species of cash crop produced in Cameroon are from regions involved in the Action Site of Humidtropics program (Table 11).

Table 11: Cash crop production in administrative regions that constitute the Humidtropics action site (2012)

	Yield (kg/Ha)	Production (t)
Avocados	4965	72000
Bananas	16471	1400000
Beans, green	5333	4000
Cocoa, beans	382	256000
Coffee, green	309	65000
Kola nuts	492	46500
Mangoes, mangosteens, guavas	6923	900
Oil, palm		230000
Papayas		43
Rubber Natural	1018	56000
Pineapples	35000	168000
Plantains	12455	3450000
Sugar cane	10000	1200000
Tea	2500	4500
Tobacco, unmanufactured	960	4800

Source : Faostat, 2012

Industrial cash crops are produced both by agribusinesses and family farms (Figure 11 to Figure 17) (See absolute value of production and exportation in Annex 13):

- Cocoa, robusta coffee and arabica coffee are the main agricultural export products led by family farms. Those crop productions involve over 600,000 farmers and activities related to these sectors benefit directly or indirectly about 6 million people. These activities represent between 25 and 30% of non-oil exports, or 1.55% of GDP (Ministry of commerce, 2012).
- Cocoa is usually grown in extensive agroforestry systems (EAFS), under shade trees more or less dense. The average yield is 375 kilograms of cocoa beans per hectare (Mabou et al, 2012) against 500 kg cocoa beans per hectare in Ivory Coast. According to Mabou et al. (2012), the Cameroon production is concentrated in Southwest region (50%) and Centre region (35%), South (10%) and East region (5%).
- The production of palm oil in Cameroon was 326,940 tons in 2010 and the total cultivated acreage was 112,430 ha (MINADER, 2012) (Figure 13). The most important part of this production was by agroindustries and the private producers market-oriented (Figure 14). The production is increasing as a result of increasing of acreage (Figure 15, Figure 16).
- The rubber production that was 62,000 tons in 2006 has decreased to reach 56,000 tons in 2012 (FAO Stat, 2012). Industrial plantations dominate the rubber production sector in Cameroon (Figure 17), while 80% of the global production of rubber is from small producers (Chambon and Eschbach, 2009).

The main producers are: CDC in the South West province (20 000 hectares); SAFACAM in the Littoral (3500 hectares); Hevecam (Hevea of Cameroon) in the South (17,000 hectares); Peasant plantations created between 1978 and 1992 under the FONADER project (approximately 1300 hectares in the South West and South); Peasant plantations (unframed planters) (approximately 2000 hectares, mainly in the Southwest).

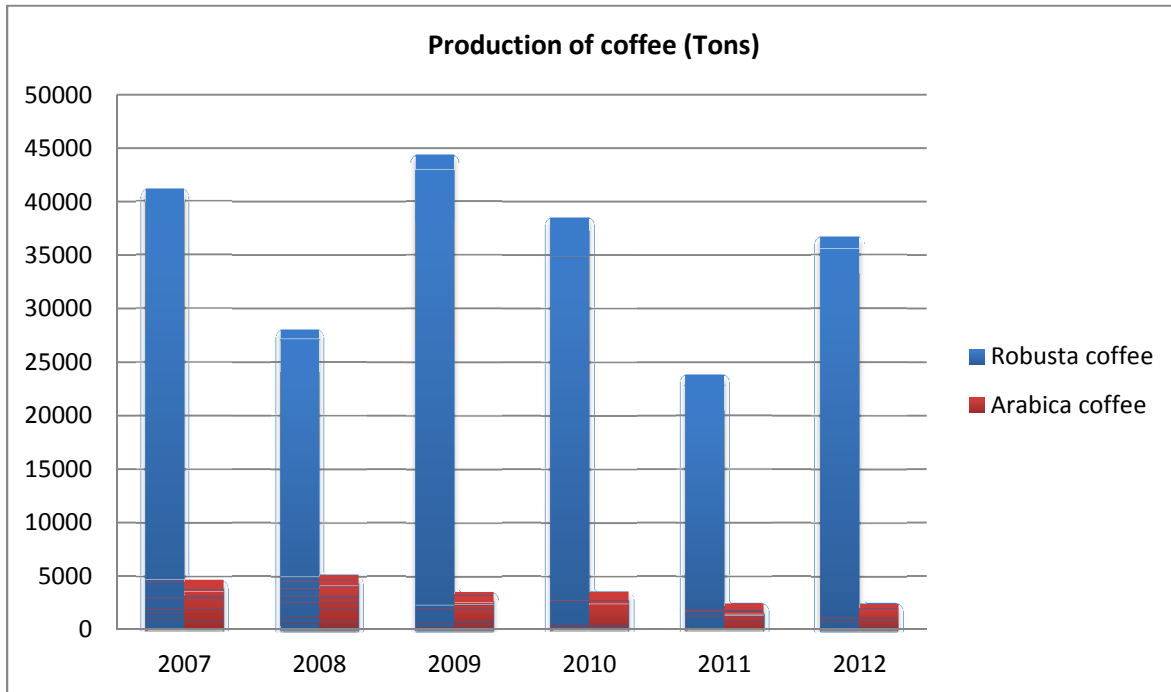


Figure 11: Production of coffee in Cameroon from 2007 to 2012 (ONCC, 2013)

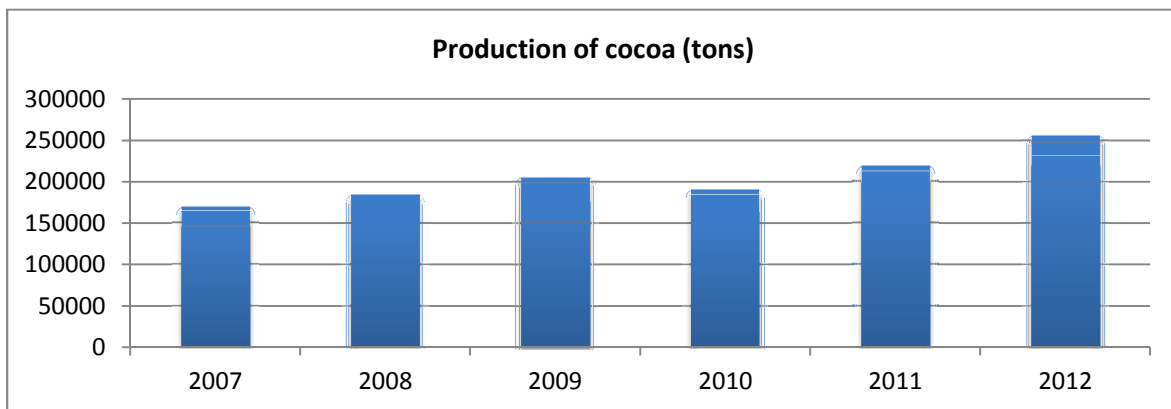


Figure 12: Production of cocoa in Cameroon from 2007 to 2012

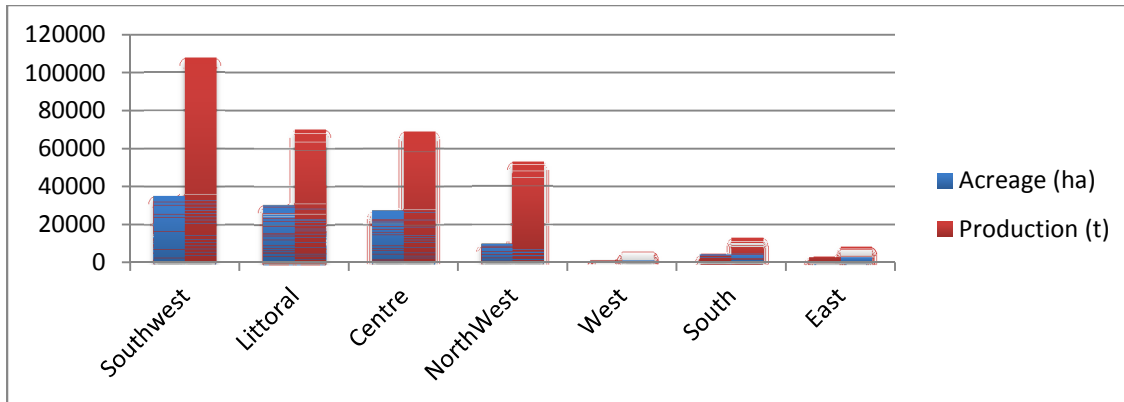


Figure 13: Acreage of palm grove and production of palm oil in 2010 (MINADER, 2012)

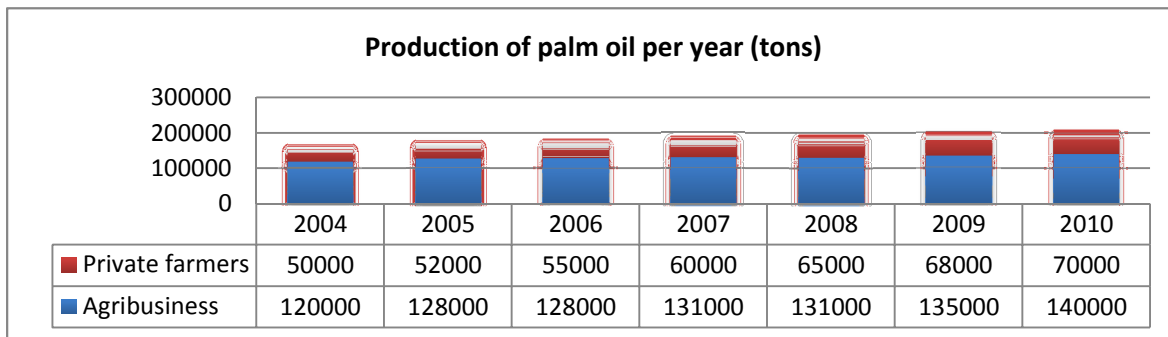


Figure 14: Production of palm oil by the market oriented-production units (MINADER, 2012)

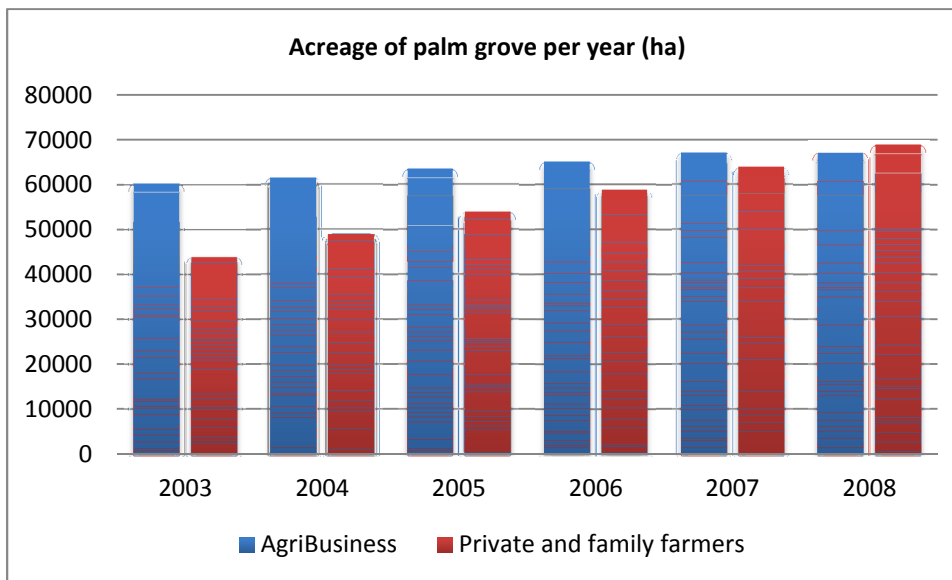


Figure 15: Evolution of the acreage of palm grove from 2003 to 2008 (Lebailly et Tentchou, 2009)

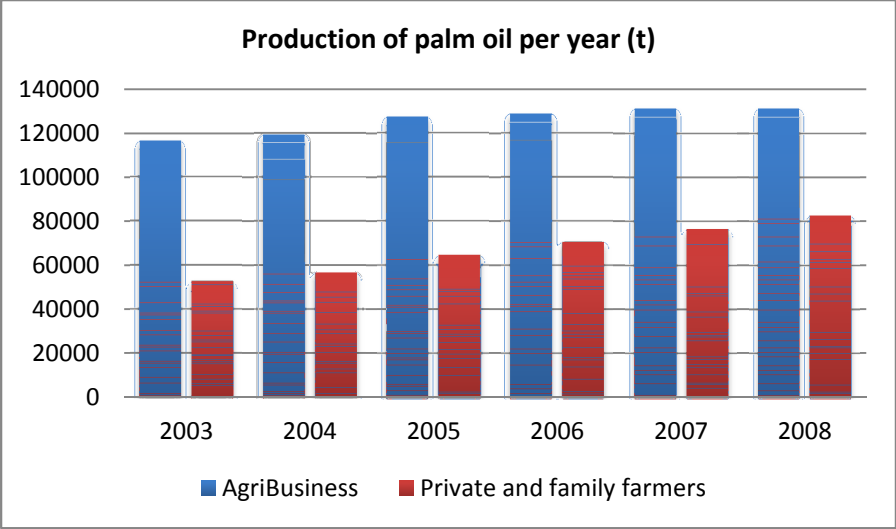


Figure 16: Evolution of production of palm oil from 2003 to 2008 (Lebailly et Tentchou, 2009)

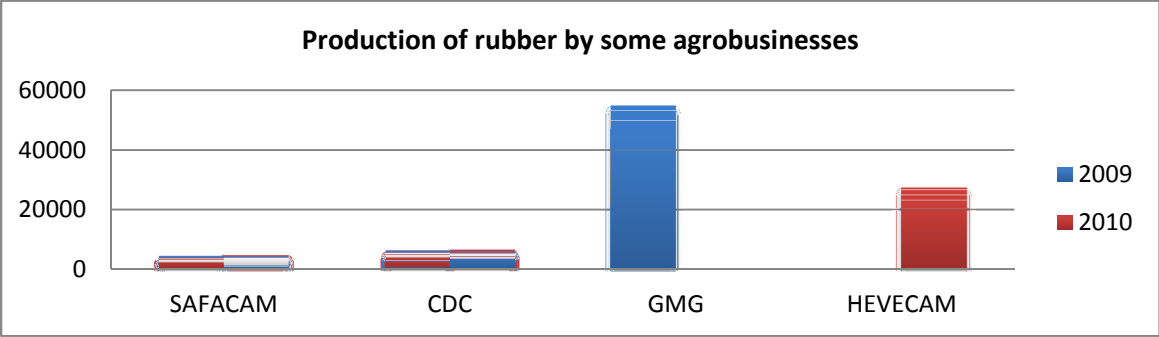


Figure 17: Production of rubber by main agribusinesses in 2009 and 2010

The detailed data of production of food crops and cash crops per division are presented from Annex 14 and Annex 19.

4.4.3. Livestock

Livestock production involves several species (Table 12, Table 13):

- Cattle are much higher in upland areas such as West, Northwest, Southwest and in low pest pressure areas (especially in Field Site II and Field Site III)
- Small ruminants are encountered in the whole Action Site and reared in small numbers (1-5 heads) per farm.
- The rearing of pigs and poultry is practiced following a traditional extensive system (feeding with kitchen remains), semi intensive (providing concentrates) or intensive (modern farms located in urban and suburban)
- The rearing of unconventional species emerges in suburban areas.

Table 12: Number of heads of main livestock species produced in the divisions of field site I and Field site II

	Field Site I			Field Site II		
	Lekié (2013)	Mefou et Afamba (2013)	Nyong et So'o (2013)	Fako (2012)	Meme (2012)	Moungo (2012)
Bovine		734	136	376	208	2920
Ovine		664	650	1923	15561	16 431
Caprine	126	915	1800	12565	34836	23 524
Porcine	512	3826	2300	11689	22420	33 619
Equine						338
Poultry	30900	5200	35000	423752	24508	
Meat producing chicks						1 710 433
Egg producing chicks						1 477 198
Cockerels						83 982
Local chicken						226 606
Guinea fowl				233	2	784
Ducks				3832	553	31 692
Geese				213	12	811
Turkey						
Quails				22810	7275	916
Canine				3894	1987	3 954
Feline						
Cane rates				518	13	263
Rabbits				920	657	1 232
Guinea Pigs				717	330	801
Pigeon				1240	5	2 647
Hedgehog						
Snail				485000	597000	9 378
Monkeys						
Bee hives				439	1732	1 363
Fishes	33600	*108 ponds				

*: Production of meat or honey or ponds

Table 13: Number of heads of main livestock species produced in the divisions of field site III

	Ngoketunjia (2012)	Momo (2012)	Menoua (2013)	Bamboutos (2013)	Haut nkam (2009)
Bovine	8 308	13 393	4110	7938	1003
Ovine	8 745	13 630	3645	5868	3140
Caprine	15 572	18 413	15081	14793	13628
Porcine	10 264	16 535	22286	36654	16337
Equine	391	1 639	149		12
Poultry	47 120	73 683	315241	334982	132657
Guinea fowl			70		
Ducks	2 756		10189	3040	
Geese	122		685	1829	
Turkey			619	1370	
Quails		253	2147	145	
Canine	2 290	3 393	1853	2545	
Feline	337	1 667	625	1661	1440
Cane rates	38	137			
Rabbits	326	463	2200	5690	1134
Guinea Pigs	765	576	3908	1445	
Pigeon			727	1374	
Hedgehog			151	240	267
Snail			2570		
Monkeys		13			
Bee hives	695		1077	2736	
Fishes	(2 t)				

**: Production of meat or honey or ponds*

The main opportunities and constraints of livestock according to species are presented in Annex 20

4.4.4. Summary of key findings and challenges

Key findings

- Low yields for both food and cash crops
- Diversity of yields among different agroecologic and socioeconomic contexts, giving an overview of how progress can be made to improve effectiveness of the production systems.
- Low yields are partly related to bad quality of seed used, but also to systems of production practiced among which the agroforest systems with high ecological interests but with low yields.

- Low production of some products highly appreciated by consumers such as Irish potato, cocoyam, taro and yam, rice.
- The combination of animals and crops on the farm is still weak and not yet reasoned and designed to optimize synergies among the two components
- A majority of livestock farmers in rural areas do not have easy access to improved breeds of monogastric animals (pork and poultry) and to veterinary products
- The productivity of monogastric is low in rural and high in peri-urban area.
- Overall, cattle farming is practiced following the extensive system and mainly meat-oriented
- Some efficient dairy farms have been developed successfully in the Field Site III with the support of Heifer Project International, or under the initiative of local elites.

Challenges and opportunities

- Facilitate access to improved varieties of starchy and proteins food crops
- Facilitate access to credit for the production of high opportunity cash crops
- Facilitate crop livestock integration. For example Soybean and Cereals can be incorporated at 80% in the diet of poultry in intensive production.
- Improve the management of diseases and pests as well as quality and biosecurity of food in intensive production of fruits and vegetables.
- Improve access and good utilization/combination of both minerals and organic fertilizers in intensive production of food crops and cash crops
- Improve harvest and post-harvest technologies, operations and practices to reduce the loss of products and improve the quality
- Develop a system of evaluation of yields in mixed cropping systems
- Develop a system of classification of farms (typology) that can be helpful to present overall practices and strategies of farmers according to their own conditions/means of production. This typology will help to better integrate the concept of “exploitation system” and accompany sustainable intensification.
- Support the improvement of livestock systems and practices in rural areas including organization of livestock farmers and facilitation of their access to improved breeds, feed and veterinary products

4.5. Current models of farming system

Farming systems are built around some major component including: households; cropping systems; livestock systems; soils; off-farm activities (hunting, fishing, picking of timber and non forest products ; etc.).

They are determined by several factors such as:

- Geographical location of farms (urban, suburban, rural savannah rural forestry or forest perished) related to market accessibility and agro-pastoral resources
- Agro-ecological conditions (quality and quantity of soil and water quality climate, pest and disease pressure)
- Demographic parameters (population density and level of pressure on land and resources)
- Agricultural Technology (farm equipment, seeds, fertilizers, organic manure)
- Socioeconomics factors
- Research and variety selection (new adapted and improved varieties)
- Other factors of production (access to credit, labor, development projects targeting specific crops, etc.).

The main cropping systems practices involve:

- Sole cropping
- Mixed intercropping where two or more crops are grown simultaneously with no distinct row arrangement;
- Row inter-cropping where two or more crops are simultaneously growing with one or more others planted in rows.
- Relay cropping
- Shifting cultivation

4.5.1. Food crop systems

The crop association and rotations are very common are practised allover the action site. Food crops are more often associated in the same plot with other crops or with trees kept or introduced in the farm in order to provide shade or other by-products (Table 14).

In Field Site I (Centre region) crop associations are very common with some difference with the crop association practiced in **Field Site III** (Table 14). The main specificities in the field site I (Centre region) are related to: the preeminence of the cocoa as main crop; the emergence of pineapple, oil palm tree, and plantain and cassava cultivation as cash crop. Except the case of cocoa, these cash crops are often produced with sole system in case of intensification strategy. In forest and periferest zones, the shifting cultivation practiced is typically based on the succession *essep*, *banana farm*, *afup owondo*, and *cocoa plantation*, as described by Kanmegne (2004).

Except the traditional system of shifting cultivation, the food crop system is always defined in interacting with other factors such as importance of cash crops (coffee, cocoa, rubber, palm-oil, livestock), location (area with high or low density; periurban or rural area) and accessibility to the market. This combination leads to diversification of production systems.

In Field Site II (Southwest and Littoral) the association is **mixed intercropping** for food crops and **sole cropping** for some industrial crops such as rubber, cocoa and large-scale oil palm farms.

In Field Site III (West and Northwest) the **mixed intercropping** is dominant and the plot of food crop can bear more than 3 additional crops in the same period. They are components of major agroforest systems encountered in these regions.

Table 14: Main types of crop associations in Field site III

Association	North west	West
Four crop associations and more	Maize + groundnuts + yam + egusi Maize + groundnuts + beans + egusi Maize + groundnuts + okra + egusi	Maize + groundnut + beans + irish potato + cassava Maize + beans + Yam + cocoyam/taro Bean + cocoyam + Cassava + plantain + bananas Bean + Banana + Plantain + cassava Soybean + maize + cocoyam + banana + yam Groundnut + maize + bean + cassava + banana
Three crop associations	Maize + groundnuts + yam	Irish potato + bean + cassava Other associations deriving from four crop associations with cocoa, coffee or maize as main crop
	Maize + groundnuts + beans	
	Maize + groundnuts + cowpea	
	Maize + groundnuts + okra	
	Maize + groundnuts + egusi	
Two crop associations	Maize + groundnuts Maize + yam Maize + beans	Maize + groundnuts Maize + bean Maize + Soybean Irish potato + maize Irish potato + cassava Sweet potato + bean Cocoyam + Taro
Sole crop	Maize	Rice
	Cocoa	Tea
	Coffee	
Tree crop associations	Coffee + Plantain + Banana + Cocoyam + taro + Safoutier + avocado Coffee + maize + banana + cocoyam + taro + avocado + mango Cocoa + plantain + banana + cocoyam + safou + avocado + mango Tree crop are also planted with low density within food crops	

The cropping pattern sequence varies considerably from one farmer to another:

- Some farmers cultivate the land continuously, growing the same association year after year.
- Others plant the same association for several years, followed by one or two years of bush fallow. Still others vary the association throughout the rotation, putting crops more demanding on fertile soils.

The length of the rotation fallow also differs from farm to farm apparently partly in response to soil fertility conditions and the degree of population pressure and / or the terms of land tenure:

- Crop 3 years / Bush fallow (1 year),
- Crop 5 years / Bush fallow (1-2 years),
- Crop 10 years / Bush fallow (1-3 years)
- Permanent cultivation without fallow (more common in Field Site III: West and Northwest regions)

4.5.2. Cocoa-based production systems

This system is mainly based in *Field site 1 (Centre region)* and in *Field site 2 (Southwest region)*. According to Temple et al. (2008), the diversification of these cropping systems can be viewed at farm level where other crop plots associated to the cocoa plots in the same farm (Table 15, Table 16) or at plot level where other crops associated to cocoa trees inside cocoa plots (Table 17).

Table 15: Types of plots exploited in 234 cocoa-based farms in Centre and Southwest regions

Types of plots	Number of farms	Percentage of farms (%)
Cocoa + palm tree + Coffee + food crop	1	0.43
Cocoa + Palm tree + food crops	6	2.6
Cocoa + coffee + food crops	1	0.4
Cocoa + palm tree	16	6.8
Cocoa + Coffee	2	0.8
Cocoa + food crop	84	35.9
Cocoa only	114	48.70
Total	234	100

Source: Temple et al., 2008.

Table 16: Crops present in crop rotation of 1171 cocoa-based farms in Centre region

Locality	% of farms growing each type of crop				
	Cocoa	Food crops*	Palm tree	Plantain	Market gardening crops
Bokito	100	86.7	14.7	0.7	1.4
Zima	100	96.2	14.5	39.7	11.9
Ngomedzap	100	89.1	-	32.4	8.4
Total	100	90.7	10.5	23.4	7.1

* Association of food crops: groundnut, maize, cocoyam, taro, egusi, yam, cassava, plantain

Source: Jagoret et al., 2009

Table 17: Intensity of diversification of cocoa crop by other crop inside cocoa plots

Number of other crops associated with cocoa crop	Number of farms (234)	Classes of diversification of the farm
0	4	Not diversified
1 to 3	79	Little diversified
4 to 5	75	Averagely diversified
6 to 12	76	Very diversified

Source: Temple et al, 2008.

Besides cocoa, other perennial crops and annual crops such as peanut, corn, cocoyam, egusi, taro, yams, cassava are grown in association for family consumption and only the surplus is sold (Table 18). Other

crops such as oil palm, vegetables (tomato and pepper) are produced in monoculture as cash crops. The plantain is produced in sole cropping system and in association depending on the intensification purposes.

Table 18: Crop rotation and income of 1171 cocoa-based farms in Centre region

Locality	Cultivated	Cocoa	Food crops	Palm tree	Plantain	Gardening crops***
Acreage (ha)*						
Bokito	3.5 ^a	2.0 ^a	1.6 ^a	0.5 ^a	0.9 ^a	0.6 ^a
Zima	6.1 ^b	3.8 ^b	1.7 ^a	1.5 ^a	0.8 ^a	1.1 ^a
Ngomedzap	6.8 ^c	4.1 ^b	2.4 ^b	-	1.4 ^a	2.4 ^b
Income (Fcf) ^a						
Bokito	678 233 ^a	495 445 ^a	96934 ^b	35000 ^a	54285 ^a	105500 ^a
Zima	1 019 936 ^b	778 419 ^c	55 502 ^a	32 723 ^a	25 348 ^a	194 531 ^a
Ngomedzap	742 149 ^a	572 289 ^b	60 169 ^a	-	57 481 ^a	38 400 ^a

* Calculated on a valid sample; ** Association of food crops: groundnut, maize, cocoyam, colocasia, yam, cassava and plantain;
 *** Both tomato and pepper crops; In the same column, values followed by the same letter are not significantly different at the 5% limit (Newman-keuls test)
 Source: Jagoret et al., 2009.

A variety of fruit tree species is found in cocoa-based farms in Centre region (Table 19).

Table 19: Evolution of density of trees and fruits species in cocoa-based farms in Centre region

Locality	Number of tree per ha		Number of species per ha	
	Total	Fruit trees	Total	Fruit trees
Bokito	274.4 ^a	225.5 ^b	38.6 ^b	22.8 ^b
Zima	149.0 ^a	110.1 ^a	36.7 ^b	17.0 ^b
Ngomedzap	102.7 ^a	32.5 ^a	29.3 ^a	5.3 ^a

In the same column, values followed by the same letter are not significantly different at 5% limit (Newman-keuls test)
 Source: Jagoret et al., 2009.

The main species in the cocoa-based systems are : orange (*Citrus sinensis*), Mango (*Mangifera Indica*), Safou (*Dacryodes edulis*) ; oil palm tree (*Elais guineensis*), advocado (*Persea americana*), cola (*Cola nitida*).

Other species not commonly encountered are : citrus specially lemon (*Citrus limon*), mandarin (*Citrus reticula*), grapefruit tree (*Citrus grandis*) ; local trees including aiele (*Canarium occidentale*), andok (*Irvingia gabonensis*), Njansang (*Ricinodendron heudelotii*), obatoan (*Voacanga africana*) ; other fruits including goyava (*Psidium goyava*), Cassamangue (*Spondia cytherea*), Sursop (*Annona muricata*) ; papaya (*Carica papaya*).

Key findings

The main evolution patterns of production systems exist in Field Site I and Field site II.:

- In forest area, during the clearing of the forest, some trees are preserved (indigenous fruit, medicinal plants, woody species) to provide low shading to young cocoa and also for their economic or social value. The combination of annual crops (maize, groundnut, plantain) is practiced in some cycles. At the same time, farmers introduce several fruit species that will grow in association with cocoa and forest

species retained at the origin. This set in a few years an agroforestry cocoa system which system represents 96.4% of the farms in the centre region (Jagoret et al., 2006).

- In peri-forest area, the development of cocoa farming system is different. The species with dense shading and the annual and perennial crops originally installed to eliminate and control *Imperata cylindrica* are gradually replaced by forest species or fruit trees with low shading (Jagoret et al., 2007). These species allow farmers to diversify the system while protecting the young cocoa trees through the establishment of suitable shading.
- Following the crises on the cocoa sector, producers have promoted the extensive production systems while minimizing production costs through the reduction or elimination of phytosanitary treatments on the cocoa trees (Achancho , 2006).

Main challenges:

- Comparative and multicriteria evaluation of agro-economic and agroecologic performance of different systems of cocoa production
- Management of insect and pest diversity, disease severity in diverse systems of cocoa production
- Quantification of biodiversity of different cocoa production systems (sole crop or in association) of trees and or food crops
- Evaluation of carbon storage in a set of contrasted systems; □
- Understanding the perception of producers regarding the progress toward sustainable production systems
- Strengthening of farmers capacities on economic and environmental marketing capacity. □
- Developing stakeholders dialogue for identifying and overcoming constraints at various levels toward improving tradeoffs between production and tree diversity in agroforestry systems. □

4.5.3. COFFEE-BASED PRODUCTION SYSTEMS

The coffee based production systems are mainly developed in Field Site II (Southwest and Littoral) and Field Site III (West and Northwest Regions).

At the farm level, the coffee production systems are highly diversified with the presence of other cultures:

- Coffee + palm + traditional fruit (cocoa, kola, citrus, safoutiers, mango) coffee + food systems
- Coffee + cocoa + traditional fruit + food crop
- Coffee + cocoa + traditional fruit + food crop
- Coffee systems + food crop for consumption
- Coffee + food crop (cash crop)
- Systems associated with traditional breeding
- Systems with outdoor activity
- Systems with modern monogastric livestock

At the plot level, the coffee is grown in association with other plants or not:

- Coffee in pure system without trees or combination of food
- Coffee treeless but food crops
- Coffee in pure under shade light consists of small number of original forest species or introduced (Ricinodendron, Milicia excelsa, Pandanus).
- Coffee in combination with traditional trees
- Coffee in association with other plants such as coffee / cocoa / palm / fruit trees / tubers

The traditional food crop system consists of corn, coupled with a legume (peanuts or beans) and tubers (beans, cocoyam, yam, cassava). These crops are grown on ridges spaced in the fields of coffee or an entire food plot.

Key findings

Farmers have changed their production systems through development of different strategies:

- Strategy based on changing the system. The coffee is fully substituted by other crops with high added value (pineapple, papaya, pepper, flowers). They are mainly farmers who have few area of coffee production. They are limited by land saturation
- Strategy based on the diversification of the system (pineapple, papaya, pepper, flowers) on small surfaces and maintenance of coffee plots with fruit densification. The grubbing-up of coffee is not systematic and depends on the available land,

- Strategy based on the preservation of the system. The farmer maintains coffee and insures densification with fruit trees (kola and citrus preference). In this case, there is no significant agricultural investment.
- Strategy based on subsistence agriculture. This translates into a widespread intensification of perennials in the farm: coffee production, advocado, oil palm, safoutiers, citrus. Cocoa and kola (being very favorable in 2002) replace coffee as main cash crop
- Strategy based on external research income, by achieving an employment.
- Producers have favored the development of extensive production systems accompanied in that case by a reduction or even elimination of fertilizers on coffee trees.
- Diversification has also led to the transfer of family labor (especially in men) to food crops with a short cycle or gardening high commercial value (Achancho, 2006).

Key challenges:

- Supporting the ongoing diversification dynamics in coffee-based systems in order to improve their environmental sustainability and economic profitability.
- Improving farmers' crop management practices and the marketing conditions of new high-value products that emerge
- Developing the systems to evaluate the health quality of new agricultural products deriving from coffee-based systems
- Evaluating the overall profitability (economic, ecological) of coffee production systems (agroforest coffee production systems versus unshaded coffee production systems) and promote the most sustainable systems

4.5.4. Rubber-based Production systems

Industrial plantations dominate the rubber sector in Cameroon while 80% of the global production of rubber is from small producers (Chambon and Eschbach, 2009).

The main production system and strategies of small and medium-sized farms in the southwest region according to the importance of rubber cultivation in the acreage is presented below (Table 20).

Table 20: Typology of farms growing rubber in SouthWest Region 2002

Type	Strategy or production system	% of rubber in total farm acreage	% of rubber to farm income	Income 2002 (millions Fcfa)
Farmers without rubber	Diversification with cocoa and palm tree	0	0	1.7
New rubber farms	Mainly Rubber + cocoa (extensive)	67%	Marginal	0.83
	Mainly Cacao (sharecropping) + Rubber	36%	Marginal	2.3
	Mainly palm tree + Rubber + cocoa (extensive)	31%	Marginal	2.1
Old farms with extension and diversification	Rubber + cocoa (sharecropping) + palm tree	78%	79%	3
	Diversification Rubber + cocoa (sharecropping)	47%	17%	2.1
	Diversification Rubber + palm tree	44%	45%	2.1
Old farms with diversification	Rubber + cocoa (extensive) + palm tree	46%	54%	2.1
	Diversification Rubber + cocoa (sharecropping) + palm	33%	25%	6
	Main cocoa (intensive) + rubber	25%	13%	8.9
Farmers without capitalization	Rubber-based	91%	84%	0.9
	Cocoa-based (extensive) + rubber	27%	40%	2

Source: Chambon et al., 2002

Key findings

The peasant production is limited for two reasons: low productivity (900 kg / ha) compared to industrial plantations (1500 kg / ha) and low planted area which is 4000 hectares, or nearly only 10% of the total area of rubber in Cameroon.

Some plantations dating from the colonial era in the southern and eastern regions, plantations dating from the colonial era

Key challenges

- Improve access to credit and access to improved planting material of good quality
- Develop marketing channels for small farmers to avoid the monopoly of the main agribusiness
- Support the organization of producers
- Develop sustainable agroforest systems based on rubber plants and adapted to the capacities and needs of small farmers

4.5.5. Production systems of palm grove

Five types of farmers can be distinguished according to their strategies of implanting the palm grove (Rafflegeau, 2008)

- Type I: Farmers who fund the creation of their palm grove in their village before the age of 40, using a small investment coming from their recent activity. In so doing, they expect to get a first regular farm income.
- Type II: Rural farmers who use a modest income coming from their primary activity (agricultural or not) to fund the creation of palm grove before the age of 55. The strategy is to diversify and complement their initial income.
- Type III: Rural peoples under 55 years using family or employee savings to create a palm grove in their home villages. The strategy is to diversify and supplement their income, generating a first farm income.
- Type IV: The urban peoples, employees, retirees and dealers who fund the implementation of a palm grove with their personal savings. They settled at any age in their village of origin or elsewhere.
- Type V: The urban peoples, employees, retirees and dealers who fund the creation of a palm grove with significant capital available to them. They settled between 40 and 55 years in their village of origin or elsewhere.

Palm production is also associated to several strategies of land conquest for implanting palm grove

- Strategies of producers owners of secured land. They inplant their palm grove on customary secured land. They have no strategy of land conquest.
- Strategies "progressive colonization" which consist settle in a forest area near the road or track.
- Strategies to create a land reserve. They then locate their first plots to block the progression of neighbors and then reserves an area of forest to gradually value between the palm grove and the initial area of operations.
- Marking strategies in which, trees are quickly felled in 1 or 2 or 3 years in order to reach the forest acreage necessary to reach the acreage of palm grove needed.

Key findings

Several factors are limiting the yields in palm grove of villagers (Rafflegeau, 2002):

- Utilization of non-improved plant materials that produces only 60% of the potential of the improved plant material
- High mortality in juvenile phase, mainly due to rodents
- Deficiency in mineral nutrition of palms due to end of potassium or nitrogen due to previous food crops grown on the plot.
- Production losses due to poor organization of the harvest

The cultivation of oil palm can be profitable at all levels, especially for small producers. However, its large-scale development (industrial scale or extensive systems mismanaged) fears of environmental and social risks (Hoyle and Levang, 2012):

- The disappearance of forests with high conservation value and biodiversity. In Cameroon, most conducive to the expansion of oil palm areas are still covered with primary tropical forests rich in biodiversity and of paramount importance for conservation. So far, a relatively small part of the area has been exploited for timber or converted to agricultural land.
- The reduction of the permanent forest estate - Forest Management Units, Council Forests and Protected Areas.
- Social costs - negative impacts on local communities and plantation workers populations. Agro-industries currently looking for large tracts of land in Cameroon do not seem to provide for the involvement of smallholders in their projects.
- The costs and environmental risks - when the most stringent environmental standards are not met, the production of palm oil can have adverse environmental impacts on soil (erosion potential on steep slopes and in the South West) and water quality (pollution by effluents from mills and pesticides).
- Opportunity costs for the state: the loss of alternative income. The conversion of forest to produce palm oil, has a potential opportunity cost resulting from the loss of these alternative income (logging, mining, hunting, non-timber forest products) or potential (conservation concession, payments for environmental services, REDD, etc.).
- Loss of carbon / low-emission development

Key challenges

- Provision and dissemination of improved genetic material
- Adapt fertilization to the requirements of varieties and soil types
- Training of producers in technics of palm grove management and palm oil production
- Development of a financing system adapted to different actors of the value chain
- Rejuvenation of palm grove
- Modelization of agroecological and socioeconomic effects of different systems of palm grove production and exploitation
- Support for the local transformation of palm oil

4.5.6. Fruits and vegetables production systems in rural areas

Fruit (excluding bananas) focuses in value in the centre (24%) and the Littoral (21%) regions and secondarily in the West (18%) and South West regions (Temple et al., 2001) :

- In the Centre region, the main fruit production value is the plum (1080 million CFA francs). Other products include Orange (900 million), mango (408 million) and, to a lesser extent, papaya and pineapple
- In the Littoral region, the main products are mango (638 million), orange (504 million) and, to a lesser extent, avocado and pineapple.
- In the Southwest region, plum and orange are the most important products
- In the West region, avocado and safou are the most important fruits
- In the Littoral and Centre regions, the weight of pineapple and papaya have been underestimated because their consumption has increased significantly in recent years and the production exported to the international market is not taken into account

Vegetable production in Cameroon is much more concentrated than fruit: three Regions contribute for over 70% of the value of production. They are: the Western region (30%), the North and Centre regions (20% respectively) (Temple and al, 2001):

- In the West Region 63% of production is provided by tomato. The second production is potato (20%).
- In the center region 43% of the production of vegetables come from tomatoes.

Key findings

- Fruits' production is often integrated to agroforestry systems, combining other food or cash crops.
- Fruit trees constitute a substantial extra income when the production site has easy access to trading opportunity
- Fruits and vegetable production units modernize
- Pineapple, papaya and watermelon are experiencing a big boom in recent years
- The use of improved varieties has improved yields but production of fruit and vegetables is experiencing fields and post-harvest losses especially due to pest and disease constraints.
- The volumes of processed products or better conditioned products before sale are marginal

Key challenges

- Develop effective systems to better connect production areas to consumption areas
- Develop post-harvest technologies for packaging, preservation, processing, and marketing of products
- Develop effective management of pests and diseases systems
- Develop risk of pollution prevention systems and product quality evaluation and control systems
- Organize producers and stakeholders of the sector, and strengthen their ability to connect to markets and seize opportunities

4.5.7. Urban and sub-urban production systems

Case studies in suburban areas of Yaounde (Temple and al, 2008 Nguegang, Dauvergne, 2011) and Douala (Voice of the peasant, 2009; Pougoué Ngouzé E., 2010) helped to highlight the characteristics of these systems of production.

It covers a variety of crops:

- Ornamental horticulture is practiced in urban center and concerns flower production, cutting of flowers and fruit tree seedlings (Temple et al., 2008; The voice of the peasant, 2008; Dauvergne, 2011).
- Food crops (maize, yam, plantain) productions are performed on land covered by dry lands close to the cities to which is added the fruit growing in the more distant radius (mango, safoutiers, etc.). These vegetable farms maintain 200 to 2500 m² (Temple et al., 2008).
- Vegetable crops are produced in pure or associated particularly in areas of swampy lowlands. It is locally sourced vegetables (African nightshade, Jute mallow, etc.), lettuce, watermelon and aromatic plants (celery, parsley, etc.), spices (pepper, chilli) and African eggplant (asaa Nguegang, 2008)
- The rearing of pigs, rabbits, quail, cane rat (hedgehog), poultry and fish (La Voix du Paysan, 2009). Livestock farms owned by people who arrived for less than thirty years and have an extra main agricultural activity; they have not had access to land in the lowlands; they perform a breeding using little space: 200 to 300 chickens or pigs April-October; when they have access to land, then they grow food in combination: peanut, corn and cassava in particular for livestock (Temple and al., 2008).
- Production of mushrooms through soilless systems (Asaa Nguegang., 2008)
- Farms cash crop by indigenous who could keep their land facing the advance of the city. These farms are often converted into vegetable farms whose margins are significantly greater (Temple and al., 2008)

Suburban production is characterized by the following main factors:

- The plant material is often improved both in market gardening as well pig and chickens rearing
- The use of fertilizer or manure is systematic in farming as well as the use of concentrated feed in livestock production
- Except richer farmers who own a motor pump, watering is done by hand.
- The irrigation system is rudimentary and sophisticated to manage water and to avoid frequent flooding in the lowlands and diseases due to excessive moisture.
- Foreigners rent area in lowlands officially state property, from indigenous families. Renting a plot can cost about 15 000 FCFA per year and Nkolondom (suburb of Yaoundé) for example, the square meter costs 5000 FCFA to buy (Dauvergne, 2011).

Key findings

- Urban food agriculture is the foundation of food security for population with low incomes and an additional source of income for various stakeholders.
- The vegetable farms systematically use pesticides, organic and mineral fertilizers on high value crops.
- Yam is also a very important culture of urban agriculture in Douala (Temple and al., 2009; Pougoué Ngouzé, 2010)
- Urban and peri-urban vegetable farming in Yaoundé is profitable from the economic point of view: a vegetable producer can earn between 1935 and 4051 FCFA per working day depending on the type of production. A margin of 35 to 21% is observed among wholesalers and retailers respectively (Mvogo, 2004).
- The farms that generate the highest economic performance indicators are those that associate with horticultural activities of livestock activities.
- Peri-urban Agriculture is one of the most intensive systems of the country, but the potential for production and sustainable intensification of these systems is not currently reached

Key challenges

- Develop funding mechanisms to improve their facilities and infrastructure (work equipment, water supply, transportation equipment, packaging and marketing infrastructure)
- Raise awareness and strengthen the technical capacities of the stakeholders in the production, packaging, storage and marketing of these products.
- Develop risk prevention mechanisms and quality control of the products of this agriculture: risks of trace metals and pesticide residues, risk of chemical pollution of soil and water, etc.

4.5.8. Livestock systems

The description of farming systems is based on the Cameroon's National Report on Animal Genetic Resources' livestock (FAO, 2003) and according to experts.

Ruminants' farming systems

The ruminant livestock is based on four main systems:

- Cattle associated with small-scale agriculture. It is practiced by farmers who have settled and whose main activity is farming which they combine small subsistence farming. This type is more prevalent in the Northwest, West and Southwest regions.
- Small ruminants associated with agriculture. It occurs throughout and farmers generally have small ruminants in variable sized numbers ranging from 4 to 15 small ruminants. In the west region, the animals are kept in pens during cropping season, while in other regions (Centre), animals are constantly straying, day and night and in all seasons.
- Livestock by delegation or fostering. Traders or city living officials sometimes have more or less important flocks entrusted to the shepherds who care entirely.
- Suburban farming systems of cattle and small ruminants. They take place nearby cities. They are less important than in the northern cities and moving towards milk production or fattening small ruminants for religious celebrations.

Swine breeding systems

Pig rearing is concentrated in the western and the Northwest regions which has been counting 70% of the national herd for the past 20 years. The humid forest zone is has about 1/4 of the national pig population.

Swine breeding systems are of three types:

- The traditional peasant farming occurs in 44-64% of farms in the west and northwest regions. Each farm has an average of 1-5 sows (Vancoppenolle 1991 cited by FAO, 2003). In the southwest region, the pig farms have between 4 and 9 individuals.
- Semi-intensive farming is found in 25% of pig farms in the West and 21% in the North West regions respectively. Each farm has an average of between 6 to 15 sows.
- Intensive farming is modern (Vancoppenolle 1991 cited by FAO, 2003). Piggeries meet the standards and animals are of improved breed.

Poultry farming systems

- The traditional poultry farming is characterized by a very large variation in numbers throughout the year particularly because of Newcastle disease epizootic diseases and the absence of vaccination.
- Semi-Intensive breeding. Average number by farm vary from a few dozen to 1,000 subjects, it is the fact of peasants, small-class civil servants, small traders, housewives, unemployed, etc., operating a small corner of their concession to produce eggs or broilers.
- Industrial breeding. It is practiced by true professionals. These farms have each tens of thousands of individuals. They are specialized in one or more types of production and supply almost all of the eggs consumed almost entirely in Cameroonian cities, and also supply the market in neighboring countries (Gabon, Congo, CAR). They are connected to specialized units (parental farms, hatcheries and feed mills). These farms are found almost exclusively around the three major cities of Bafoussam, Douala and Yaoundé.

Summary of key findings on livestock

- Integration of cattle on farms is still marginal, as well as the practice of ranching
- The development of intensive livestock systems is limited to urban and peri-urban zones.
- Traditional farming is limited by diseases and epidemics that continue to decimate livestock

Summary of key challenges on livestock

- Develop and support appropriate integration models of livestock farming to different types of farms
- Train rural producers to intensive production techniques
- Develop credit systems for every type of farming.
- Facilitate access of traditional farmers to inputs and veterinary products
- Encourage monogastric livestock and other short cycle animals (rabbits, guinea pig, cane rat, quail, ducks, etc.) to increase the availability of protein in rural households

4.6. Main constraints to productivity improvement

4.6.1. A weak and ineffective national seed system

The seed system in Cameroon is regulated by Laws (Law No 2001/014 of 23rd July 2001 relating to seed production and marketing; Law No 2003/003 of 21st April 2003 on phytosanitary protection), several ministerial decrees, and the joint Order No 380/MINADER/MINCOMMERCE of 7th August 2006 laying down specifications for production, importation and marketing of seeds.

This regulatory framework has organized the seed system as follow:

- The quality of any seed marketed in Cameroon is checked by MINADER. Quality control tests and those related to seed certification are performed by IRAD or laboratories approved by Minader-Minresi.
- IRAD and "accredited seed growers institutions" are responsible for producing and making available pre-basic seed and basic comply with the legislation.
- Basic seeds are used by other "seed growers institutions" and "seed growers farmers" to produce "certified seeds" for final producers
- "Basic seeds" and "certified seeds" produced in Cameroon must be certified by the MINADER.
- A practical guide specifies the requirements for integrating seed production chain (MINPMEESA 2008)

Except vegetable seeds (cabbage, parsley, tomato, watermelon, etc.) that are imported and cash crop seeds (coffee, cocoa, palm oil, rubber) whose production is well supported and framed, certified seeds for food crop and fruit culture of good quality are rare and are accessible only by a minority of producers. This is a major obstacle to improving productivity.

Key findings

Producers typically use improved seed for cash crops (coffee, cocoa, oil palm, rubber, gardening). They use improved seed for food crops depending on the availability of these seeds and their financial capacities to buy them. Some actions have been made by MINADER to provide improved seed to farmers. But those actions need to be increased significantly before impacting the growth of national agricultural productivity.

In Mezam division:

- About 56 000 cuttings were received by MINADER from IRAD and distributed to some farming groups.
- 87 000 coffee seedlings were bought by MINADER and distributed to enhance creation of new farms.

In Momo division,

- A quantity of 6.3 tons basic seeds of maize were produced and distributed in the Division in 2013.
- 30 000 cuttings of cassava were received and distributed to some farming groups in the division
- 43 000 coffee seedlings were bought by MINADER and distributed to farmers to create new coffee farms in the Division. In addition, close to 57 kg of coffee seeds were distributed to farmers in 2014
- 14 312 cocoa seedlings has been acquired by MINADER and distributed to farmers in 2013

In Mungo division

- Supply of 42 bags of 50 kg of inorganic fertilizers to farmers
- Distribution of 400kg of maize planting materials to seed multipliers and distribution of 35,000 coffee seedlings and 126,000 for cocoa seedlings.

In Ngoketunjia

- An annual average of 48.85 tons of improved seeds of maize were produced in the Division between 2010 and 2013 by seed multipliers for distribution. Among these, 38.44 tons were acquired and planted in the Division while 10.41 tons were sold out of the Division.
- 1.06 tons basic maize seeds were produced and distributed in the division between 2009 and 2013.
- 37.06 tons of improved rice seeds were distributed (or sold) per annum to farmers in the Division. Seeds were provided by UNVDA, MINADER and IRAD Nkolbisson.
- An annual average of 59 400 coffee seedlings produced within the Cocoa Coffee Seedlings Project were bought by MINADER and distributed to farmers to create new coffee farms in the Division. In addition, close to 100 kg of coffee seeds were distributed to farmers over the past four years.
- During the past 4 years, an average of 2250 cocoa seedlings was been acquired by MINADER and distributed to farmers.
- Two groups bought 65kg of basic seeds of Solanum potato from IRAD Bambui for multiplication in Bamunkumbit. 208 kg of commercial seeds acquired for ware production in Balikumbat

In West region

- Some producers have also use improved maize seeds (Kasai and Shaba) bought from authorized seed services, and seed of new bean varieties popularized by IRAD: mainly Mak 33 ECAPAN, Mex 142
- For plantain, they use offspring and PIF plant materials
- For perennial crops: coffee and cocoa seedlings planted today by most producers are improved seedlings from improved varieties available to them by the CAPLAME.

In centre region

- Seeds are either are selected (case of pre-germinated seeds of palm oil produced by IRAD, case of improved cocoa planting material produced by specialized nurseries of SODECAO and by some producers groups from good pods harvested through selection in field), or locally produced from crops plants already in production.

Key challenges

Sustainable solutions to be provided by the state must be up to the following main brakes that limit access to producers to certified / improved fruit trees and other crops seeds:

- Insufficient supply of pre-basic and basic seed
- The low capacity (financial, personnel and infrastructure) of the state structures to produce pre-basic and basic seed
- The low technical capacity and the lack of experience on "seed production facilities" approved at the national level
- A low recognition / integration of producers in the creative process and variety selection
- The lack of support to "seed growers farmers"
- Seed control system is poor, resulting in the sale of seed not satisfying the market as compared to certified seed
- The fraudulent sale of non-compliant seeds under a certified label

4.6.2. Strong pressure of parasites and diseases

Key problems

- Pest and diseases in crops are serious problems including arthropods, birds, mammals, weeds, fungi, bacteria and even viruses in the Action Site (Table 21). The tables of pests and diseases per Field Site are presented from Annex 21 to Annex 28.
- In Mezam division for example, post harvest losses due to rotting weevils and rodents damage are as high as 40 % for cereals. For Colocasia, yield reduction due to phytophthora chlorosis is up to 60%.
- Pest and diseases are also a major concern in livestock production systems (Table 22).
- In Mungo division for example, 841 sick animals were reported in 2013 due to different diseases and parasites: Foot and Mouth Disease (74 cases); pest of small ruminants (21); newcastle disease (432); Streptothricosis (4); Bovine trypanosomiasis (90); bovine babesiosis (56); Faciolosis (82); others internal parasites (50); ectoparasites (32)
- Access to chemicals and proper management of pest and diseases is still difficult for producers situated at countryside or not involved in market-oriented production systems

Key challenges

- Bring actors to enforce plant protection laws and/or decision
- Prevent arrival of illegal, obsolete and banned chemicals in the market
- Train farmers on ways to prevent the misuse of chemicals and their negative impacts
- Develop effective integrated pest management as part of new ecological and intensive production systems (see Munier-Jolain and Dongmo 2010; Dongmo and Munier-Jolain, 2011)
- Facilitate access to credit to encourage producer to seek and purchase proper chemicals or to experiment new intensive and sustainable production systems

Table 21: Major crops pests and diseases encountered in the Action Site

Major crops	Major pests	Major diseases
Cocoa	Stem borers, defoliating caterpillars, mirids/capsids	Black/brown pods
Coffee	Defoliating caterpillars, mites, mealy bugs, bugs, coffee berry borers	Anthraxnose, la rouille
Rubber	Mealy bugs, defoliating caterpillars, ants, urticating caterpillars	Phytophthora, root rot
Taro / Cocoyam	Corm beetles	Corm rot, leaf rot
Tobacco	White grubs, defoliating caterpillars	Damping-off, cercospora, fusarium wilt, mosaic, bacterial wilt
Banana/Plantain	Borer weevils, mealy bugs, aphids, snails	Cercospora, BBTD,
Tea	Mealy bugs	Cercospora, Oligonychus coffea
Sugar Cane	Mealy bugs, white grubs, silky cane weevil	Mildew, rust disease, Mosaic, red rot
Ground nut	White flies, aphids, grasshopper, termites, defoliating caterpillars, beetles/weevils	La rosette, Cercospora, rust disease
Maize	Boring caterpillars, bugs, aphids, birds, grain weevils, rats	Damping off, mildew, cercospora, alternaria disease, mosaic
Tomatoes	White flies, defoliating caterpillars, burrowing caterpillars, carpophage, aphids	Damping-off, mildew, cercospora, bacteria/fungal wilt, alternaria disease, mosaic
Solanum potatoes	White grubs, rongeurs, beetles, aphids	Mildew, Damping-off, fusarium wilt, virus attack
Sweet potatoes	Sweet potato weevil, defoliating caterpillars	Virus attack on vines and leaves
Pineapple	Mealy bugs, white grubs	Root and stem rot,
Citrus fruits	Fruit flies	
Avocado	Mealy bugs, fruit flies, bugs, white flies, grasshoppers	Anthraxnose, cercospora, bacterial chancre
Mango	Mealy bugs, white flies, bugs, fruit flies, defoliating caterpillars, mites	Anthraxnose, cercospora
Papaya	Mealy bugs, fruit flies	
Onion	Thrips	Mildew, alternaria disease, rust, aspergillus
Cassava	Mealy bugs, grasshoppers, termites, white flies	African mosaic, blight, rottenness, anthracnose
Yams	Mealy bugs, beetles	Anthraxnose
Taro		Leaf rot
Cocoyam		Corm rot
Rice	Crickets/grasshoppers, caterpillars, grey grubs	Blast, rhizoctonia / Black scurf, yellow mottle virus
Pepper	Fruit flies, white flies	Fungal wilt
Leafy vegetables	Defoliating caterpillars, snails, aphids	Leaf rot
Oil palm	Leaf miners, palm weevil	Ganoderma, fusarium

Table 22: Major animal diseases, parasites and pests encountered in the Action Site

	Pests and diseases	Control methods
Large ruminants	Lumpy skin disease	Vaccine
	Rinderpest	Vaccine
	bovine pasteurellosis	Vaccine
Small ruminants	Small ruminants pest	Vaccine
	Diarrhea	Compliance with hygiene measures
Pigs	African swine fever	Compliance with hygiene measures
	Swine erysipelas	Vaccine and Compliance with hygiene measures
Fowl	Gumboro disease	Vaccine and Compliance with hygiene measures
	Coccidiosis	
	Newcastle disease	
	Fowl pox	Vaccine
	Fowl thyphoid	
	Fowl cholera	Vaccine
Rabbits / Cane rats	Scabies	Vaccine and Compliance with hygiene measures
	Anal ringworm	
	Mastitis	
	Conjunctivitis	
	Pneumonia	
	Coccidiosis	Vaccine and Compliance with hygiene measures, coccidiostatics
Diseases common to several species	Foot and mouth disease	Vaccine
	Avitaminoses	Good feeding practices, vitamin supply
	Lameness	
	Diarrhea	Deworming, Compliance with hygiene measures
	Ectoparasitosis	Chemicals
	Endoparasitosis	Deworming

4.6.3. Poor management of soil fertility

Key Findings

The management of soil fertility is a key factor in productivity well recognized by the producers.

Fertility is managed in several ways:

- Crop association and development of agroforest production systems, mostly based on coffee (Field Site I) and cocoa (Field Site II) systems, or in shifting cultivation (Field site I).
- Use of organic manure and inorganic fertilizers are primarily for food and vegetable crops for sale. The organic material consists of household wastes and faeces of domestic animals (Traditional poultry, pigs, small ruminants). For crops for sale (garden produce, Potatoes, corn), the use of chicken manure purchased from intensive poultry farmers tends to widespread but the main gap is unavailability and high cost. The use has grown during recent decades in the Field Site II, and since some years in saturated or suburban areas of the Site Field I.

- Use of mineral fertilizers in both crops. But the crisis of the coffee and cocoa sectors, liberalization of cocoa and coffee sectors and the devaluation of the CFA Franc currency have severely limited the use of fertilizers. The quantities supplied by agrodealers are still limited regarding the acreage of the division (Table 23, Table 24).
- Integration of fallow in crop rotations (in the zone with middle and high population density)
- Itinerant slash and burn cultivation Systems (in peri-forest with low density)
- An overview of quantification of farmers' practices of soil fertility conservation is presented in Annex 29.

The main causes of deterioration of fertility include:

- Monoculture and deforestation that facilitate erosion and decline of soil organic matter. According to (Liéno et al., 2002), the amount of erosion is between 5 to 14 tons / km² / year in closed forest region.
- Poor farming practices and misuse of pesticides and fertilizers that reduce the soil biological activity
- Continuous cultivation and removal of biomass (through harvesting) without appropriate restitution (through supply of organic matter)

Key challenges

The main ways of improving soil fertility are among the following:

- Carry out a deep diagnosis to understand the current practices of soil fertility management and use of organic and mineral fertilizers.
- Provide information and data relative to current levels of use of organic fertilizers and mineral fertilizers.
- Develop crop-livestock integration models adapted to the size of farms and the socio-economic context (see Dongmo 2012a chapters 2 and 3; Dongmo et al., 2012b).
- Exploit these models to conceive and manage the crop-livestock integration in each farm (see Dongmo et al., 2012a, Dongmo et al., 2012b)
- Exploit these models to build the resource exchange (fodder, crop residues, animal manure) between the exploitation of farmers and ranchers (Field Site II and III) or between farming communities and farmers (see Dongmo et al., 2012a)
- Develop value chains from production to recovery of monogastric organic manure in farms (in Field Site I and Field Site II, and in saturated and peri-urban areas of the Field Site I)
- Develop the much-based cropping systems that are appropriate to increase the carbon stock in soil and reduce erosion (see Mbiandoun et al., 2010)
- Develop systems of access and of reasonable use of organic and mineral fertilizers

Table 23: Agrodealers of inorganics fertilizers in Momo

Economic operator	Type	Quantity sold (bag of 50 kg)
Ndam Manases (Guzang)	NPK (20.10.10)	75
	NPK (13.11.27) for tubers	80
	Urea	20
	Sulphate	10
	NPK (12.6.20)	10
E P A	NPK (20.10.10)	260
	Urea	128
Asanji godfred	NPK (20.10.10)	186
	NPK (11.11.25)	50
	Urea	356
Momo cooperative union	NPK (20.10.10)	245
	NPK (24.8.15)	116
	Urea	168

Table 24: Acquisition of inorganic fertilizers in Ngoketunjia (units in tons)

	2010	2011	2012	2013
Through private dealers				
NPK (20 10 10)	80.0	60.0	80.0	100.0
NPK (14 24 14)	6.5	3.5	10.0	15.0
Urea (46%)	85.0	55.0	90.0	110.0
Acquisition through UNVDA:				
NPK (20 10 10)	152.50	152.50	218.65	196.40
Urea (46%)	133.00	133.00	169.55	178.60
Yara Mill			15.73	8.78
Acquisition through MINADER				
NPK (20 10 10)	-	37.45	-	-
NPK (14 24 14)	-	26.30	0.95	-
Urea (46%)	16.50	11.15	0.85	-
Total	473.00	478.19	585.73	608.78

V. MARKETS, INSTITUTIONS AND POLICIES

5.1 Summary facts on agricultural markets in Cameroon

Agricultural markets especially for food crop and horticultural products are informal and operate at various scales on a one to one basis. Many efforts have been made by MINADER to promote group sales and organization of agricultural markets but even so, they remain largely small scale, disorganized and self-motivated. Since in Cameroon there is no clear delineation of agricultural market practically, structurally and institutionally, urban areas, food markets and public spaces like road sides are the main markets of agricultural products as per our definition. It is important to capitalize and define the volume of sales as per these various markets. Thus urbanization is one important factor that can promote agricultural markets especially for food commodities. Almost all the towns with more than 50000 inhabitant in 2005 registered at least twice its population between 1976 and 2005. The only exception was the case of Nkongsamba, the capital city of Mounjo division and Cameroon's 3rd town in 1976, whose demographic growth continue to drop from 1.8% in 1976-1987 to 1.1% in 1987-2005 (BUCREP, 2010) (Table 25).

Table 25: Internal markets within field sites – cities with population of more than 50000 inhabitants in 2005

Cities	Population statistics			Average annual growth rate of city (%)	
	RGPH 1976	RGPH 1987	RGPH 2005	1976-1987	1987-2005
Field site 1					
Mbalmayo	22 075	35 390	52 813	4,4	2,2
Field site 2					
Tiko	14 810	23 559	60 796	4,3	5,2
Limbe	26 988	44 561	84 223	4,7	3,4
Buea	24 584	32 871	90 088	2,7	5,6
Nkongsamba	70 464	85 420	104 050	1,8	1,1
Kumba	44 175	70 112	144 268	4,3	4,0
Field site 3					
Dschang	17 814	35 717	63 838	6,5	3,2
Bafoussam	62 239	112 681	239 287	5,5	4,1
Bamenda	48 111	110 142	269 530	7,8	4,9

Using these criteria of urbanization and population level, the number of agricultural markets within field sites is classified on Table 26. It is important to note that the urban areas are capitalized for the entire region meaning that it is being considered that agricultural products are hardly marketed where they are produced but are rather transported to the closest urban area and sometimes across regions.

Table 26: Urban areas per field site - markets

Size of city	Number of cities					
	Cameroon	FS 1	FS 2		FS 3	
		Centre	Littoral	SW	NW	West
< 1000	27	11	3	3	0	1
1000 – 1999	39	12	2	2	3	4
2000 – 2999	30	8	3	2	1	5
3000 – 4999	51	12	5	4	3	2
5000 – 7499	39	1	1	7	7	6
7500 – 9999	24	4	1	0	3	4
10000 –14999	25	4	1	1	6	3
15000 – 19999	21	6	1	2	3	2
20000 – 34999	24	1	3	1	3	3
35000 – 49999	9	1	2	1	0	2
50000 - 74999	8	1	1	1	0	1
75000– 99999	6	0	0	2	1	1
100000 – 199999	3	0	1	1	0	0
200000 – 499999	4	0	0	0	1	1
500 000 – 999999	0	0	0	0	0	0
1 000 000 >	2	1	1	0	0	0
TOTAL	312	62	25	27	31	35
		Total FS 1 = 62	Total FS 2 = 52		Total FS 3 = 66	

Looking at Table 26, field site 3 had the highest potential of having more local markets for agricultural products because it presented many more urban areas. However, field site 1 and 2 present a unique advantage that they also have the biggest cities in the country meaning they had a bigger market. In all, one thing that influences these market is the level of accessibility of FS and villages and their proximity to the borders or to the national or economic capital of the country.

Out of the action site, a lot of food products go to the three Northern provinces especially from FS 3, which naturally have a conducive environment for the cultivation of many food crops. Passing through these provinces these products go right beyond borders to Chad and Northern Nigeria in some cases. There are also renown trans boundary markets in the three field sites in Ekok (FS3), Edenau and Ekondo titi (FS 2) in the Douala air and sea port (FS and 3) in the littoral region and the Ambam Kye-ossi market (FS 3 and 1) in the South region. It should be noted that FS 3 is a big producer of many food and vegetable products with limited markets for their productivity. Food products leave the FS for these border markets on a daily basis. There is no particular preferred route as buyers and sellers carry the products to the markets at their discretion and ease of transaction. Most marketing transactions of agricultural products are hampered by the lack of appropriate transportation equipment, unclear policy and legal framework which leads to some extortion of product dealers, transporters and subsequently farmers by administrative authorities.

5.2. Presence of extension support and development agencies

Data on institutional inventory was very complex as there was no clear distinction between institutions at the local level. There are 12 banks in Cameroon (MINEPAT and INC, 2011, WFP, 2007) with SGBC being the highest employer with 22.6% of the market followed by BICEC (20.3%), Afriland First Bank (13.8%), Cr ditAgricole SCB (12,5%), CBC (10,8%), ECOBANK (6,8%), Standard Chartered Bank (4.1%), CITIBANK and UBC (2.8%) AMITY Bank (2.6%) and NFC-BANK (0.9%). There also exist a host of other financial institutions, insurance companies and microcredit institutions and credit unions. At the level of the divisions it was most common to find credit unions and microcredit institutions than Banks (Table 27).

Table 27: Institutional inventory

Level	Number of				% Distribution of			
	NGOs	Micro finances	Credit unions	Coope-ratives /CIGs	NGOs	CIGs	Cooperatives	Associations
National					1.6	36.7	0.6	58.3
Center								
SW								
Littoral					0.5	14.2	1.4	81
NW					36.8	10.5	0	52.6
West					2.3	9.4	0.6	84.1
Leki�					19.6	25.5	3.9	49
Mefou et Afamba					0.5	20.7	0.4	77.1
Mefou et Akono	6			631				
Nyong et So'o	1	1		406				
Moungo	3	2		490				
Fako	12			302				
Meme	12			302				
Momo				325				
Mezam				280				
Ngoketundjia		3		210				
Menoua		27		405				
Haut Nkam				123				
Bamboutos	10	4		14				

Source: Computed from various council development plans

Market shares varied by financial sector. The banking sector had the highest share at 86%, the other financial institutions other than insurance companies had 5.6%, and micro finance institutions had 3.6% while insurance companies had 4.5%.

Generally the financial sector is characterized by weak saving over liquidity of banks, modernization of payment procedures and other means to improve on collaterals and credit schemes in order to promote credit to small and medium size entrepreneurs. A World Bank report of 2007 reports that the banking sector holds only 14.4 credits account per 1000 inhabitants lower than the level for low income countries. Performances at the level of credits are lower with only 355 accounts per 1000 inhabitants contrary to 423 counterpart countries with the same level of development like Cameroon. In Cameroon it was reported that 27.7% had access to credits whereas 97.8% were self-financing their agricultural activities and only 0.1% received credits from banks and cooperatives whereas 0.9 received credits from social saving groups (njangi houses) (WFP, 2007, IMF, 2013). This means that a majority of households who had access to credit were not agricultural households and those who receive the credits did not use it for farming purposes (Table 28).

Table 28: Extension, Credits and agricultural finance

Administrative level	% of Household								
	With access to credits	Self-financing agriculture	Receiving credit from banks	Receiving credit from cooperative	Receiving credit from social savings (njangi)	Receiving credit from minader	Receiving credit from others	With saving accounts	With access to technical support (minader)
National	27.4	97.8	0.1	0.1	0.9	0	1.1	40.2	56.9
Center									
SW									
Littoral	0.8	99.9	0	0	0.1	0	0	26	50.3
NW	6.9	85.5	0.1	0.7	5.5	0	8.2	31.2	67.2
West	25	99.3	0	0.2	0	0	0.5	22.5	82.6
Lekié	7.6	98.7	0.1	0	1.1	0	0	27.1	48.9
Mefou et Afamba	9.7	98.6	0.3	0	0.8	0	0.3	43.2	68.3
Mefou et Akono									49
Nyong et So'o									12.7
Moungo									
Fako									
Meme									31.5

Source: INS, 2008, various council development plans

5.3. Key policies and sectorial policies

The agricultural sector is regulated by Law N° 2003/003 of 21st April 2003 on phytosanitary protection, Decree N° 2005/0771/PM of 6th April 2005 fixing the modalities of execution of plant quarantine operations; Decree N° 2005/0772/PM of 6th April 2005 fixing homologation and control conditions of phytosanitary products; Decree N° 2005/0769/PM of 6th April 2005 on the organization of the Phytosanitary National Council; and the Rural Development Strategy Paper of 2006. Apart of these governing frameworks, other policies are designed for various sectors of the value chain from factors of production through production activities, processing, marketing and food consumption.

At the level of the seed, policies include:

- Law No 2001/014 of 23rd July 2001 relating to seed production and marketing;
- Decree No 2005/153 of 4th May 2005 on the creation, organization and functioning of the National Seed and the New Plant Variety Council;
- Decree No 2005/169 of 26th May 2005 on the creation, organization and management of Seed Fund;
- Decree No 2005/3090/PM of 29th August 2005 laying down the quality and missions of sworn-in seed control and certification officers;
- Decree No 2005/3091/PM of 29th August 2005 laying down modalities for production, quality control and marketing of seeds;
- Joint Order No 380/MINADER/MINCOMERCE of 7th August 2006 laying down specifications for production, importation and marketing of seeds;
- Joint Order No 381/MINADER/MINCOMERCE of 7th August 2006 laying down general norms of chemical treatment, storage, packaging and labeling of seeds;
- Decision No 541/MINADER/SG/DRCQ/SDRSQV of 7th September 2006 on the homologation of official technical regulation of the control of certain vegetable seeds.

Cameroon presents a variety of taxes with some specifics on economic activities and some special taxes for particular sectors. Overall, taxes and duties are grouped around direct taxes, indirect taxes and the quasi-taxes as presented in Figure 18.

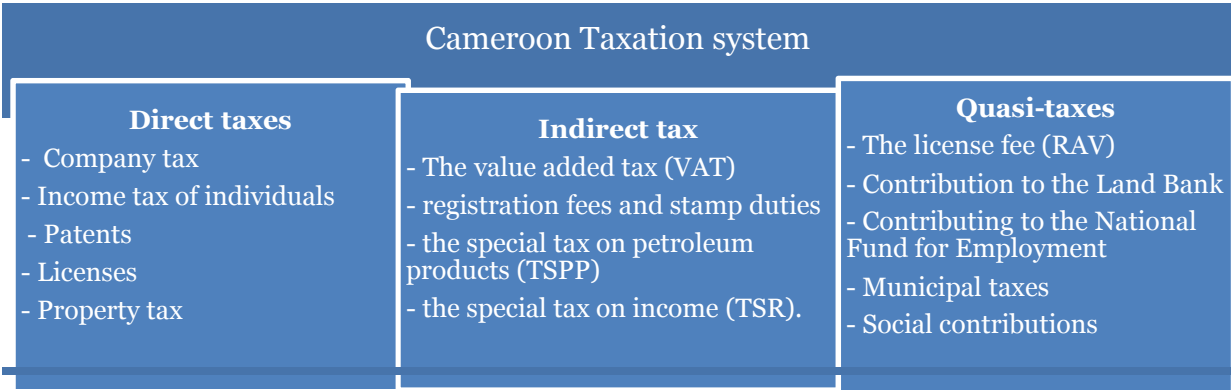


Figure 18: Cameroon taxation system

Law N° 2002/003 of 19 April 2002 on the general Code of Taxes and all its various modifications fine the various taxes per sector of activity. Small Agricultural activities are not often taxed even though large scale operators are entitled to some taxes mainly on land and on revenue. One of the major institutional frameworks affecting the agricultural sector is the National Governance Program (PNG) in Cameroon which is composed of decentralized and local development sub-commissions that liaises with the directorate in charge of councils in the Ministry of Territorial Administration and Decentralization (MINATD). MINATD aims at reforming and aligning the Cameroon administrative system to the advent of decentralization and is responsible for the development and leadership in all the administrative units.

The forestry and environmental sector affects agricultural land and most agricultural activities especially the expansion of farms and cash crop plantations. Forestry management is regulated by Law No. 94/01 of 21 January 1994 on forestry, wildlife and fisheries and decree of implementation of 95/531/PM of 23 August 1995 fixing the modalities of the application of the forestry law while the environment is regulated by Law N°96/12 of 05 August 1996 relative to environmental management in Cameroon. The application of these laws are complemented with other state laws such as:

- The taxation code and finance law;
- Ordinance No.74-1 of 6 July 1974 to establish rules governing land tenure;
- The criminal procedure code;
- The 1995 National Forest Action Program (NFAP) adopted in 1996;
- Constitution of January 18, 1996 of Cameroon;
- Decree N° 77/418 of 24 October 1977 creating and organizing the Local Government Centre, known by its French acronym 'CEFAM';
- Decree No 2000/365 of December 11, 2000 reorganizing FEICOM;
- Decree No 2006/182 of May 31, 2006 reorganizing FEICOM;
- Decree N° 2002/216 of August 24, 2002 to reorganize the government of Cameroon;
- Finance Law of The Republic of Cameroon, 1962;
- Law N° 74/23 of 5 December 1974 to organize councils;
- Law N° 2004/17 of July 22, 2004 on the orientation of decentralization;
- Law N° 2004/18 of July 22, 2004 to lay down rules applicable to councils;
- Law N° 2004/19 of July 22, 2004 to lay down rules applicable to regions;
- Law No 2006/004 of July 14, 2006 to lay down conditions governing the election of regional councilors.
- Other regulatory texts (orders, circulars and decrees) signed by various authorities as need arise

Two governance instruments oversee these laws:

- CONAC (2010) Stratégie nationale de lutte contre la corruption 2010-2015 CONAC
- PNG, (2006) The national governance program 2006 – 2010
- A host of other international agreements which do not have a direct effect

The Table 29 presents environmental and other procedures to which Cameroon has ratified and which could affect the agricultural sector.

Table 29: Ratification to international conventions

Date	Convention	Context/Source
June 2000	ACP-EC Partnership Agreement signed in Cotonou on 23 June 2000 / Revised in Luxembourg June 25, 2005	Linked to the Voluntary Partnership Agreement http://ec.europa.eu/europeaid/infopoint/publications/development/2b_fr.htm
2009	Economic Partnership Agreement	Occurred after the Lomé Convention in 1975 and initialized Cotonou Agreement concluded in 2000. Cameroon signed an interim EPA in 2009 http://ec.europa.eu/trade/wider-agenda/development/economic-partnerships/negotiations-and-agreements/#central-africa
21 march 1986,	Vienna Convention On The Law Of Treaties Between States and International Organizations or Between International Organizations	http://untreaty.un.org/cod/avl/pdf/ha/vcltsio/vcltsio-e.pdf Birth to the idea of COMIFAC
June 1992	Rio declaration on all types off forest and Agenda 21 of chapter 11	
	United Nations Convention on Biological Diversity	http://www.biodiv.org
	United Nations Convention to the fight against desertification	
19 October 1994	United Nations Framework convention on climate change	http://unfccc.int
2005	Treaty relating to conservation and sustainable management of forested ecosystems of Central Africa	COMIFAC Treaty http://www.comifac.org
2006	1971 convention on Wetlands of international importance	Identified a number of Ramsar sites
1981	Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES).	http://www.cites.org 05/06/1981 (A) and 03/09/1981
2007	United Nations Declaration on the Rights of Indigenous Peoples	Not yet adhering to the legally binding 1989 ILO Convention (No. 169), which is an international framework for indigenous peoples.

VI. NATURAL RESOURCES MANAGEMENT AND ENVIRONMENT

6.1 Natural areas and buffers, deforestation frontiers

The forest area of Cameroon is estimated at 196,000 km², 40% of the area of the national territory. The government under the Forest Code (Law N.94/01 of 20 January 1994) has undertaken to classify 30% of the country as permanent forest domain (that includes protected areas and production forests). The most extended land uses are logging, forest protection and agriculture (Figure 19).

According to Robiglio et al. (2010), 9.77 % of the national territory was gazetted as protected area (includes national parks, wildlife reserves or sanctuaries and forest reserves) while 7.70 % was gazetted as production forest (FMUs and council forest) and additional 7.63 % was already attributed or announced for exploitation (announced production forest). That corresponds to about 7.5 M ha of production forest, and 4.5M of protected areas.

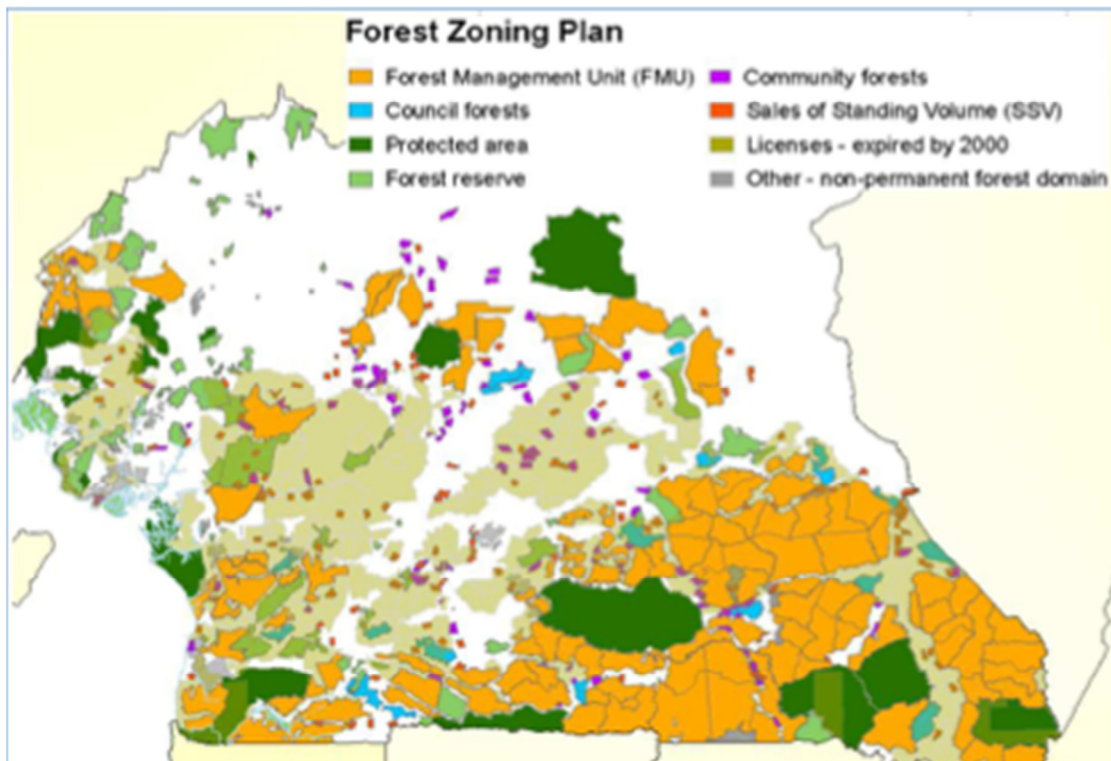


Figure 19: The forest-zoning plan in Cameroon. On the left side of the legend are management units in the Permanent Forest Domain. On the right side are Management units in the Non Permanent Forest Domain (Map obtained from Robiglio et al., 2010)

6.2 Deforestation and degradation of forest

The following indicators give an overview on forest loss and forest disturbance in Cameroon:

- The annual rate of deforestation has increased from 0.6% for the period 1990 –1995 to 1% for 2000-2005 (FAO 1997, FAO 2006 cited by Robiglio et al., 2010)
- Regarding degradation, FAO assessment (FAO, 2007) indicates that : only about the 25% of the forest is undisturbed ; only the 25% of the forest has a canopy cover higher than 70% ; about 30% has coverage of less than 40%. The FAO-FNMA report also indicates that clear-cutting is practiced on 0.1% of the forest surface and the rest of the exploitation is selective logging for about 4.8 M ha corresponding to the 22% of the whole forest surface.

The contribution of agriculture to deforestation and degradation of forest is through the following factors:

- Shifting cultivation and fallow-based rotational systems for food cash crops. Depending on subsistence requirements, each household cultivates a minimum of two new food crop fields a year and maintains a set of cultivated plots and natural fallows under various secondary vegetation stages (Robiglio et al., 2010)
- Expansion of annual cash crops systems in the peri-urban areas and in area easily accessible from national and regional urban centres.
- Increasing of large plantations (banana, oil palm) that are moving from their traditional regions (south west and Littoral) to new ones (centre and south regions)
- Increasing of small-scale plantations in particular oil palm in a context where agriculture is still mostly artisanal with low use of organic and chemical fertilisers and lack of improved varieties.
- Transformation of traditional agroforest systems of cocoa and coffee production into unshaded intensive systems.
- Increasing of production by expanding acreage cultivated at expenses of forest instead of increasing of the productivity of land and capital. Small-scale farms, new entrepreneurs and industrial palm plantations in peri-forest areas with low density of population are in this process. High development of industrial palm plantation may also have some risks (Figure 20).

Figure 20: Environmental risk of palm grove extension

The cultivation of oil palm can be profitable at all levels, even for small producers. However, its large-scale development (industrial or extensive systems mismanaged) may involve a number of risks (Hoyle and Levang, 2012):

- The disappearance of forests. In Cameroon, most conducive to the expansion of oil palm areas are still covered with primary tropical forests rich in biodiversity and of paramount importance for conservation. So far, a relatively small part of the area has been exploited for timber or converted to agricultural land.
- The reduction of the permanent forest estate - Forest Management Units, Council Forests and Protected Areas.
- Social costs - negative impacts on local communities and plantation workers populations. Agro-industries currently looking for large tracts of land do not seem to provide for the involvement of smallholders in their projects.
- The costs and environmental risks - when the most stringent environmental standards are not met, the production of palm oil can have adverse impacts on soil (erosion potential on steep slopes of South West) and water quality (pollution by effluents from mills and pesticides).
- Opportunity costs for the state: the loss of alternative income (logging, mining, hunting, non-timber forest products) or potential (conservation concessions, payments for environmental services, REDD, etc.).
- Loss of carbon / low-emission development

6.3 Demographic threats and opportunities on production systems and Natural Resources Management (NRM)

Population growth is a threat to natural resources, especially land, water and forests if poorly managed and unaccompanied. Based on the correlation model between population density and the developed level of agricultural intensification proposed by Yemefack et al., 2010 (Figure 21) we discuss the drivers of production systems changes in the Action Site and propose some ways of sustainable intensification.

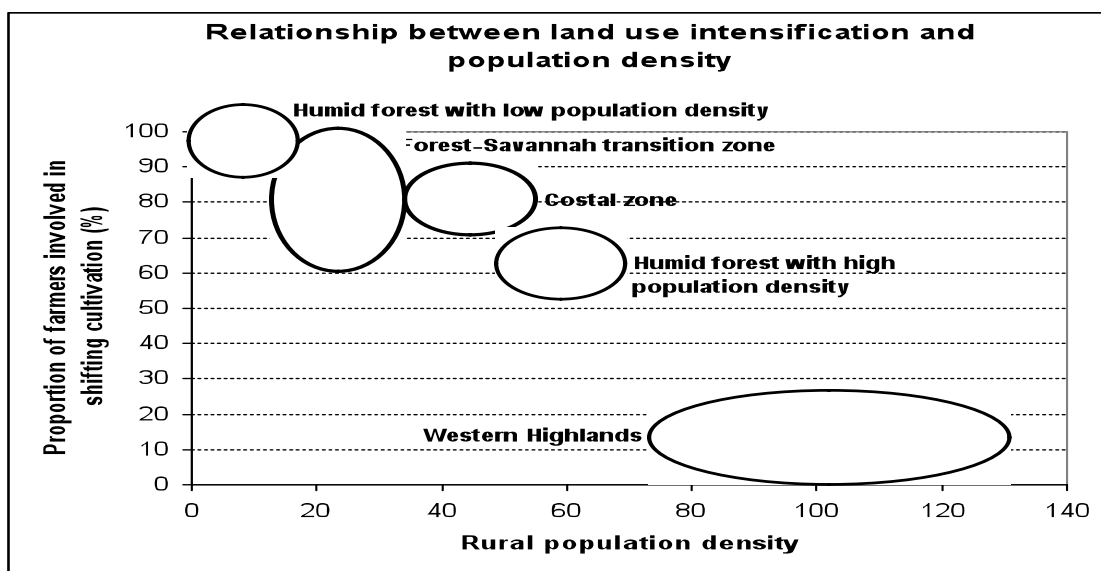


Figure 21: Relationship between land use intensification and rural population density (source: Yemefack et al., 2010).

The model is in line with the hypothesis of Boserup (1970) but with specificities related to the agro-ecological and socio-economic context of the Action site:

- Generally, intensive systems are abandoned as the land saturation increases.
- In areas with very high population density (West) most producers have moved towards semi-intensive systems based on associations and crop rotations, integration of tree in the system, the use of organic fertilizers and inorganic ones when accessible.
- In areas with very low density of population, the conditions of access to land are easy (accessible prices, clearing facility, availability of family labor, etc.) while the conditions of access to inputs and the market is difficult, producers maintain extensive systems whose ecological value can be strong (traditional slash and burn systems), medium (agroforestry systems cocoa production) or low (oil palm).
- Producers are willing to step up production systems where access to land becomes difficult or very expensive.
- Increased production is mainly done by the improvement of traditional techniques and know-how when the other inputs remain generally unchanged (non-existent or difficult to access capital, rudimentary tools, support from state is low or absent).
- The modernization of technics and means of production is progressive when producers have better access to the market. Whereas it's quickly blocked when other factors of production are not improved by the state.
- In the absence of improved production conditions, the intensification process is essentially slow and leads actors to turn to adaptive and opportunistic strategies such as:
 - Migration to unsaturated agricultural areas and rural exodus
 - Land accumulation by agricultural clearing and persistence of slash and burn agriculture in unsaturated or moderately congested areas.

The priority actions to be developed for all regions are:

- Identify, design, evaluate and disseminate ecological intensification technologies (integrated crop-livestock systems; intensive agroforestry systems; culture systems on land cover, etc.) most appropriate for each context
- Facilitate producers' access to these ecological intensification technologies and post-harvest technologies (conservation, processing, packaging and marketing of products)
- Strengthen the technical and organizational capacities of stakeholders through training, information and awareness on good agricultural practices, post-harvest technics as well as marketing approach.
- Develop adapted systems for access to loan, equipment and inputs
- Organize producers and agricultural value chains to strengthen regional capacities concerning access to agricultural markets and meet stakeholders' expectations in term of quality and quantity.

6.4 Water availability and management

Main features on water availability and management in Cameroon the following:

- In 2009, the total estimated withdrawal of water for consumptive use in Cameroon was about 0.46 % of the internal renewable water resources (MINEE & GWP, 2009).
- Agriculture is the predominant water user accounting for about 72 % of all the water withdrawn.
- Unfortunately agricultural water resources are often overused and misused, especially in irrigated agriculture. The average application efficiency of irrigation is about 30 % (Fru Fontey, 2012)
- About 70 % of the water mobilized for irrigation is wasted through deep percolation or as runoff. (Fru Fontey, 2012)
- Despite the highly variable rainfall, and incidences of droughts, food production in Cameroon is almost entirely rainfed, with little investment in managing soil moisture. MINEE & GWP (2009) estimated that only about 0.44 % of cultivated land in Cameroon is irrigated.

According to MINEE & GWP (2009) cited by Fru Fonteh (2012), the main water resources problems in Cameroon in order of decreasing importance were:

- Reduction in surface water flow especially in the dry season due to reduced soil cover, climate change, increased evaporation and sedimentation;
- Reduction in ground water recharge due to climate change and increased evaporation;
- Increase in the turbidity of water resulting from erosion;
- Water borne diseases;
- Pollution of surface water resulting from spills during the transportation of petroleum products and from used engine oil dumped in watercourses. In river basins with intense agricultural activities; eutrophication of surface water, partly as a result of soil erosion and fertilizer use; and surface water pollution by pesticides from runoff from agricultural lands are also important problems

6.5. Non timber forest products management

The Non-Timber Forest Products (NTFP) or Non-Wood Forest Products (NWFP) are Spontaneous forest products of biological (vegetable and animal origin), other than timber, derived from forests, and other wooded land and trees outside forests (Ingram and Schure, 2010).

6.5.1. Plant NTFPs

From an estimated amount of 3000 plant species identified in Cameroon, some 181 plant products can be termed NTFPs and are regularly sold in the markets (Betti, 2007 cited by Ingram and Schure, 2010). A certain volume and species of this NTFP are traded internationally including in France and Belgium.

NTFPs are sold in majority for food consumption (44%) and Medicinal use (29%) (Betti, 2007). According to CIFOR review (Ingram and Schure, 2010), the food NTFPs include:

- *Gnetum africanum* and *Gnetum buchholzianum* (Okok / Eru)
- *Dacryodes edulis* (Safou)
- *Garcinia kola* (Bitter Kola)
- *Cola acuminata* and *Cola nitida* (Kola nut)
- *Ricinodendron heudelotii* (Ezezung/ Njansang)
- *Irvingia gabonensis* (Bush mango)

NTFPs are collected by almost all small rural producers and used either for self-consumption, marketing, for the pharmacopoeia, and building of houses.

Women and young people have a very active part in the collection and gathering products from biodiversity

Regarding okok/Eru for example, a study conducted in Thirty-eight villages from three sub-divisions of the Lekie division (Chupezi Tieguhong et al., 2011) shows that

- Collectors of okok were mostly young people with mean age of 25 years with overall range of 11-60 years. 89% of them are women.
- Okok harvesting was considered by 29% of those interviewed as a major occupation.
- For the 101 harvesters studied, 80.2% retained part of the okok harvested for personal use, mostly for cooking (74%); the rest was given as gifts to friends and relatives.
- Typically, gross annual income from okok varied considerably from one harvester to another with about 58% of them getting less than 200000 CFAF and 17% getting more than 400000 CFAF per annum

The project of domestication of Okok (*Ngnetum africana*) is in the process of restoring hope for the sustainable conservation of this resource because many women in the province have planted at least a small area (400-600 m²).

6.5.2. Animal NTFPs

Indigenous people hunt wildlife for self-consumption or marketing. The table of Key animal NTFPs species has been developed by CIFOR (Ingram and Schure, 2010). The estimated annual volume of Bush meat in the humid zone of Cameroon is around 1233.26 tons (Table 30). The proportion of bushmeat biomass consumed varies from 34% to 63% while the remaining part is sold (Nasi et al., 2011).

Table 30: Volumes and values of bushmeat, Cameroon

	Annual Volume (Tons)	Value FCFA (Market value)	Date	References
Dja, East	12.71	11,434,500	2004	Vermeulen (2009)
Lebialem, Southwest	-	-	2007	Wright (2009)
Littoral, Centre, SW (Korup & Cross River)	674.56	608,303,595	2002-2003	Fa et al (2006)
Takmanda, Southwest	-	417,641,603	2000 & 2001	Ayeni (2001)
	-	250,000,000	2003	GFA (2006)
Banyang Mbo, South west	22.39	50,779,476	2006-2007	Aubighe (2007)
	-	38,377,199	1999-2002	Wilcox (2007)
Lobeke, East	484	43,914,000	2007	Tieguhong (2009)
Yaounde markets (Centre & North)	7	35,710,369	2005	Edderaï (2006)
Cameroon Humid zone estimated*	1233.268	1,417,783,543	2001-2007	

Source : Extracted from Ingram and Schure (2010)

The urban bushmeat consumption in Cameroon is lower than other urban areas of Congo Basin, but still significant according to Nasi R. et al. 2011 (Table 31). This consumption can be drastically reduced if the domestic livestock sector is significantly developed.

Table 31: Annual consumption of bushmeat based on deadweight (kg/person/year) in Cameroon

Indigenous group	Annual consumption	Source
Indigenous group or rural forest sites		
Campo Man Reserve, Cameroon	69.4	Dounias et al. 1995 reported in Dethier 1995
Mvae, Cameroon	67.0	Bahuchet and loveva 1999
Kola, Cameroon	79.0	Bahuchet and loveva 1999
Badjoué, Cameroon	16.4–35.9	Delvingt et al. 2001
Dja Reserve, Cameroon; Ngotto CAR and Odzala National Park, Congo	29.2–58.4	Delvingt 1997
Mbanjock (Cameroon)	2 kg/person/year	

Source: Nasi R. et al. (2011)

6.6. Current NRM interventions by agencies

- Environmental Impact Evaluation by Consultants
- “Club des amis de l'environnement” or Nature’s Friends Club: This association of students is acting through sensitization, planting trees around buildings etc.
- Construction of wells, bridges, roads; environmental monitoring by the National program of Participatory Development (PNDP);
- Animation and sensitization: Nature’s Friends Club
- Implementation of the program of “water hyacinth and other invasive plants” to give solution to the high pollution has driven invasion of the river by weeds
- The management of the environment, collection and recycling of waste; enhancement for compost utilization in urban and peri-urban agriculture (CIPCRE)

6.7. Climate change and mitigation strategies

Carbon dioxide (CO₂) is the primary greenhouse gas emitted through human activities including the burning of fossil fuels, the change in land use and deforestation.

In southern Cameroon, the average total carbon produced by the shifting agricultural landscape is only 157 T.C/ha-1, which is half that stored in primary forest (Njomgang et al., 2012).

According to Sonwa et al. (2010), the forest and community of the Central Africa are exposed to climate change. In Cameroon for example, temperature had increased by 0.7 °C since 1960 and the number of hot nights per year had increased by 79 (an additional 21.7% of night) between 1960 and 2003 (McSweeney et al. 2009). Annual precipitations have decreased by 2.9 mm/month between 1960 and 2003.

The actions to be developed to reduce and mitigate the climate change are to:

- Develop mechanisms to bring the actors to respect forest legislation
- Design with the actors and popularize ecologically intensive production systems to limit one hand the expansion of agricultural parcels on forestry domain, and also the unreasonable use of chemical inputs
- Develop incentives for farmers to sequester carbon in the soil through sustainable farming systems such as cropping systems mulch-based, agroforestry systems; etc.
- Introduce methods adapted to agricultural practices to present climate through the use of new scientific and technological innovations

VII. CONCLUSION AND POTENTIAL ENTRY POINTS

Following the guidelines for the situation analysis, indicators that best describe and provide an overview of rural and human development characteristics of households, production systems and natural resource management and environment in the Cameroon Action Site were identified et analysed, presented and discussed.

The national agricultural policy and strategies are voluntarist but still lack adequate, concrete and decisive actions to develop and scale-up innovations capable to bring sustainable agricultural and rural development. The urbanisation rate indicate a high potential for food markets development in the FSs as well as labour availability for agricultural activities. Contrarily, a problem of less availability of agricultural land is raised this also gives an opportunity for the intensification and diversification of agricultural activities which are pillars for the 3rd generation agriculture for an emerging Cameroon. The **urbanization rate** is least for SW, NW and West regions and below the national level indicating FS are mainly rural and could be vibrant opportunities to create development impact through agricultural activities. The level of road and rail infrastructure are still very low and calls for concern as farm to market roads are still a big concern. Thus farmers are unable to maximize the sales of the farm products due to absence of roads. Women are strongly self-involved in agricultural activities but they are still facing several constraints and lowest incomes. Many indicators have also shown that the population in rural areas is still more vulnerable to food insecurity and sanitation problems than urban population.

The production systems are characterized by low yields for both food and cash crops with difference between diverse agroecologic and socioeconomic contexts. The low yields are partly related to bad quality of seed used, but also to systems of production practiced among which the agroforest systems with high ecological interests but with low yields.

It worth noting that some products highly appreciated by consumers such as **Irish potato, cocoyam, taro and yam, rice are produced only in marginal quantities**, although the favourable conditions of production exist. Crop- livestock integration systems are also missing at the farm level and farmers do not yet reasoned and designed to optimize synergies among the two components. A majority of livestock farmers in rural areas do not have easy access to improved breeds of monogastric animals (pork and poultry) and to veterinary products. Therefore, the productivity of monogastric animals is low in rural areas and high in peri-urban areas. Overall, the cattle farming is practiced following the extensive system and

mainly meat-oriented but some field site (FS II) have successfully experienced intensive milk production systems.

The main factors hindering the improvement of productivity and production include: high pressure of pests and diseases and the difficult access of most smallholders to chemicals and proper technics of management of pest and diseases ; weakness of the national seed to deliver improved seed in quantity and at time to farmers; poor management and conservation of soil fertility due to monoculture and deforestation, depletion of soil organic matter and poor access and misuse of fertilizers and manure.

Regarding ecological sustainability, some extensive agricultural systems and natural resource management practiced in some FS have negative impacts on biodiversity and natural resources conservation: over exploitation of NTFPs; deforestation; destruction of wildlife; expansion of monoculture; etc.

Many conditions and opportunities prevailing in the action site are favourable for sustainable rural and agricultural development: Great potential for tree cultivation and fruit growing (FS I); emergence of commercial food and openness to domestic and transborder market favors the intensification of cropping systems (Action Site); Opportunities exist to improve farm incomes and families by increasing and diversifying (FS I); presence of national and transboundary markets (FS I); High biodiversity potential (FS I and FS II); Non-timber forest products constitute a useful wealth for households (FS I and FS II); the Know how in agroforestry systems already exist (eg in cocoa plantations) (FS I and FS II); Good prospects for cocoa worldwide; good recognition of the importance of trees in traditional farming system, preexistence of agroforestry systems and proper recognition of the importance of trees (FS III); presence of livestock spaces and ruminant breeders communities in the highlands (FS II and FS III); monogastric livestock practiced by farmers can be intensified and contribute to the valuation seeds (Cereals, soya) and manure production (Action Site).

Uplifting a number of challenges can create opportunities towards sustainable agricultural and rural development:

- Develop adequate mechanisms to enhance the seed systems and facilitate access of farmers to improved varieties of seeds
- Facilitate access to credit for the production of high opportunity cash crops

- Conceive, adapt and disseminate improved agricultural technics and innovative systems comprising crop-livestock integrated systems and agroforest systems, to insure sustainable management and conservation of forests and natural resources both in family farms and industrial farms
- Improve the management of diseases and pests as well as quality and biosecurity of food in intensive production of fruits and vegetables.
- Improve access and good utilization/combination of both minerals and organic fertilizers in intensive production of food crops and cash crops
- Improve harvest and post-harvest technologies and practices to reduce the loss of products and improve the quality.
- Develop a rigorous assessment of mixed farming systems including the agroforestry systems in order to highlight the trade-offs between high ecological interest but low yields of these systems
- Develop a typology of farms that is accurate and adapted to support the sustainable intensification of production systems.
- Develop adequate mechanisms to connect the different existing markets (local, national and transboundary) with different production systems and production sites, in order to supply the demand in terms of quantity and quality of products.
- Support the improvement of livestock systems and practices in rural areas including organization of livestock farmers and facilitation of their access to improved breeds, feed and veterinary products.
- Identify, conceive, adapt and disseminate sustainable urban and peri-urban systems and develop mechanism to prevent, control and improve the sanitary quality of products.

To achieve these challenges, the Humidtropics program should in addition to classic research and on-farm research, conceive, implement and promote more innovative approaches of research such as action-research, integrated agricultural research for developpement (IAR4D), innovation platforms , etc.

At the time of this situational analysis four important **national surveys** were ongoing - The 2014 ECAM survey, 2014 Agricultural survey, the 2014 Food security and vulnerability survey using new tools and approaches and updating of council development plans by PNDP. It is important that during the next two to three years the variables and indicators already developed should be completed and updated using results from these surveys. As well, further field excercises should be carried in specific contexts at early stage of implementation of Humidtropics program, to build specific indicators related to markets and their characteristics, and to agroforest systems and crop-livestock integrated systems.

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VIII. ANNEXES

Annex 1: Health and wellbeing indicators

Indicator/Variable	National	Total Regional	FS-1	FS-2	FS-3	Total FS
% Prevalence of HIV/AIDS (15-49)	4.3	5				
Men	2.9	3.9				
Women	5.6	6				
Malaria prevalence rate	15	21		16.7	20.7	18.7
0-14 (% of malaria prevalence)	77	75.2				
15-59(% of malaria prevalence)	58	61.2				
% of malaria prevalence	15	14.6				
Annual health expenditure per head (FCFA)	12.774	13.4				
Number of patients received in hospitals	646	66.6				
% of Population with Access to Health Care	72	80.7		71.1	67.5	69.3
% women who receive prenatal care from skilled health personnel	58.9	81.6	69.8	81.9	84.4	78.7
% of health coverage				39	63.6	34.2
Number of Health Care Facilities	3776		272	166	243	681
Number of hospitals	81		17	34	24	75
Number of Health Centres	2445		63.8	132	36.5	232.3
Number of Health schools				6	1.5	7.5
% levels of satisfaction with health services	46.9	45	34.5	53	43.6	43.7
Level of vaccination cover	53.2	68.9	42.2	60.8	62.7	55.2
Average distance to the nearest health center (km)	5.6	6.1		0.6	1.5	
Average distance to the nearest health center (minutes)	38.1	40.1				
Average life expectancy (in years)	51			51	57	54
Male life expectancy at birth	50					
Female life expectancy at birth	51.6					
Healthy life expectancy	45					
Maternal mortality			5.4			1.8
Maternal mortality ratio/100,000 live births	669		1			3.3
Under-five mortality/1000	144	120.4	2			6.7
Infant mortality rate/1000	86.2	71.8				
Crude death rate/1000	14.2	5.4	5			25
Male adult mortality rate/1000	35	29.9				
Female adult mortality rates/1000	39.84	35.7	1			3.3
Adult mortality rate/1000	40.3	26				
Morbidity rate	24.5	26.5				

Source: INS, 2009, Worldbank 2012, council development plans, INS, 2011a, WHO, 2010

Annex 2: Poverty and food security

Indicator/Variable	National	Total Regional	FS-1	FS-2	FS-3	Total HTC MR_FS
Percentage of poor households		19	4.8			1.6
% of Male Headed Households	92.5	84.8				
% of Female Headed Households	17.5	15.2	5		29.8	
% of Food Self Sufficient Households	89	44.2				
% of Food Insecured Households	20.1	15.3				
% of Food Self Sufficient Households in Rural area	49.6					
% of Food Self Sufficient Households Urban						
% of chronic Food Insecure Households	9	0.6				
% of household vulnerable to dryness and subsequently food insecurity	30.3	4	34.9	35.8	40.3	37
% of HH with poor food consumption	3.9	3.9				
% of HH with limited food consumption	16.3	16.1				
% of HH with acceptable food consumption	79.9	79.6				
% of HH with severe food insecurity	2.2	1.2	3.3	3.9	4.3	3.8
% of HH with moderate food insecurity	7.4	2.3	5.4	6.5	5.7	5.8
% of HH with relative food insecurity	10.5	16.9	2.6	3.1	2.5	2.7
Percentage of food secured households	49.6	75.6	54.1	53.6	50.9	52.8
Incidence of poverty	39.9	35.9	6.7	5.6	10.4	7.6
Depth of poverty	12.3	9.5	1.6	2	4.9	2.8
Severity of poverty	5	3.5	0.7	1	1.2	1
Inter-quantile ratio (Q5/Q1)	7.5	5.6				
Part of a fifth of the poorest quintile in the total poor consumption	7.5	11.1				
Poverty line	738					
Percentage of very poor income HH	54.4	50.6				
Percentage of poor income HH	45.5	39.1				
Percentage of average income HH	19.7	18.9				
Rich income HH	11.6					
Total poor population	49.9	44.8				
% Poor HH with knowledge on HIPC initiatives	20.8	33				
% rich HH with knowledge on HIPC initiatives completion point	52	51.3				
Total HH with knowledge on HIPC initiatives completion point	42.9	46.6				
Average annual household food expenditure (FCFA)						
Human development index/Rank	0.495 (150)	5.7				
Expected years of schooling	10.1					

Source: WFP and MINADER, 2007; IMF, 2012, Worldbank 2011, MINADER, 2014, INS, 2008, WFP et al., 2011

Annex 3: Education

Indicator/Variable	National	Total Regional	FS-1	FS-2	FS-3	Total FS
Number of Primary schools	13850	10964.0	809.0	551.0	1342.0	2702.0
Number of students	3350662	1960829.0				
% Enrolment in Primary Education	79.8	94.3				
% of boys	82.1	95.0				
% of girls	77.5	95.4				
Pupil- teacher ratio	53	43.8	48.9	45.7	50.5	48.3
Classroom/pupil ratio	59	52.4	43.5	46.9	67.8	52.7
Desk/pupil ratio	1.3	1.7	3.0	3.0	3.7	3.2
Average distance to nearest primary school (km)	1.4	1.4	1.0	1.3	1.5	1.3
Primary net attendance for girls	97	100.6	101.8	79.7	95.7	92.4
Primary net attendance for boys%	79			39.3	27.5	22.3
Boy/girl parity index in primary education	0.95	1.0		39.4	30.7	23.4
Primary repeat rates	7.5	9.1	9.1	4.0	5.3	6.1
Primary dropout rate	2.2	1.6				
Primary completion rate	21.5	27.4	25.8	29.3	33.3	29.5
Urban Primary completion rate	91					
Rural Primary completion rate	68	84.1				
% expenditure on primary education from total household expenditure						
Average expenditure on primary education per child per year (CFA)	47490	38887.6				
Number of Secondary Schools				47.7	5	32.6
Number of students in secondary education	478254	77453				
Enrolment in Secondary Education	79.8	91.3			107798.0	107798.0
Boys	82.1	91.5			8871.2	8871.2
Girls	77.5	90.6			54307.0	54307.0
Number of teachers	27323	22476.0				
Pupil- teacher ratio	53	43.8	48.9	45.7	49.2	47.9
Classroom/pupil ratio	59	52.4	43.5	42.7	67.8	51.3
Desk/pupil ratio	1.3	1.7	3.0	3.0	3.7	3.2
Average distance to nearest secondary school (km)	1.4	1.4	1.0	1.4	1.6	1.3
Secondary net attendance (%)	55	72.0				
Secondary net attendance for girls (%)						
Secondary net attendance for boys (%)						
Boy/girl parity index in secondary education	0.86	0.8				
Secondary school completion rate						
Urban Primary completion rate						
Rural Primary completion rate						
Number of Secondary schools	187848	135385.0				

Average expenditure on primary education per child per year (CFA)						
Number of Universities	45	39.0	13.0	11.0	12.0	36.0
% Enrolment in University Education		36.8				
Boys		36.6				
Girls	77.5					
% expenditure on education from total household expenditure	4.7	4.8				
Average expenditure on education per child per year (CFA F)	75	87.6				
% of Adult Education Completion Rate		84.1				
Net school attendance rate per region	82.8	81.3				
Illiteracy rate		84.1				
% of individuals satisfied with education services	19.8	20.1				

Source: Council Development plans, Statistical year book for primary and secondary education, INS, 2007.

Annex 4: Infrastructure

Indicator/Variable	National	Total Regional	FS-1	FS-2	FS-3	Total FS
% of HH with radios	49.4	51.5	29.8			29.8
% of HH with TVs	30.7	24.6	37.0			37.0
% of HH with computers	2.3	1.2	3.6			3.6
% of HH with vehicle	2.6	1.9	3.2			3.2
General household classification of HDI	0.628 (Rank 137)					
% of population with access to improved portable water	45.3	42.9		47.5	45.4	46.5
% of urban population with access to improved portable water	75.1					
% of rural population with access to improved portable water	27.7					
% of population with access to improved sanitation	33.6	33.6	25.3	37.0	21.9	28.1
% of urban population with access to improved sanitation	75.1					
% of rural population with access to improved sanitation	35					
% of population with access to electricity	48.2	46.6	23.3	57.4	21.5	34.1
% of urban population with access to electricity	90.4					
% of rural population with access to electricity	23.4					
Average density of roads (KM)	50000					
Percentage of villages accessible by tarred roads	16					
Percentage of villages accessible to untarred roads	66					
Percentage of tarred roads	10					
Roads tarred/paved (% of total)	8.1					
Percentage of households accessibly by tarred roads						
Number of km of tarred roads per 1000 inhabitants	0.28					
Number of km of untarred roads per 1000 inhabitants						
Rail way network	1016					
Main exchange points						
% of population with access to fixed phone	1.1	0.5				
% of population with access to Mobile cell phones	52	54.8	38.9	59.5	37.0	45.1
Number of telephone lines per 100 inhabitants						
% of population using the internet	5.4					
Number of women empowerment centers						
Number of agric posts						
Number of slaughter slabs						
Number of community halls			14.0	12.0	9.8	11.9
Number of markets			9.3	22.0	17.2	16.1

Source: Common wealth, 2013, INS, 2007, Council development plans

Annex 5: Types of soils and suitable crops in the action site

Soils	Location	Advantage/Inconvenient	Suitable utilization
Weakly ferralitic ferrisolic soils on acid rocks (VIII.14)	Small areas scattered in the north of Yaoundé	Good chemical richness Potential is limited by their shallow depth.	In forest zone : tree crops (cocoa, coffee)
Ferralitic typical yellow soils on sediments (VIII.19)	Halo of the Douala Sedimentary Basin, from Edea up to Mbanga	Low value, very deficient in minerals, difficult to improve	Tree crops (oil palm, rubber) ; extensive farming of food crops
Ferralitic typical yellow soils on acid rocks (VIII.20)	Large block across west and southwest, close to the coast and along borders of Rio Muni and Gabon	Weak organic and mineral potential	Not suitable for coffee or cocoa
Humic soils on black basalt (VIII.21)	Volcanic hills of the west highlands	High levels of organic matter but high acidity and nutrients weakness	Tea cultivation and potatoes with fertilizer supply
Indurated soils on acid rocks (VIII.22)	Some parts of the centre and east regions		No crop
The little evolved erosion soils on basic rocks (II.2) and ash II2)	Mungo area and the Bamun country	Good soils with organic matter and nutrients Thin soils	
The modal input soils on basic ash (II.3)	Nun Valley		
The modal input soils on the fluvial alluvia (II.4)	Very narrow bands at the extreme south-west and along the Wouri.	Easy to work wit ; Need to be watered regularly Low retention capacity	All crops
The modal input soils with hydromorphic trend on marin alluvia (II.6)	Mouth of all estuaries from the Wouri to Ntem		
Modal eutrophic brown soils on basic rocks (VI.1)	Located in the Mungo region and surrounding areas, and in the western highlands.	Permeable and well structured, rich in organic matter and exchangeable bases with significant reserves	Excellent soils suitable for all rich crops (bananas, coffee, cocoa, etc.) And of course the food crops.
Hydromorphic soils (Class X)	Great marshes of upper-Ntem, upper-Nyong, central part of the valley of upper-Noun and Noun		Rice or pasture
Source : adapted from Martin et Segalen, 1966			

Annex 6: Acreage and quantities of cereals produced

Regions	Cultivated area (ha)		Production (t)		Yield (T/ha)	
	2009	2010	2009	2010	2009	2010
Maize						
Centre	80168	106645	160335	193201	2.00	1.81
Littoral	70657	61730	141313	134104	2.00	2.17
Northwest	76878	80740	153756	176473	2.00	2.19
West	148760	149013	297521	298812	2.00	2.01
Southwest	65450	72815	156747	172740	2.39	2.37
Cameroon	821371	846130	1625213	1670321	1.98	1.97
Rice						
Centre	6614	8798	7080	9588	1.07	1.09
Littoral	23	34	21	25	0.91	0.74
Northwest	22037	27302	23705	27108	1.08	0.99
West	2953	3409	2946	3393	1.00	1.00
Southwest	1590	1901	1407	1947	0.88	1.02
Cameroon	115677	139976	134649	153078	1.16	1.09
Millet/sorghum						
Northwest	6310	6328	5361	5111	0.85	0.81
Cameroon	1222552	1332582	1145536	1187531	0.94	0.89
<i>Source : Agristat n°17. Direction des enquêtes statistiques, MINADER, 2012.</i>						

Annex 7: Acreage and quantities of grain legumes

Regions	Cultivated area (ha)		Production (t)		Yield (t/ha)	
	2009	2010	2009	2010	2009	2010
Groundnut						
Centre	39464	46676	47174	56251	1.20	1.21
Littoral	4486	4489	3494	3599	0.78	0.80
Northwest	5339	5530	6513	7715	1.22	1.40
West	3326	4070	3258	3404	0.98	0.84
Southwest	27557	5269	5012	5981	0.18	1.14
Cameroun	366501	377496	503175	536187	1.37	1.42
Cowpea						
Centre	8730	9769	7444	9477	0.85	0.97
Littoral	1584	1667	675	711	0.43	0.43
Northwest	565	623	264	281	0.47	0.45
West	75	82	64	68	0.85	0.83
Southwest	711	768	521	549	0.73	0.71
Cameroun	236654	249486	141206	166145	0.60	0.67
Bean						
Centre	2827	3125	3114	3306	1.10	1.06
Littoral	10465	11542	12783	13424	1.22	1.16
Northwest	92603	113269	120106	129606	1.30	1.14
West	78075	90154	120016	131044	1.54	1.45
Southwest	7054	8132	8873	9476	1.26	1.17
Cameroun	244034	285858	327526	353729	1.34	1.24
Soybean						
Centre	1796	1901	2671	2810	1.49	1.48
Littoral	1554	1637	2514	2647	1.62	1.62
Northwest	1787	2034	1784	2156	1.00	1.06
West	2443	2877	3463	3654	1.42	1.27
Southwest	136	138	164	168	1.21	1.22
Cameroun	8774	9788	11594	12544	1.32	1.28
Voandzou (earth pea or underground bean)						
Centre	1731	1904	1432	1575	0.83	0.83
Littoral	2883	3171	2670	3037	0.93	0.96
Northwest	4814	5195	3812	4193	0.79	0.81
West	515	607	412	453	0.80	0.75
Cameroun	30371	34148	25644	29308	0.84	0.86
Source : Agristat n°17. Direction des enquêtes statistiques, MINADER, 2012.						

Annex 8 : Acreage and quantities of roots and tubers

Regions	Cultivated area (ha)		Production (t)		Yield (t/ha)	
	2009	2010	2009	2010	2009	2010
Cassava						
Centre	80676	86819	1057714	1198080	13.11	13.80
Littoral	10106	13928	283926	311123	28.09	22.34
Northwest	10758	13768	100751	110708	9.37	8.04
West	6500	15100	110496	121634	17.00	8.06
Southwest	19864	26303	325542	430694	16.39	16.37
Cameroun	239418	270787	3340562	3808239	13.95	14.06
Cocoyam/taro						
Centre	34407	38255	287108	316040	8.34	8.26
Littoral	36789	42946	340330	375041	9.25	8.73
Northwest	18342	18278	182008	105259	9.92	5.76
West	13881	15544	118283	127486	8.52	8.20
Southwest	14036	18972	161417	179732	11.50	9.47
Cameroun	160280	185402	1537057	1632004	9.59	8.80
Sweet potato						
Centre	11416	13624	73150	75108	6.41	5.51
Littoral	3020	3297	21496	22550	7.12	6.84
Northwest	3618	3598	17019	19340	4.70	5.38
West	7468	7645	46500	49963	6.23	6.54
Southwest	1137	1263	4775	5155	4.20	4.08
Cameroun	49012	53336	266078	288970	5.43	5.42
Yam						
Centre	11628	13897	127733	131834	10.98	9.49
Littoral	5344	6005	54154	57275	10.13	9.54
Northwest	5201	6491	82534	90790	15.87	13.99
West	3052	3778	32544	34266	10.66	9.07
Southwest	2494	2728	39933	44529	16.01	16.32
Cameroun	38509	44768	466749	499564	12.12	11.16
Irish potato						
Centre	81	76	415	506	5.12	6.66
Littoral	90	79	222	358	2.47	4.53
Northwest	4212	4007	37185	43262	8.83	10.80
West	6564	6583	93194	107937	14.20	16.40
Southwest	419	354	354	4236	0.84	11.97
Cameroun	13953	14868	166772	188452	11.95	12.68
Source : Agristat n°17. Direction des enquêtes statistiques, MINADER, 2012.						

Annex 9: Acreage and quantities of other food crops (1)

	Cultivated area (ha)		Production (t)		Yield (t/ha)	
	2009	2010	2009	2010	2009	2010
Plantain						
Centre	60459	69348	678994	832181	11.23	12.00
Littoral	28822	30112	409873	428220	14.22	14.22
Northwest	12649	13954	100793	111195	7.97	7.97
West	20780	25572	166777	205236	8.03	8.03
Southwest	16828	19835	130636	153977	7.76	7.76
Cameroun	230545	260301	2758953	3182184	11.97	12.23
Ginger						
Centre	46	47	133	148	2.89	3.15
Littoral	2175	2285	19424	23658	8.93	10.35
Northwest	1443	1516	8558	9970	5.93	6.58
West	575	604	3696	4149	6.43	6.87
Southwest	159	167	1227	1365	7.72	8.17
Cameroun	4409	4629	33086	39342	7.50	8.50
Palm oil						
Centre	22679	27667	65769	69057	2.90	2.50
Littoral	27770	30517	54848	70191	1.98	2.30
Northwest	9969	10153	26291	52818	2.64	5.20
West	1265	1328	5398	5668	4.27	4.27
Southwest	33376	35295	102379	107739	3.07	3.05
Cameroun	102109	112430	275130	326940	2.69	2.91
<i>Source : Agristat n°17. Direction des enquêtes statistiques, MINADER, 2012.</i>						

Annex 10: Acreage and quantities of other food crops (2)

	Cultivated area (ha)		Production (t)		Yields (t/ha)	
	2009	2010	2009	2010	2009	2010
Sesame						
Centre	5381	5571	4757	5046	0.88	1.06
West	1977	2076	2845	2987	1.44	1.05
Cameroun	29805	30836	43033	43963	1.44	1.02
<i>Source : Agristat n°17. Direction des enquêtes statistiques, MINADER, 2012.</i>						

Annex 11: Acreage and quantities of fruits and vegetables (1)

Regions	Cultivated area (ha)		Production (t)		Yield (t/ha)	
	2009	2010	2009	2010	2009	2010
Pineapple						
Centre	1723	1906	79265	87192	46.00	45.75
Littoral	1723	1885	55151	60148	32.01	31.91
Northwest	28	29	404	424	14.43	14.62
West	107	114	1272	1337	11.89	11.73
Southwest	94	99	1968	2069	20.94	20.90
Cameroun	4047	4442	147767	159875	36.51	35.99
Watermelon						
Centre	719	827	13764	15280	19.14	18.48
Littoral	54	82	1813	2368	33.57	28.88
Northwest	50	53	1241	1303	24.82	24.58
West	912	976	22411	24256	24.57	24.85
Southwest	12	13	212	223	17.67	17.15
Cameroun	1800	2007	40486	44527	22.49	22.19
Sweet Banana						
Centre	25544	25876	464312	513407	18.18	19.84
Littoral	10166	10191	156320	164913	15.38	16.18
Northwest	4610	4792	40603	43696	8.81	9.12
West	6736	7165	67034	73279	9.95	10.23
Southwest	7218	6344	104282	228803	14.45	36.07
Cameroun	71896	77120	1223233	1333851	17.01	17.30
Tomato						
Centre	9332	11682	126043	119195	13.51	10.20
Littoral	487	515	867	762	1.78	1.48
Northwest	3568	4367	39902	36808	11.18	8.43
West	37516	46744	433206	568369	11.55	12.16
Southwest	138	148	2290	2043	16.59	13.80
Cameroun	53213	65999	666607	795327	12.53	12.05
Chili pepper						
Centre	4240	4082	6423	6423	1.51	1.57
Littoral	225	217	468	468	2.08	2.16
Northwest	1230	1220	3309	3408	2.69	2.79
West	3490	4704	9484	13278	2.72	2.82
Southwest	2312	2226	3005	3005	1.30	1.35
Cameroun	13083	14007	25987	29910	1.99	2.14

Source : Agristat n°17. Direction des enquêtes statistiques, MINADER, 2012.

Annex 12: Acreage and quantities of fruits and vegetables (2)

Regions	Cultivated area (ha)		Production (t)		Yield (t/ha)	
	2009	2010	2009	2010	2009	2010
Okra						
Centre	1891	2222	4311	4664	2.28	2.10
Littoral	809	850	2681	2816	3.31	3.31
Northwest	2039	2154	9920	10467	4.87	4.86
West	2050	2251	6192	7159	3.02	3.18
Southwest	2359	962	5794	181	2.46	0.19
Cameroun	18622	24004	47169	60384	2.53	2.52
Onion						
Centre	275	430	4042	4257	14.70	9.90
Littoral	24	25	238	251	9.92	10.04
Northwest	43	49	1420	1513	33.02	30.88
West	534	571	9575	10168	17.93	17.81
Southwest	21	22	177	186	8.43	8.45
Cameroun	2008	3252	50705	65409	25.25	20.11

Source : Agristat n°17. Direction des enquêtes statistiques, MINADER, 2012.

Annex 13: Quantities of coffee and cocoa produced and exported from 2007 to 2012

Year	Arabica coffee		Robusta coffee		Cocoa	
	Production (t)	Exportation (t)	Production (t)	Exportation (t)	Production (t)	Exportation (t)
2007	4 717	3 891	41 201	38 968	169 100	157 378
2008	5 198	3 122	28 050	28 315	184 800	162 255
2009	3 612	3 612	44 378	30 556	205 232	180 652
2010	3 613	3 613	38 552	44 966	190 871	173 430
2011	2 499	2 390	23 822	30 194	218 702	189 731
2012	2 493		36 727			182 127

Source: ONCC, 2013.

Annex 14: Production of crops, cultivated area and farming population in Meme and Fako divisions

Indicators	Meme			Fako	
	Production (tons)	Acreage (ha)	Farming population	Production (tons)	Acreage (ha)
Food Crops and vegetables					
Cassava	205937	14914	82661	81409	4855
Maize	14397	10240	70845	11415	4343
Plantain	146542	13840	43423	44104	3943
Banana	63130	5865	20902	2719	314
Cocoyam	38896	5660	31800	975	360
White yam	23230	2855	1740	3955	353
Sweet potatoes	3069	565.5	1888	504	70
Leafy vegetable	8951	403	6375	969.5	197
Pineapple	5439	199.6	3075	226.5	63.2
Pepper	635.2	123.4	5600	207	86
Tomato				2390	258
Egusi	1599	1581	6358	124.2	190.5
Groundnuts	2642.7	1668.8	7062	197	102
Okra	208.9	99.8	4857	277	108
Sweet yam	692.4	39.1	3598		
Garden egg				48	28
Water melon				859	52.5
Mushroom				1.5	50 bags
Perennial crops					
Cocoa	47723	60410	98887		
Robusta coffee	227	290	242		
Oil palm	53808	7565	20014		
Rubber	22144.9	9850	555		
Citrus	7784	482.1	2971		
Plum	131	257.1	1301	261	119
Cola nuts	27.48	53	2213		
Orange				249	64
Sugar cane				33.6	210
Mango				808	97
Papaya				90	45
Pear				468	71
Apple				57	8

Annex 15: Evolution of production of crop in Menoua division (tons)

Crop / Year	2009	2010	2011	2012	2013
Food crops					
Maize	20 563	17 900	18 571	19 770	20 739
Bean	10 523	9 297	10 130	11 516	15 242
Irish potato	19 144	13 492	16 224	15 028	11 207
Plantain	29 414	27 875	23 156	31 909	31 881
Banana	13 704	12 615	12 361	12 329	12 708
Taro	18 641	4 765	3 520	3 992	4 178
Cocoyam	2 413	2 170	2 200	2 053	2 453
Sweet potato	7 434	8 193	10 212	10 835	11 666
Soybean	16	17	19,2	21	40
Groundnut	361	226	159	142	236
Igname	4 676	4 831	4 892	4 944	5 148
Cassava	13 403	13 219	17 053	19 970	23 451
Bambara groundnut	51	47,7	34.1	43	45
Rice	/	40	80	130	40
Gardening crops					
Oignon	469	395	427	503	668
Carotte	1 650	1 902	2 008	2 342	4 542
Tomate	10 471	7 269	7 530	8 234	9 771
Chou	7 768	6 862	8 202	10 547	17 486
Poireau	668	564	638	727	871
Poivron	1 056	1 036	1 142	1 319	1 719
Morelle noire	4 045	3 739	3 810	4 150	4 869
Haricot vert	500	518	662	698	775
Betterave	20	22	20	45	48
Gombo	570	732	838	965	1 138
Piment	407	480	440	652	872
Gingembre	4 316	5 461	7 111	8 656	12 173
Aubergine	97	67	88	105	116
Ail	1	2,1	2.6	28	31
Pastèque	14	6,7	7.2	33	35
Perennial cash crops					
Café Arabica	599	731	896	1 301	1 678
Café robusta	2 836	2664	2 828	3 678	4 221
Cacao	623	808	1 083	1 215	1 457
Huile de palme	268	436	644	745	995

Annex 16: Acreage cultivated and production in Lekie Division

Crop	Acreage (ha)		Production (t)	
	2010	2013	2010	2013
Maize	211	277.55	499,5	475.1
Cassava	36	32	415,5	103.7
Rice	-	13.76	-	2.474
Yam	1	2	8.2	7
Groundnut	-	3	-	2.18
Soybean	1.25	0.1	2	0.2
Tomato	4	14	108.7	95
Okra	5.6	9.75	3.7	4.18
Chili Pepper	1.35	8	1.3	2.125
Onion	0.66	0.75	3.48	6.344
Water melon	1	1	3.05	4.082
Okok (eru)	0.75	2.5	-	-
Palm oil	50	54	25607	12727
Cocoa	2550	2467	1633	90.8
Plantain	2	5	-	-
Pineapple	1	1.25	25	-

Annex 17: Acreage cultivated and production in Mefou et Afamba Division

Crops	Acreage (ha)		Production (T)			Price (FCFA/kg)	
	2013	2009	2013	2012	2009	2013	2009
Cassava	378,5	13150	13791	13791	180479	101	97
Maize	328,5	3825	4 200	3 969	7129	260	250
Plantain	123	8634	9 060	8 898	112091	145	139
Groundnut	23	5683	3203		3244	610	610
Sweet potato	02		18				
Tomato	13		760				
Chili pepper	25		14,75				
Yam		92.5	101	101	570		
Vegetable	1,9		17				
Pineapple	69	-	21613	14181	3234		
Bean	2,5	1519	0,2		2,2		
Water melon	02		15				
Sugar cane	10		240				
Cocoa	103	27471	28284	28284	5166		
Robusta coffee			1197	1197			
Palm oil	46	-	1680	1680	7970	650	700

Annex 18: Acreage cultivated and production in Mefou et Akono Division

Crop	Acreage (ha)			Production (t)			% of assets 2011
	2010	2011	2013	2010	2011	2013	
Cocoa	458	491	487,5	18,7	86,75	146,1	21,18
Palm oil (l)	147	109	237	73000	104000	4615	6
Pineapple	38	61	27,5	505	2745	927	2,3
Tomato	-	5	6	-	64	108,6	16
Okra	-	-	0,7	-	-	1,2	
Chili peppert	26,5	16	10,2	24,7	15	10,2	26
Maize	220,8	221	334,5	293,9	486	787,6	40
Cassava	432	264	576	5116	5475	8978	65
Groundnut	-	300	-	-	450	-	1,5
Plantain	230	151	168	1246	1691	1322,5	25
Banana	-	28,5	-	-	1310	-	20
Cocoyam	-	0,25	2,5	-	3,75	50	25
Yam	-	90	3,25	-	2250	47	10
Sweet potato	-	25	-	-	625	-	10
Rice	3	2	34,7	59	8	7,625	8

Source : synthese Rapports PNVRA MAK 2010, 2011 et 2013
Data only for farmers framed by PNVRA

Annex 19: Acreage cultivated and production in Nyong et Soo Division

Spéculations	Superficie (ha)				Production (t)				Average price (FCFA/kg ou l)		
	2010	2011	2012	2013	2010	2011	2012	2013	2011	2012	2013
Groundnut	1400	1406	1420	2078	2500	2530	2543	5094	553	623	590
Maize	1600	1405	1419	1559	4800	4215	4236	3104	243	253	251
Manioc	2600	4320	4335	6009	28600	28850	28947	43048	65	92	91
Cocoyam	4300	2610	2626	3865	12900	13050	13130	27055	95	151	143
Plantain	4700	4720	8390	6950	44650	44840	79700	69500	110	158	149
Yam	600	602	602	64	-	-	-	668			
Cucumber	200	110	165	510	480	209	314	944			
Sweet patato	700	705	710	243	3500	2525	3550	1705		138	137
Cocoa	27710	27829	28454	28499	4988	5048	10244	10266			
Robusta coffee	60	-	60	60	-	-	-	17,5			
Oil palm	650	685	702	1200	3050	3080	4212	6559	605	790	684
Pineapple	50	52	54	58,7	500	520	540	1168			
Tomato	120	125	132	173,5	3120	3250	3960	4325			
Chili pepper	40	43	48	295	40	43	48	295			
Okra	30	32	35	49	84	90	123	172			
Vegetable	-	50,5	51	59	3000	303	306	354			
Water melon	-	-	15	19	-	-	375	475			

Source : synthèse des Rapports DDADR-Nyong et So'o

Annex 20: Main opportunities and constraints of livestock systems

Cattle farming

- Cattle are mainly reared within mountains grazing fields or in foaml pastoral zones by the Bororos who own herds of 60 to 120 animals on the average.
- These people practice mainly the extensive breeding farming system. The Bororo, Zebu, Goudali and Fulani breeds of cattle are farmed.
- Certain animals or herds belong to merchants and officials living in cities and who entrust them to the herders living on the grazing areas.
- Cattle livestock is most develop in areas free from *Glossina spp* the lone vector of trypanosomosis.
- However, bovine breeding in this area is plagued with some crucial problems that have adversely influenced production and productivity such as:
 - No pasture management/pasture improvement within the grazing areas.
 - Lack of crutches and dips at the grazing sites.
 - Insufficient means for movement of personnel to reach production sites to technically backstop ranchers.
 - Very high cost of livestock inputs
 - Poor road network linking the markets
 - Few livestock markets

Small ruminants production

- Despite the fact that sheep play a major role during festivities, the sheep sector still need to be organized. Sheep are reared on free range usually resulting to recurrent grazer farmers conflicts.
- Sheep breeding is of great value to the people of this division who use sheep during socio-cultural events such as in marriages, death, birth and other ceremonies.
- Economically, sales of sheep have received a big boost throughout the division as sheep meat (mutton) is now popular and sold as soya and pepper soup to the public on a daily basis.

Pig farming

- Pig production is on the increase in some divisions of the action site as many more persons and groups are now engaged in this noble activity. With the aid also of the Swine Production and Development Program (SPDP) and PACA programmes, pig production activities has been given a big boost, following the creation of new groups, unions of CIGs that have also benefited from state subsidy.
- Local feed ingredients for husbandry are available.
- The pig meat is used customarily in festivities/ceremonies.
- Some pig breeders who applied for funding through the PACA program have already benefited from the scheme, to reconstruct new pigsties.
- Traditional, semi-intensive and intensive farming systems are being practiced.
- However, the persistent outbreak of African swine fever and swine erysipelas is the main drawback to this venture since there are frequent outbreaks of these diseases within the main divisions producing pigs.
- Also, the lack of farm to market roads is a big hindrance to the activities of this livelihood.

- Most of the breeds of pigs are crosses of varied types like the land race, large white and duroc. Pure breeds are difficult find

Poultry production

- Poultry production is gaining much attention in the whole Action Site with the largest, medium and small size poultry farms. There are also many small poultry groups that have taken upon poultry as the number one speculation.
- Holdings of 100-300 broilers do exist in many towns and villages of the action site
- Unfortunately, the high cost of day old chicks, feed, essential vaccines and medication are some of the major draw backs in the realization of this venture.
- Back yard poultry farming still dominates within village setups.
- Unfortunately, the birds are allowed to fend for themselves with little or no food and water provided to the fowls.
- The seasonal outbreak of Newcastle disease amongst other impact poultry ailments that usually strikes in the dry months of the year has continued to remain a threat to this enterprise.
- Some poultry groups in the action site have been funded by the PACA programme in the domain of infrastructure.

Non-conventional animal breeding

- This livestock system is progressing with greatly needs to be encouraged, since many groups on snails, cane rats and bees do exist in the action site.
- MINEPIA in partnership with WWF coastal forest programme have been organising workshops to revamp snail and cane rat domestication.

Bee keeping

- In spite of the fact the ecology of the action Site is favours the development of apiculture such as the presence of plenty of bee loving vegetation found within the various forests coupled with suitable climate, a strong market within and out of the division amongst others; this sector however seems to be wobbling.
- Beekeepers practices are mostly of extensive form of husbandry.
- New entrepreneurs and civil servant are practicing some intensification but the number is still reduced. The state needs to strongly support this activity in terms of husbandry materials, technology transfer and cash flow, so as to boost production tremendously.

Fish farming

In well watered areas of the Action Site, aquaculture could offer great opportunities with respect to high quality protein and cash flow associated with the venture and

Unfortunately, this sector has lots of difficulties that have resulted in the abandonment of many ponds, such as:

- Lack of credits for the acquisition of inputs
- Pond management
- Insufficient technical expertise (aquaculture technicians) to help develop and follow up fish farm

Annex 21: Pests and diseases in Lékié Division (Field site I)

Crops	Main pests and diseases	Impact	Control methods practiced	Coverage
Cocoa	Shield bug (capsids)	High	Insecticide	75%
	Black pod disease	High	Fungicide Removal of diseased plants	80%
	Withering plants	Low	No solution, abandon of orchard	5%
	Psyllids	High	Chemicals	
Citrus	Bites of scale insects, aphids on fruits	High	Pesticide treatment	35%
	Desiccation of leaves Withering plants	Medium	No solution	
	Gummosis	High	Systemic fungicides	5%
Cassava	Mildew	High	Resistant varieties, crop rotation, improve planting technique	60%
	Tuber rot			
	Physiological decay and rot	High		10%
	Kop	High		
Maize	Termites	Low	Insecticides	30%
	Mosaic	High		40%
	Weeds	High	Weeding and herbicide treatment	80%
	Stem borers	Medium	Chemical control	60%
Oil palm	Grasscutters attack	High	Trapping	10-20%
	Blast	Medium	Nematicides,	
	Cercosporiose	Medium	Fongicides, mancozebe	
Banana	Nematodes and weevils	Medium	Trimming and dipping (mocap)	70%
	Cercosporiose	Medium	Use the PIF	15%
Tomato	Caterpillar	Medium	Pesticides	60%
	Mildew	High		80%
	White fly	Medium		60-80%
	Nematodes	High	Tolerant varieties	60-70%
Okra	Borers of leaves	Medium		
Groundnut	Rosette	Medium	Early sowing	
Chilli peper	Fruit drop	Low	Pesticides	30%
	Fruit rots	Low		60%
Sugar can	Cane rats and termites	High	Trapping and ashes	30%

Source : DDADER-LEKIE, Annual Report 2013

Annex 22: Pests and diseases in Mefou et Afamba Division (Field site I)

Crops	Pests and diseases	Impact	Control methods	Coverage
Cocoa	Mirids	High	- Chemical control - Cropping practices	40% 50%
	Caterpillars	Low	Chemical control	60%
	Black pod disease	High	- Chemical control - Cropping practices	50% 30%
Coffee	Coffe berry borers	Medium	- Chemical control - Cropping practices	20% 30%
	Caterpillars	Low	- Chemical control	10%
Oil palm	-Cercosporiose	Medium	- Chemical control	0%
	-Fusariose	Low	-//-/-	0%
	-Nut rots	Low	-//-/-	0%
	-Blast in nursery	Medium	- Chemical control	60%
Roots and tubers	- Scale insects	Medium	- Chemical control	0%
	- Rot	Medium	-//-/-	0%
	- Viroses	Medium	-//-/-	0%
	- Caterpillars	Low	- Chemical control	10%
	- Grasshoppers	Low	-//-/-	10%
Banana	- Weevils	Medium	- Chemical control	35%
	-Nematodes	Medium	-//-/-	35%
Pineapple	- Wilt	Low	- Cropping practices	15%
	- Fruit rot	Low	- RAS	0%
	- Nematodes	Medium	- Chemical control	20%
Maize	- Borers	Medium	- Chemical control	30%
	- Deficiencias	Medium	-//-/-	50%
	-Santériaux	Low	-//-/-	10%
Vegetables	-Decay	Medium	- Chemical control	80%
	-Nematodes	Medium	-//-/-	10%
	- Miners	Medium	-//-/-	0%

Source : Rapports DDADER MAF

Annex 23: Pests and diseases in Mefou et Akono Division (Field site I)

Crops	Maladies et ravageurs	Impact	Moyens de lutte
Cocoa	Black pod disease	High	Integrated pest management
	Capsids	High	
Cassava	Tuber rot	Medium	-
	Scale insects	Medium	Nematicides
Plantain	Nematodes	Low	//
	Lodging	Low	Staking
Palm oil	Rots of bunches	Low	-
	Yellowing of leaves	Low	-

Annex 24: Pests and diseases in Nyong et Soo Division (Field site I)

	Principales pertes et maladies	Impact	Moyen de lutte
Cocoa	Shield bug (capsids)	High	Chemical control
	Black pod disease	High	Chemical control, sanitary harvesting
	Caterpillars	Medium	Insecticide
Cassava	Root rot	Medium	Crop rotation, Healthy cuttings
Cocoyam / taro	Tuber rots	Medium	Good harvest and concervation of tubers
Tomato	Fruit rots	Medium	Chemical control
	Falling of fruits	High	Chemical control
Banana plantain	Nematodes	Medium	Choix et assainissement des rejets
	Weevils	Medium	Utilisation Mocap
Chilli pepper	Rot and fall of immature fruits	High	Chemical and mechanical control
	Stunting of leaves, fruits and branches	High	Chemical control and use of healthy seed
<i>Source : Rapports DDADR-Nyong et So'o 2013</i>			

Annex 25: Major pests/diseases and management/control practices of major crops in Fako Division (Field site II)

Crops	Pests/Diseases
Cocoa	Shield bug (capsids, black pod disease)
Oil palm	Leaf mining beetles, fusarium, rats/squirrels
Rubber	Root rot
Plantain/banana	Corm borer weevil; Black sigatoka (fungal leaf spot); Root boring nematodes
Cassava	White flies
Colocassi/macabo	Leaf rot
Maize	Stem borers; grain weevils during storage
Sweet potato	Weevils during storage
Leafy vegetables	Defoliating Caterpillars; leaf rot
Pepper	Fruit flies; White flies
Okra	-Leaf beetles

Annex 26: Major pests/diseases and management/control practices of major crops in Mounjo division (Field site II)

Major crops	Pests and diseases	Management techniques applied
Maize	Stem borers, stored grain weevils	Use of insecticides in the field, keep grains in tight-fitting containers
Cassava	White flies, mealy bugs	
Banana	Black sigatoka, nematodes, corm borer weevils, mealy bugs	Leaf pruning, airplane spraying with fungicide, use of insecticide-nematicide mocap
Plantain	Black sigatoka, corm borer weevils	Leaf pruning, airplane spraying with fungicide, use of insecticide-nematicide mocap
Sweet potato	Sweet potato weevil	
Oil palm	Leaf miners	Leaf pruning of infested leaves
Yam		
Papaya	Mealy bugs, fruit flies	
cocoa	Capsids, black pod	Spraying fungicides and insecticides
Pineapple	Mealy bugs	
Citrus fruits	Fruit flies	
Cocoyam	Corm	
Taro	Leaf rot (causing crop loss of 40% as against 90% in 2011)	
Leafy vegetables	Caterpillars, aphids	Use of wood ash, use of insecticides

Annex 27: Major diseases and ways of managing these diseases in Mezam division (Field site III)

	Diseases / Pests	Period of attack	Control method
Cocoa and coffee	Fungi		Fungicides, spray equipment and body protective kits
			The village Phytosanitary Intervention Brigades (VPIBs) are being followed up and the main problem is the lack of intervention chemicals.
Tomatoes	Continuous rain resulted in floods/higher water table which submerged the crop, birds and insects	August - September	Bird scaring, Spray with insecticides
Maize	Soil grubs (P)	April - May	Application of nematicide
	Silk eating insects (P)	June - July	Use of fumigants
	Stem borers (P)	April - June	Spray with insecticides
	White ants (P)	May - July	Use of fumigants
	Grasshoppers and caterpillars (P)	Period of outbreak	Massive spraying, using insecticides
	Weevib (P)	April – June	Rug and bury
	Maize streak (D)	January – May	Treat insecticides
Huckleberry	Black ants and aphids	All year	Spray with insecticides
Okra	Insects and leaf borers	All year	
Plantains	Nematodes (P)	All year	Nematicides
	Panama (D)	May – October	
	Weevib	All year	Setting of traps
Colocosia	Phytophthora chlorosis		Fungi treatment

Annex 28: Pests, diseases and management in West region (Field site III)

Crop	Pest and disease	Control methods
Maize	Rust disease	
	Coal	
	Weevil	
Bean	Root rot	Use resistant varieties
	Mosaic	Use resistant varieties
	Rouille	Use resistant varieties
	Anthraxnose	Use resistant varieties
	Weevil	
Banana	Weevil	
Arachide	Cercosporioses	
	Rust disease	
	Rosette disease	
	Stunting	Use resistant varieties; Crop rotation
	Centipedes	Insecticide
	Nématodes	Nematicide treatment
Soja	Anthraxnose	Utiliser des variétés résistantes
	Fusarium disease	Fungicide treatment; use resistant varieties
	Blight	Use healthy seed; crop rotation
	Viruses	Use healthy seed; weed control
Irish potatoes	Mildew	Keep the field and boundaries clean and airy; Use healthy seed; treat alternatively with systemic and contact fungicide sprays; Proceed to the purification/selection
	Brown rot	Use resistant varieties; Avoid cultivation in lowlands; Utiliser les semences saines; Crop rotation; purification/selection
Tomato	Alternaria disease	
	Mildew	Avoid high density in planting; Extract and burn infested plants; Use fungicide (manèbe, mancozèbe...)
Cabbage	Mildew	Extract and burn infested plants; Use fungicide
	Flea beetles	Insecticide; Crop rotation
	Cabbage moth (caterpillar) and cabbage looper	Traitement à insecticide; Crop rotation
Coffee	Anthraxnose	Fungicide sprays
	Collar rot	
	Cercosporiose	
	Fusarium	
	Coffee berry borer	Insecticide; Keep the field and boundaries clean and airy
	Caterpillars	
	Insects	

Annex 29: Farmers' practices for soil fertility conservation

	Coastal zone	Humid forest north	Humid forest south	Forest-savannah	Western Highlands
No response	8	13	2	7	
Stabilising band				1	3
Use of legume species				4	4
Practice of improved fallow	1	2		11	7
Natural fallow	15	11	45	12	
Ridges along the contours		3		4	10
No-tillage		6		6	9
Use of manure	3	15	1	14	25
Use of organic matter and crop residues	1				9
Use of fertilizer Use of compost	7	36		20	26
Total of respondents	35	76	48	79	93
Source: Yemefack et al., 2010.					