BASELINE STUDY REPORT

Project: Cameroon Green Commodity Landscape Programme: Landscape Production Protection and Inclusion (PPI) Study in Mbangassina Municipality

World Agroforestry (ICRAF)

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Contributors

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Disclaimer

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Acronyms

4Rs	Roles/ Responsibility, Resources, Rights of stakeholders in the landscape
ACEFA	Program to Improve the Competitiveness of Agropastoral Family Farms.
AFD	Agence Française de Développement
AFOP	Program for the renovation and development of vocational training in the agriculture, livestock and fishing sectors
AFOP-PCP	Program for the renovation and development of vocational training in the agriculture, livestock and fishing sectors - Consolidation and Sustainability phase
AMS	Agroproduce Management Service
AUC	African Union Commission's
CAFS	Cocoa Agroforestry System
CGIAR	Consultative Group on International Agriculture Research
CICC	Conseil Interprofessionnel du Cacao et du Café
CIG	Commun Initiative Group
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CoopSecTaS	Coopérative du Secteur Talba Sud
CSO	Civil society organizations
CVEACA	Abreviation of a micro finance cooperative
DBH	Diameter at Breast Height
DEUC	Diagnostic de l'Espace Urbain
DPNV	Diagnostic Participatif Niveau Village
FAO	Food and Agriculture Organisation
FCFA	Franc de la Communauté Financière Africaine
FGD	Focus Group Discussion
FIDA	Fonds international de développement agricole
FODECC	Fonds de Développement des filières Cacao et Café

FTA	Forest, Trees and Agroforestry
GCLP	Green Commodity Landscape Programm
GDP	Gross Domestic Products
GICAM II	Group d'Intérêt Commun de AM II
GoC	Government of Cameroon
HH	HouseHold
HHS	HouseHold Survey
ICRAF	World Agroforestry
IDH	Sustainable Trade Initiative
IRAD	Institut de Recherche pour l'Agriculture et le Développement
LBA	Legalised Buying Agents
MBANGASSUD	Société Coopérative des Producteurs de Cacao de Mbangassina Sud
MC2	Mutuelle Communautaire de Croissance
MINADER	Ministry of Agriculture and Rural Development
MINFOF	Ministry of Forest and Fauna
NARS	National Agricultural and research organisations
NCCP	Non Certified Cocoa Producers
NGO	Non Gouvernemental Organisation
NTFP	Non Timber Forest Produit
OECD	Organisation for Economic Co-operation and Development
OLAM CAM	OLAM Cameroon
OMS	World Health Organisation
ONCC	Office National du Cacao et du Café
PAM	World Food Program
PAUEF2C	Project d'appui à l'utilisation des engrais dans les filières cacao café
PCD	Plan Communal de Développement
PCP-ACEFA	Consolidation and Sustainability phase - Program to Improve the Competitiveness of Agropastoral Family Farms
PES	Payments for Environnemental Service
PIN	Project Idea Note
PLADT	Plan Local d'Aménagement et du Développement Durable du Territoire
PPI	Production Protection Inclusion
RA	Rainforest Alliance

Rainbow/LTS	Rainbow Environnement Consult / LTS International Limited
REDD+	Reducing Emission from Deforestation and Forest Degradation
SAFs	Agroforestry System
SIC CACAO	Société industrielle Camerounaise de Cacao
UFA/FMU	Forest Management Unit
UNICEF	United Nations of International Children's Emergency Fund
UTZ	Certification Program
VAT	Value Added Tax
VSD	Vascular Streak Dieback
WDI	World Development Indicators
WWF	Worldwide Fund for Nature

Table of Contents

Figures

Tables

1. Executive summary

Cocoa farms occupy about 600,000ha of arable land in Cameroon and a source of livelihood to between 400,000 to 600,000 farmers, with 95% being small-scale farmers. The major cocoa producing areas of Cameroon are in the South-West regions (31.54% of total production), Centre (50.36%), South (4.99%), littoral (6.98%), the West, North-West and East regions account for the remaining 6.12%. Cocoa production and exports accounts for 0.905% of GDP.

The cocoa sector in Cameroon depends on a lot of natural elements to favour its production and productivity. Climatic factors such as rainfall, temperature, sunshine, humidity, soil moisture and wind affect cocoa production. Cameroon like other commodity producing countries suffer from low yields and increasing rates of deforestation due to expansion of tree crop commodities such as cocoa and palm oil. Besides, like most other cocoa producing countries in West Africa, Cameroon have similar causes of low yield which include low input use, inadequate maintenance, pest and disease control, poor shade management, little or no fertilizer use and ageing cocoa farms. These problems emphasize critical issues related to production; however, production issues are accompanied by deforestation and land degradation resulting from cocoa expansion. This increasing phenomenon is raising global attention, thus, the need to devise alternative options for increasing cocoa production without increasing deforestation. The use of children and the exclusion of women in cocoa value chain have equally been highlighted as one of the major issues related to inclusion of different actors, as well as ensuring social justice in cocoa production. Thus, the sustainability of cocoa production, processing and commercialization is at the risk of reducing yields, increasing deforestation and social exclusion. There is, therefore, the need to enhance cocoa production by looking at sustainability from three strands: sustainable production, protection and inclusion.

The Green Commodity Landscape Program (GCLP) initiated by, the Sustainable Trade Initiative (IDH), and the World-Wide Fund (WWF) Cameroon commissioned the World Agroforestry (ICRAF) to conduct a baseline study for the municipality of Mbangassina and Mintom as part of the Grand-Mbam and Mintom landscapes respectively. This baseline study has the objective to; (1) Establish the current state of the key indicators both quantitatively and contextually with emphasis on production, protection and inclusivity aspects in selected cocoa growing landscapes (2) Identify and characterize the key interventions/ practices and active actors, and potentials and challenges for greening cocoa landscapes in an environmentally sustainable, socially inclusive and economically rewarding manner for the key actors – the smallholders and the companies engaged in cocoa production and processing. This report summarizes the findings from the municipality of Mbangassina.

Data for this baseline study was collected from 08 villages of the municipality of Mbangassina, different data collection tools were used: focus group discussions were used to capture information related to production, protection, social inclusion and environmental challenges of the community; sample plots along 4 transects averaging 8 km along the landscape served as source of information on the biophysical characteristics of land-use and land-use change.

Descriptive statistics with central tendency measures (mean, median, mode), standard deviation and standard error computation were used. Content analysis was specifically used for qualitative information and data that were gathered both from the field and past works. This was fundamental for policy issues, market related aspects e.g., cocoa prices and other perception of deforestation and other development trends in the community. Additionally, the qualitative data was analysed by examining and providing an explanation of respondents' answers.

Key Findings

Production

Access to land and land markets: Access to land is principally through inheritance within the landscape, 59% of cash crops fields and 52% of food crop fields were obtained through inheritance. With increasing immigration, purchase of land is becoming common, especially for cash crop. The sampled population indicated that 32% of cash crop fields were bought against 13% for food crop fields. These farmers have different rights to land, 39% of respondents highlighted that they only have occupancy rights for cocoa fields because they consider their cocoa farms as family legacy. However, 61% underscored they have the right to sell, nevertheless, all respondents confirmed that they only have occupancy rights over food crop fields.

Food crops: Productivity of different food crops and cash crops within the municipality vary greatly and not often close to expected potential. Food crops average productivity is estimated at; cassava (8,000-10,000 kg/ha), yams (17,888 kg/ha), Maize (714.4 kg/ha), plantain (3,242 kg/ha) and Egusi "Pistache" (3 bags of 50 kg/ ha). Cassava, yams, coco-yams, plantain and maize are the most dominant food crops in the area. On average 58% of cassava is sold, 52% for yams, 31% plantain and 25% maize, thus cocoa is the dominant cash crop.

Cocoa productivity varies widely across the landscape: As for cocoa which is the main cash crop in the area, average cocoa productivity from focus group discussions in the 8 sampled villages vary between 800-1500 kg/ha. However, individual household data shows high variability ranging between 300-1500 kg/ha. Yet, there are significant variations in cocoa yields. The GCLP (2019) report indicates that when farmers apply correct inputs and good farm management practices, yields can go up to 1500 kg/ha in the Grand Mbam, however, yields in the South region is lower, ranging between 150-250 kg/ha (GCLP Mintom). Farmers indicate that the productivity trend is reducing and indicated poor knowledge in cocoa rejuvenation, pest and diseases and lack of finance as key reasons for this reducing trend.

Dominance of men and less educated farmers: Men dominate cocoa farming in the municipality of Mbangassina, cocoa farmers have an average age of 48 years, with 7 dependents. Sampled respondents had some secondary education (45%), completed primary school (18%) and some primary education (26%), only a few completed secondary education (2%) and went beyond secondary schools (7%).

Men dominate cocoa value chains and women dominate food crops value chain: Men are engaged in majority of the activities along the cocoa value chain, men dominate production activities, women are engaged in collection of cocoa pods, men dominate drying, marketing and decisions on income. However, for food crops, women dominate all the activities within the value chain.

Dominance of complex agroforestry systems: From a sample of 24 cocoa plots each with 30m*30m in the municipality. The total tree density (cocoa and shade trees) was 658 trees of this, 49% are cocoa trees while the rest 51% are shade trees (336trees) that also provide other benefits such as fruits, firewood and timber. The most frequently encountered shade tree species is Njansang (Ricinodendron heudelotti) occupying about 8.4% of all non-cocoa trees density and occurring in 29% of the cocoa plots sampled. Fraquet (Terminalia superba), occupying about 7.5% of all non-cocoa trees' density in the cocoa plots and occurring in about 29% of the plots is the second most predominant shade trees. Azobé (Lophira alata) is another shade tree commonly occurring (in 25% of the plots) and Baobab (Adansonia digitata) occurring in 17% of the cocoa plots.

Discrepancies in reported cocoa farm sizes: Information on average size of cocoa farm vary depending on the source from a low of 1.87 ha to a high 2.98 ha. focused group discussions reported an average of 2.64 ha, household survey (HH) reported 2.98ha, size declared by farmer before farm measurement (2.42 ha) average size effectively measured (1.87 ha), this underscores an average difference of 0.55 ha between reported information on farm size and real farm size. Average farm sizes vary depending on farmers' access to external support. In general, and for shaded tree agroforestry system, average farm sizes for smallholder farmers without support is estimated to be 1.5 ha per household; small holder farmers with support generally have 2.5 ha land per household. Small holder practicing full sun cocoa have an average household farm size of 3 ha. Farmers described to have medium sized cocoa farms, have an average of 12 ha while large scale farmers have an average of 25 ha (Lescuyer et al., 2019). On average, 68% of cocoa farmers are small holder farmers without support, 15.34% receive support from government, NGOs and other actors, 15.34% are small holders who practice full sun cocoa while 1.02% are medium sized farmers and 0.1% are large or big farmers (Lescuyer et al., 2019).

Food crop fields are characterized by small sizes: Food crop fields are generally small (Less than 0.5 ha) and characterized by mixed cropping system of Plantains/bananas, yams, maize groundnuts, cassava, vegetables/*home* and Egusi *pistachio*. A large proportion of these products are sold to retailers (59% of farmers), 17% to coaxers, 14% to wholesalers, 08% to consumers and 2% to *bayams*. Most of these products are sold at farmers' doorsteps (93%) while 5% of the remaining products are taken to urban markets and 1% to village markets.

Foreign cocoa buying companies are main buyers: Cocoa marketing in the municipality of Mbangassina is dominated by 5 major cocoa buying companies SIC CACAOS, OLAM CAM, TELCAR, AMS and Barry

Callebaut. They have their buying agents that come regularly to the different villages. Other individual buyers commonly called ‘coaxers’ are common within the landscape.

Contract labour dominates the cocoa value chains and family labour is common for food crops: Labour for farm maintenance is a major problem within the landscape with 2 types of arrangements are often made by farmers owners with labourers. The labourer is in charge of all activities within the farm while the farm owner buys inputs. Remuneration of the labourer is often done either as a percentage of sales or a fixed amount agreed upon by both parties. The second system is based on piece labour, where some young farm owners carry out different farm maintenance activities themselves and only hire labour for specific tasks.

Enhancing marketing of fruits can significantly increase profits per ha: On average, 1 ha of cocoa agroforestry system with fruit trees and producing 1000 kg/ha of cocoa can generate profits of 2,258 ,200FCFA ($4,053.32), if fruit trees are equally sold. However, if only cocoa is sold, profits can be 575, 000XAF ($1,032.09), an average selling price of 1,050 FCFA ($1.88468) per kg of cocoa was used.

Significant potential exists for farmer organizations to propel sustainable production: Producer organizations, (CIGs and cooperatives) permit farmers to benefit from diverse advantages linked to better prices for final products, purchase of inputs at cheaper prices and training. On average 52.44% of sampled farmers belong to producer organizations and cooperatives. Of these, 48.36% belong to cocoa cooperatives, 43.31% are in cocoa common initiative groups (CIG) while 8.33% are in food crop CIGs. However, members complain some producer organisations are not very active due to poor management, however, a few are very active with many members and social benefits.

Labour shortages, low productivity, and pest and diseases are key problems plaguing cocoa in the municipality: Cocoa farmers face a number of challenges, 57% of the sampled respondents highlighted labour shortage as main constrain to cocoa production while 43% highlighted diseases, pests and insects as main obstacles, and 43% of respondents equally underscored fluctuating cocoa prices as major constraints. Low productivity and shortage of inputs were highlighted by 29% of the sample as main constraints and 14% of the sample highlighted low market demand. Mismanagement of cocoa revenue, poor farmer organizations and low yields emerged from focus group discussions as key constraints to cocoa cultivation within the municipality.

Opportunities for sustainable production exist: The landscape presents several advantages for green commodity promotion, with reducing availability of land for cocoa, recent innovations in cocoa agroforestry permits cocoa expansion into degraded savannah. This presents an excellent opportunity to reduce pressure on small patches of the remaining forest in the zone. The presence of active and successful farmer cooperatives underscores the great potential for farmer organizations to enhance agriculture and livelihoods of members.

Other income generating opportunities exist for livelihood improvement: Hunting, sand mining and fishing are practiced by a small proportion of members in the community for income generation, with the scarcity of animals in the forest, hunting is principally for consumption or gifts. Sand mining is growing in the municipality; however, low demand and regulatory control hampers the growth of the sector.

Protection

Bafia forest reserve and stretch of community forests presents opportunity for sustainable forest management: The municipality of Mbangassina is neighboured by 30 community forests, 3 council forests and 3 UFA. The Bafia forest reserve covering 6,116 ha and 2 neighbouring community forests specifically from Ngoro and Ntui stretch into the municipality covering 2,000 ha. However, there is no management plan for the Bafia forest reserve.

Small existing patches of forest are highly degraded with high regeneration potential: To capture the diversity of land-use along the landscape, a total of 29 plots along 4 transects averaging 8 km were placed, of these, only 5 were forest plots. In the sampled forest plots, the average tree density was found to be 262 trees per ha. 10.30% of the trees are bigger than 31 cm circumference while the remainder 89.6% are less than 31 cm in circumference but taller than 3m viable to be counted as trees. This underscores the dominance of small trees, which is principal because these are secondary forests that had been previously logged, commercial timber species of exploitable diameter had been exploited.

Agroforestry remains the main forest related activity: Community members rank agroforestry as the most important forest related activities within the landscape. Other activities such as nurseries and seedling production and growing of fruit trees follow in the 2nd and 3rd position respectively. Firewood, fruit, cash-crop (food) emerged as the 1st, 2nd and 3rd ranked forest-based products within the municipality.

Climate regulation stands out as key benefit from forest ecosystem within the municipality: Forest ecosystems are important to people of this municipality because they provide important forest services, the community rank climate regulation as the most important forest service, soil fertility management is ranked 2nd while shade, soil protection and water conservation were all classified as 3rd.

Expansion of cocoa farms and settlement are key drivers of deforestation: Expansion of cocoa farms (1), settlement (2) and food crop (3) in this order were highlighted as the most important drivers of deforestation with suggesting that the trend is increasing. The observed trend can be explained by the increasing population of the area which leads to increasing pressure on forest land and land for settlement.

Animal biodiversity is highly affected by increasing ecosystem encroachment: Due to high forest encroachment within the landscape, animals such as chimpanzees, antelope, buffalo, gorilla, hare, lions, panthers and red monkey are threatened or extinct species in the landscape. However, animals such as rats, hedgehog, squirrels, porcupine, rodents, monkeys, and mole are abundant and can be seen on a weekly basis.

Human-wildlife conflicts are equally common, 71% of the sample highlight damage to crops as the main source of conflict, 28% underscore damage to resources and 14% confirm competition for resources as sources of conflict.

Social inclusion

The municipality of Mbangassina is made up of about 68,208 inhabitants unequally distributed amongst the different villages with Voundou as the most populated village with over 12,100 inhabitants. Similar to the national average, 56% of the sample are females, 44% male. Migration into the municipality has been very high, with over 39.6% increase in population over a 10-year period (2005-2015). Thus, increasing population density of 150 persons per km² in 19 villages (GCLP Grand Mbam, 2019).

The population of the municipality is made up of natives - "the Sanaga" and immigrants from other ethnic groups such as Bafia, Balom, Bamiléké, Bamoun, Haoussa, Eton, Yambassa, Manguissa, Mambila, anglophones from the North-West region and foreigners from Chad and Mali.

Access to health care remains a major challenge within the municipality with only 10 public integrated health centres, out of which, 2 are not operational; 1 is a functional medical health centre in Mbangassina and 4 private integrated health centres with that of Ngocke in a bad state.

Access to electricity is still a major problem in the municipality, 15 of the 19 villages are connected to the electricity grid, however, constant power cuts are very common.

Access to clean water is equally a big challenge, there are 48 wells (33 operational) and 36 bore holes (21 operational).

On average food is diversified by 41% thus farming households don't have a wide basket of foods they eat from, with 0% of households being in a situation of slight food insecurity and 82% in a situation of moderate food insecurity, about 6% of the population is in a situation of serious food insecurity.

Sources of income: The findings from household surveys shows that, agriculture is the main source of livelihood for the population of this municipality, it accounts for 80% of food consumption and 70% of household income. Cocoa is the main source of livelihood with 96% of the sampled population indicating that cocoa is one of their main sources of income, 79% depend on food crops, 23% on tree crops (Fruit trees, NTFPs), 11% from small businesses, 5 % generate revenue from livestock and 4% from pension.

2. Introduction

Just like other sub-Saharan African countries, agriculture contributes significantly to the national economy of Cameroon. The agricultural sector accounts for 22.9% of GDP and 62% of employment AUC/OECD (2018). However, data from the World Indicator database (WDI, 2020) shows that in 2018, the agriculture, forestry and fishing sectors contributed 14.42% of GDP, the agricultural sector accounted for 46.3% of total employment. This data underscores the importance of agriculture to the economy and its potential in propelling the economy towards its 2035 economic emergence agenda.

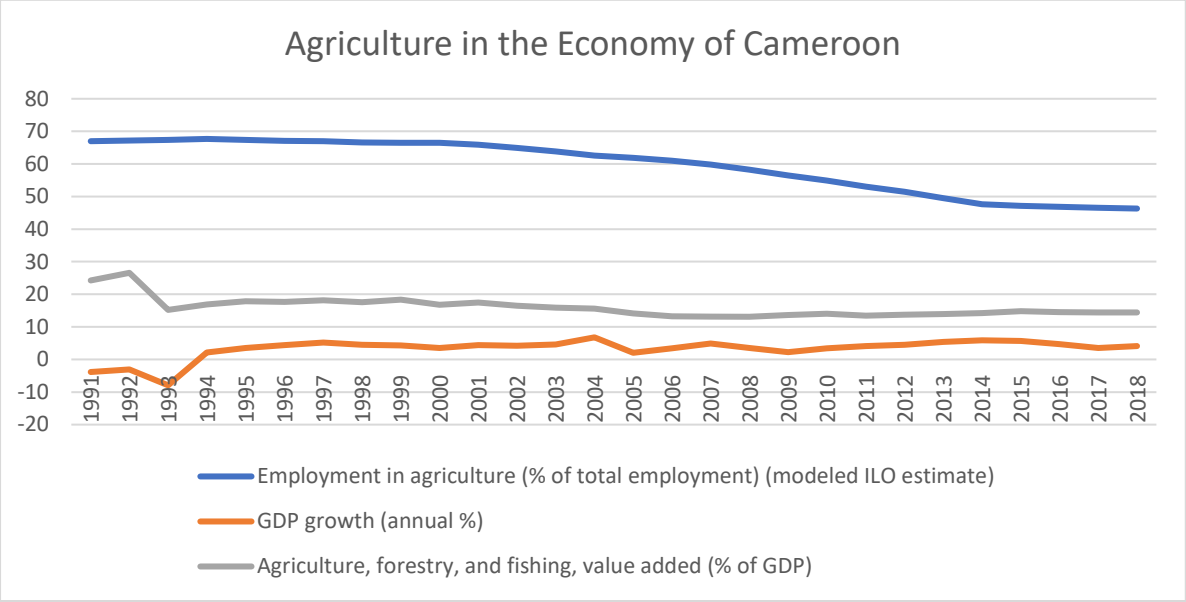


Figure 1: Importance of agriculture to the economy of Cameroon. Source: WDI, 2020

Cocoa is the main exported agricultural commodity, excluding the very low domestic consumption of chocolate products, the product in the cocoa value chain is intended for export. The amount of these exports of non-certified beans ("bulk"), certified beans and cocoa mass ("chocolate products") is approximately 273 billion CFA francs in 2018. The difference between the amounts exported and imported indicates a trade surplus of around 228 billion CFA francs generated by the cocoa sector in 2018 in Cameroon (Lescuyer et al., 2019). The cocoa sector contributes approximately 6.25% of the total 14.28% to the value added produced by the agricultural-forestry-fishing sector in the GDP of 2018 (ibid). The production, processing and export of cocoa in Cameroon generate Value Added (direct and indirect) of 202 billion F.CFA and contribute about 0.905% to the GDP of Cameroon, which was estimated at 22,375 billion FCFA in 2018 (Lescuyer et al., 2019). This is a significant drop from the frequently cited estimate over the past decade of a 2% contribution from this sector to GDP. This is principally due to the low cocoa prices and the overall decrease in volumes produced and exported since 2016. The tax revenue generated by the cocoa sector in Cameroon comes from four main sources: the export charge, the turnover tax, the VAT not refunded to businesses, and the taxes on imports. This taxation concerns the domestic cocoa value chain,

but general taxation also applies to sectors that interact with this branch of the national economy. In total, tax revenue produced directly and indirectly by the cocoa sector is estimated at CFAF 25.1 billion per year (Lescuyer et al., 2019).

Cocoa production over time has been one of the major export crops of Cameroon. Total surface area of land dedicated to cocoa in Cameroon is estimated at 600,000 ha (Lescuyer et al 2019), thus an important determinant of land-use change in Cameroon. The major cocoa producing areas of Cameroon are in the South-West regions (31.54% of total production), Centre (50.36%), South (4.99%), littoral (6.98%), with the West, North-West and East regions accounting for the remaining 6.12% (ibid). About 400,000-600,000 farmers depend on cocoa for their incomes and livelihood, with about 95% being small scale farmers with farm sizes ranging between 2.5-5ha (Drum, 2016). The sale of cocoa beans remains the main source of income for its producers.

2.1. Cocoa production, productivity and profitability in Cameroon

Lescuyer et al (2019) gives a succinct description of the cocoa farming system and farmers in Cameroon. The description is based on the different ecological zones and differences in socio-economic characteristics of farmers, different cocoa practices and type of cocoa farmers exist. From the latter, two main types of cocoa agroforestry systems are known to exist in Cameroon, full sun and shade tree agroforestry systems. According to the authors, average farm sizes vary depending on farmers' access to external support. In general, and for shaded tree agroforestry systems, average farm sizes for smallholder farmers without support is estimated to be 1.5 ha per household; small holder farmers with support generally have 2.5 ha land per household. Small holder practicing full sun cocoa have an average household farm size of 3ha. Farmers described to have medium sized cocoa farms, have an average of 12ha while large scale farmers have an average of 25 ha. On average, 68% of cocoa farmers are small holder farmers without support, 15.34% receive support from government, NGOs and other actors, 15.34% are small holders who practice full sun cocoa while 1.02% are medium sized farmers and 0.1% are large or big farmers (Lescuyer et al., 2019). This, thus, underscores the fact that small holder farmers without support dominate the cocoa value chain in Cameroon (see table below).

Table 1: Description of the cocoa farming system and farmers in Cameroon

Key characteristics	**Shade tree cocoa agroforestry**		**full sun**	**Medium scale farmers**	**Large scale farmers**	**Total**	**Official data sources (MINADER, ONCC)**
	1. Without support	**2. With support**	**3. With support**				
Average surface area	1,5	2,5	3,0	12,0	25,0		

(ha/household)							
Productivity, dried cocoa beans (kg/ha/an)	280	600	500	700	150		
Number of households	200,000	45,000	45,000	3,000	300	**293,300**	300,000-500,000
Total surface area (ha)	300,000	112,500	135,000	36,000	7,500	**591,000**	600,000
Total cocoa beans production (t/an)	84,000,000	67,500,000	67,500,000	25,200,000	1,125,000	**245,325,000**	241,029,519

Source: Lescuyer et al., 2019

The figure below shows the evolution of cocoa sold in Cameroon from the 2003/2004 - 2018/2019 production season

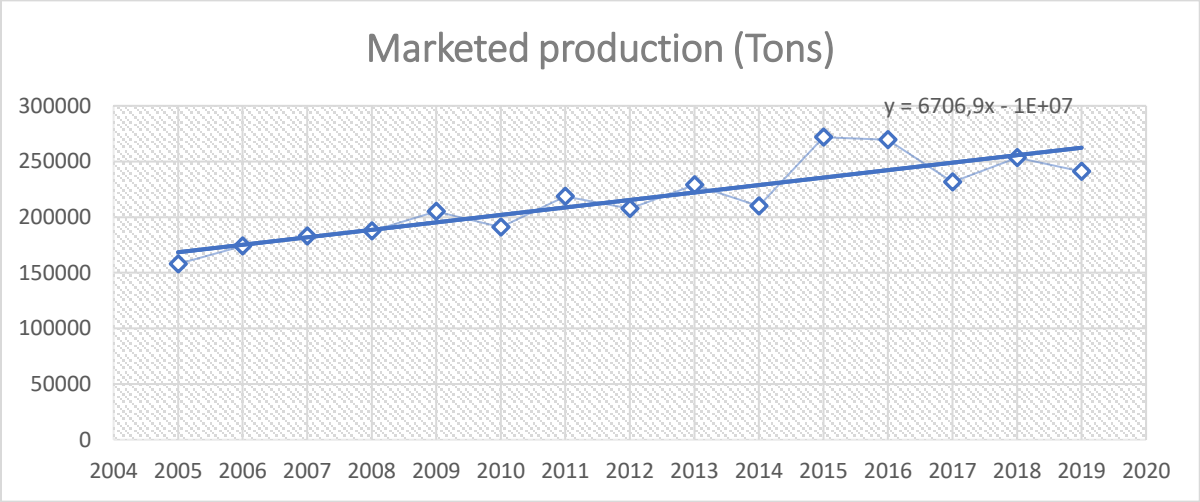


Figure 2: Marketed cocoa production in Cameroon. Source: ONCC, 2019.

Marketed cocoa production experienced an increasing trend until 2016 but is undergoing aftermath of falling international prices and unrest in the South-West for almost three years to stagnate around 250,000 tons of dry beans per year. Although the South-West region has been the main production area for at least two decades, due to the socio-political crisis in the region, the Centre region is now the highest cocoa producing region, accounting for 50.36% of national production, the South West region follows with 31.54%, South (4.99%), East (3.38%), Littoral (6.98%), North West (1.21%) and West (1.53%).

It is noteworthy that although Cameroon is one of the top producers of cocoa in the world, yields continuously remain low averaging 300-400 kg/ha. Average yield in other Cocoa producing countries in Africa is equally low, in Cote d'Ivoire, it varies between 500-600 kg/ha, 400 kg/ha in Ghana and Nigeria (Wessel et al, 2015). However, there are significant variations in cocoa yields; the GCLP (2019) report indicated that when farmers apply correct inputs and good farm management practices, yields can go up to 1500 kg/ha in the Grand Mbam, however, yields in the South region is lower, ranging between 150-250 kg/ha (GCLP Grand Mbam, 2019).

Lescuyer et al. (2019) highlights that primary producers with small plantations are characterized by net profit rates between 4% and 24%. Subsidies received by around 90,000 farmers in the form of inputs or training at lower cost help to increase these profit rates. Producers with farm sizes between 5 and 20 hectares have a moderate net profit rate of 9% but generate a large added value and receive substantial gross revenue.

The cocoa sector in Cameroon depends on a lot of natural elements to favour its production and productivity. Climatic factors such as rainfall, temperature, sunshine, humidity, soil moisture and wind affect cocoa production. According to Wessel and Quist-Wessel (2015), cocoa producing countries in West Africa have common causes of low yield which includes: low input use, inadequate maintenance, pest and disease control, poor shade management, little or no fertilizer use and old age of cocoa farms. These problems emphasise critical issues related to production; however, production issues are accompanied by deforestation and land degradation resulting from cocoa expansion. This increasing phenomenon is raising global attention, thus, the need to devise alternative options for increasing cocoa production without increasing deforestation. The use of children and the exclusion of women in cocoa value chain have equally been highlighted as one of the major issues related to inclusion of different actors as well as ensuring social justice in cocoa production. Thus, the sustainability of cocoa production, processing and commercialisation is at the risk of reducing yields, increasing deforestation and social exclusion. There is therefore the need to enhance cocoa production by looking at sustainability from three strands: sustainable production, protection and inclusion.

2.2. Background and objectives of the study

This baseline study was carried within the framework of the Green Commodity Landscape Program (GCLP). The GCLP was initiated by IDH, the Sustainable Trade Initiative, and the Worldwide Fund (WWF) Cameroon. It is a landscape-level multi-stakeholder program that aims to support sustainable commodity production while contributing to forest protection and improving the livelihoods of farmers and their community, using cocoa production as an entry point to the landscape. This baseline study is a follow up of the scoping study that was carried out from January until July 2019.

The general objective of the baseline study is to conduct a "Landscape Production, Protection and Inclusion study" in 2 selected municipalities Mintom and Mbangassina as part of the Grand Mbam and Djoum-

Mintom landscapes, in order to gather information to support dialogue at landscape level and the development of targets and action plans that take into account the landscape specificities.

The specific objectives of the baseline study are to:

- Establish the current state of the key indicators both quantitatively and contextually with particular emphasis on production, protection and inclusivity aspects in cocoa growing landscapes selected.
- Identify and characterize the key interventions/ practices, active actors and potentials and challenges for greening cocoa landscapes in an environmentally sustainable, socially inclusive and economically rewarding manner for the key actors – the smallholders and the companies engaged in cocoa production and processing.

This report is focused on the Mbangassina landscape and describes how the baseline study was designed and carried out using the three pillars of sustainable production, Protection and Inclusion. The next section describes the methodology with a focus on i) the conceptual framework based on the three pillars, ii) the context of the studied landscape and iii) the data collection tools, approaches. And iv) analytical approach. The methodology is followed by the results packaged into the three pillars

3. Methodology

3.1. Conceptual framework- based on the GCLP and PPI approach

The conceptual framework applied in the design of this study is based on the Green Commodity Landscape program which adopts a landscape approach and implies working together with industry partners (from the cocoa sector but also from other sectors), public institutions, farmer associations, financiers, CSOs and knowledge partners to develop jointly a vision and action plan that balances sustainable production, forest protection & restoration and community inclusion (PPI) in the landscape.

The aim is to have a landscape where commercial and food crops are grown sustainably (Production); forests and other natural resources are sustainably used, protected and when needed restored (Protection); and farmers' and communities' livelihoods are enhanced (Inclusion).

This study adopts the cocoa supply chain as the entry point to the landscape and pays attention to other agricultural supply chains, industries (timber, extractives), and infrastructure that may have significant impact on the three pillars, in the landscape.

The sustainability dimension of the landscape approach to cocoa production lies on the fact that while producing cocoa in a given landscape, the needs of the local communities are taken into account in the inclusion dimension and the protection dimension ensures that forest and natural resources are protected. This is expected to help build cocoa farming into a more sustainable livelihood option for rural entrepreneurial farmers and hence reinforce protection of ecosystems services that farmers rely on.

3.2. Context of The Grand Mbam Landscape and the Mbangassina municipality

3.2.1.Administrative boundaries

The Grand Mbam Landscape: Mbangassina municipality was selected as the priority municipality within The Grand Mbam Landscape due to its accessibility, high cocoa production and relatively strong engagement of the private sector in developing the cocoa value chain. In fact, the first unit of analysis and level of socio-political engagement for the GCLP is the Municipal Council and all stakeholders living within it, and/or having an influence in that municipality. To start with and keep the work manageable, priority municipalities were selected in each landscape. They serve as entry point to the landscape, with the GCLP expanding rapidly to neighbouring municipalities.

The Municipality of Mbangassina was created by presidential decree n ° 93/321 / PR of November 25, 1993. Mbangassina is located in the centre region, Mbam and Kim Division and is made up of 19 villages. The municipality of Mbangassina covers a total surface area of about 815km². It is located on both banks of the Mbam river with an area of 638 km² and 120 km from Yaoundé. The Municipality is bordered to the north by the municipality of Ngoro, to the south by Sa'a, to the east by Ntui and to the west by the municipalities of Ombessa, Bafia and Bokito (PCD Mbangassina, 2015).

3.2.2.Topography

The Municipality of Mbangassina in general, has a slightly uneven relief consisting of a succession of hills and plateaux for the most part (PCD Mbangassina, 2015). These are linked by sedimentary rivers in which some marshy areas exist. The rest of the municipality is made up of vast plains and small valleys and large hills of up to 526m above sea level (Montama I, II, III) which are currently occupied by populations in search for new fertile land. A socio-ecological system that consists of natural and/or human modified ecosystems, and which is influenced by distinct ecological, historical, economic and sociocultural processes and activities (PCD Mbangassina, 2015).

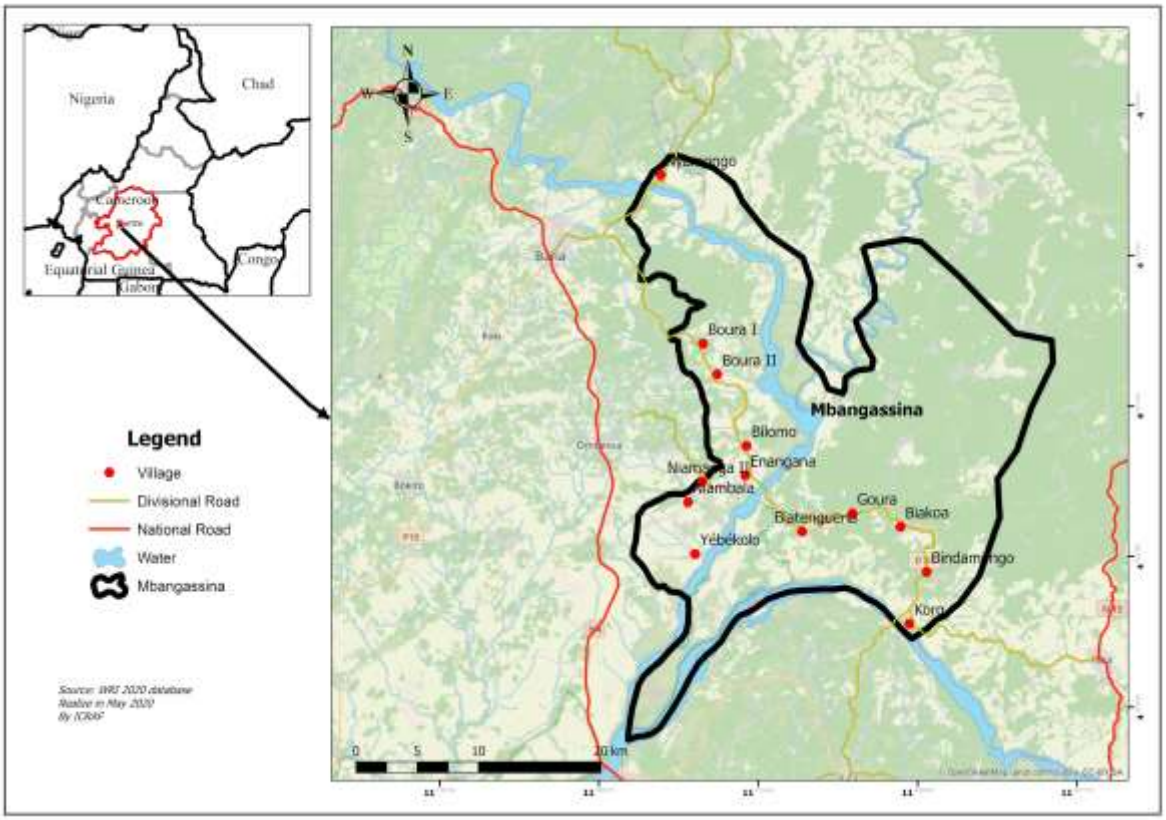


Figure 3: Map of Mbangassina area

3.2.3.Climate

The Mbangassina municipality extends between 11 ° 1 and 11 ° 30 East longitude and between 4 ° 20 and 4 ° 40 north latitudes. The annual average temperatures range between 22 ° C and 32 ° C. Rainfall between 1300 and 1500 mm per year (Commune de Mbangassina, 2010). Due to its location in the equatorial zone, the Municipality benefits from a climate characterized by four seasons including two dry seasons and two rainy seasons. The long dry season runs from mid-November to mid-March, short rainy season runs from mid-March to mid-June, the short dry season from mid-June to mid-August and the long rainy season from mid-August to mid-November (PCD Mbangassina, 2015).

3.2.4.Soil

Soils in the Mbangassina municipality include plateaux soils, swampy soil and plain soils. Most of the soils of the municipality are either ferralitic, or coarse structure and the colour varies from yellow to dark grey. The soils of the plateaux (Banta) have rocky outcrops that can be seen on the sides of hills. These soils are poor in organic matter but support gravel pits. The soils of the lowlands, notably in Mbangassina, Badissa, are very rich in organic matter but are most often waterlogged during the rainy seasons and poorly drained in dry seasons. These are very fertile soils because, resulting from runoff of water causing a lot of organic matter and sediment from leaching and erosion of the soils upstream. The soils of the plain land especially in Voundou, Ngocke are generally ferralitic with clay-sandy or loamy soils. The flat nature of the topography makes it a major habitation zone for the community (PCD Mbangassina, 2015).

3.2.5. Vegetation

The landscape is dominated by cocoa agroforestry and patches of secondary forest with large savannah area. The main woody species are among others represented in the table below:

Table 2: The main woody species and their uses

No	Species	Scientific name	Usage
1.	Baobab	Adansonia digitata	Medicine
2.	l'Iroko	(*Milicia excelsa)*	Medicine, firewood
3.	Le fraké	(*Terminalia superba*)	Medicine, timber, construction
4.	Parasolier	Musanga cecropioides	timber
5.	Le Sapelli	(*Entandrophragma cylindricum*)	Medicine, construction
6.	Padouk	Pterocarpus osun	timber
7.	Le Bilinga	(*Nauclea diderrichii*)	Medicine, timber
8.	l'Ebènier	*(Diopyros crassiflora*)	timber
9.	Le Doussié blanc	(*Afzelia pachyloba*)	timber
10.	L'ayous	(*Triplochyton sceroxylon*)	timber
11.	Le Moabi	(*Baillonella toxisperma*)	Medicine timber
12.	Le Sipo	(*Entandrophragma utile*)	Medicine
13.	le Framiré	(*Terminalia ivorensis*)	Medicine
14.	Okoumé	Terminalia ivorensis	Medicine
15.	Le Movingui,	(Distemonanthus benthamianus)	Medicine, timber
16.	Le Noisetier	(*Kola acuminata*)	Food
17.	Le Bitter cola	(*Garcinia cola*)	Food
18.	Le Djangsang	(*Ricinodendron heudolettii*	Food

Source: PCD Mbangassina, 2015

3.2.6.Wildlife

The Municipality of MBANGASSINA is an ideal area for agriculture. The fauna is characterized by the presence of rodents such as (porcupines, rats). However, there are other species such as antelopes, civets, monitor lizards, crocodiles, pythons, etc.

Table 3: The main animal species and their protection classes

N°	Common name	Scientific Name	Protection class
Mammals			
1.	Chevrotin aquatique	*Hyemoshus aquaticus*	A
2.	Hippopotame	*Hippopotamus amphibus*	A
3.	Sitatunga	*Tragelaphus spékei*	A
4.	Buffle	*Syncerus caffer*	A
5.	Gazelle	*Gazelle rufufrons*	A
6.	Céphalophe à bande dorsale noire	*Cephalophus dorsalis*	B
7.	Civette	*Vivera civetta*	B
8.	Nandini	*Nandinia binotata*	C
9.	Céphalophe bleu	*Cephalophus monticola*	C
10.	Aulacode commun	*Thryonomis swinderianus*	C
11.	Rat	*Cricetomys*	C
12.	Pangolin à longue queue	*Manis tetradactyla*	C
13.	Pangolin à écaille. tricuspides	*Manis tricuspis*	C
14.	Écureuil à pattes rouges	*Funisciunus pyrrhopus*	C
15.	Écureuil à quatre raies	*Funisciunus isabella*	C
16.	Athérure	*Atherurus africana*	C
17.	Hocheur	*Cercopithecus nictitans*	C
18.	Moustac	*Cercopithecus cephus*	C
Reptiles			
19.	Varan du Nil	*Varanus niloticus*	B
20.	Python	*Python sebae.*	B
21.	Tortue terrestre	*Kinixis spp.*	C
22.	Vipère du Gabon	*Bitis gabonensis*	C
23.	Couleuvre	Thamnophie sirtalis	
Birds			

24.	Francolins	*Francolinus spp.*	A
25.	Perroquet vert	*Poicephalus crassus*	A
26.	Perroquet rouge	*Poicephalus gahem*	A
27.	Oie sauvage	*Anatida sp.*	B
28.	Calao	*Ceratogimna spp.*	C
29.	Pintades	*Numida sp.*	C

Source: PCD Mbangassina

It appears from this table that at least 32 wildlife species are found within the Municipality of Mbangassina. Of these 32 species, 09 are fully species protected in Cameroon (class A), 06 are partially protected (class B) and 17 belong to protection class C.

3.2.7.Hydrography

The Municipality is watered by numerous streams and rivers, the most important are the rivers (Sanaga and Mbam,) and the Djim. These rivers contain fish and unfortunately also constitute a reservoir of blackflies, with as a corollary the resurgence of onchocerciasis. Next to these main rivers, there are a multitude of small rivers (rivers, streams, springs) some of which have a seasonal regime.

The table below shows the rivers and streams that water each community

Table 4: The rivers and streams that water each community

Village	**River**
BANTA	Djim, Ma'a, Djigbe, Sana
BIAKOA CENTRE	Ikokoro, Korno, Mbawomba
EYAMBOUNOU	Onomo,Towaro, kwassara, Mpi, Adjinea, Bolea, Eyambounou
NYAMANGA	MBAM, Bontse ba , Itoungourou
VOUNDOU	Djim,Ossom rabouini, Ngatenga,Meteh,Banta
BIATANGANA	Mbam, Sanaga,Onomo ,Ogono-ekoto,Yamba
TCHAMONGO	Mpeme,Bianga
MBANGASSINA	Sanaga, Mbam,Assora kotto,
NGOKE	Eyambounou,Ossombara bouni,Ngoke,Gol beme,Bitorno,Ndenga
ENDIGUILI	Mpeme,Mbounya
BIATOMBO	Mbam,Bitatane,Tanda I,Tanda II,Ngo itakouré,Wakwa iwourou
TEATE	Mpi,Niki,Sombo,Ndenga,Mpeme
BIAHONGO	Sanaga,Norongona tsetsegni, Ehondoti, Barmanda
BIALANGUENA	Mbam,Ikoumou,Ofama,Moegnogni
GOURA I	Sanaga, Eyambounou, Toaro, Ongourou, Ebossa, Wane, Ossombo wawa, Onomo, Woreh

YEBEKOLO	Mbam, Bikahô, Etoa, Iyoh

3.2.8.Land use and cover

The municipality of Mbangassina is subject to different land use types, these land use types have changed over time due to population growth, immigration, and change in socio-economic conjuncture of the municipality. The table below shows the different land-use types within the municipality of Mbangassina, the dominance of secondary forest. The table shows that forest land occupies 48.54% of the landscape while agricultural land is dominated by crop land accounting for 13.39% of the landscape while cocoa accounts for 11.22% of the landscape. Grasslands and Shrublands account for 21.90% of the landscape.

Table 5: The different land-use types within the Mbangassina municipality

Land use	**Land Cover**	**Area (hectares)**	**Share (%)**	
			Land use	Landscapes
Forested Land	Primary forest	18177	45.89%	22.27%
	Secondary forest	21432	54.11%	26.26%
	Total	**39608**	**100.00%**	**48.54%**
Agricultural Land	Oil palm	3.4	0.02%	0.00%
	Cocoa	9158.4	45.58%	11.22%
	Rubber	0	0.00%	0.00%
	Cropland	10931	54.40%	13.39%
	Total	**20092**	**100.00%**	**24.62%**
Grasslands and Shrublands	Grassland	7005.6	39.20%	8.58%
	Shrubland	10868	60.80%	13.32%
	Total	**17874**	**100.00%**	**21.90%**
Others	Water	3281.7	81.45%	4.02%
	Urban	747.44	18.55%	0.92%
	Total	**4029.1**	**100.00%**	**4.94%**
Total Area		**81603**		**100.00%**

Source: Adapted from Satelligence (2020)

3.3. Data and data collection tools and approaches

3.3.1.Literature review

a) *Rainbow/LTS study and other literature*: This consisted of a rigorous review of previous work done by Rainbow/LTS Consultancy firm. The Rainbow/LTS study was designed to set the scene on the existing livelihood supporting activities in the Grand Mbam municipality. Consequently, the results were considered the starting point of the in-depth analysis of the production, protection and inclusion potential of the municipality. Besides the Rainbow/LTS study, other reports and

publications related to the three pillars were sourced and reviewed to complement existing information.

b) *Review of past and present projects in the landscapes:* This involved identification and brief analysis of the various productive activities in the landscape and examined their environmental, social and livelihood implications. The analysis also focuses on identifying the initiatives, potential pathways for sustainable production and current constraints for sustainable production. This activity was supported by the data that was collected from the field as will be described under field data collection.

c) *Reviews of maps, management plans, and social data:* This consisted of a review any data that had relevance to the current task including maps produced by Satelligence and those from other sources. Other social data and statistics relevant to the landscape such as information from the municipality development plan were also reviewed.

d) *Review of projects and programs in the landscape:* This consisted of detailed review of existing and past projects that have or are being implanted in the municipality/landscape and that may have an impact on the three pillars of the GCLP: Production, Protection and Inclusion.

3.3.2.Field data collection

Field data collection deploys five major data collection procedures that were aimed at capturing different types of data at different levels of details.

a) Key informant discussions

Information was also collected from key informants in the municipality. The key informants were usually, project heads, sub divisional delegates in charge of agriculture, livestock and forestry. Other important information was also collected from the municipal council by talking to staffs and elected delegates. The idea was to gather information to paint a general picture of present and past initiatives related to the three pillars and also to have an understanding of active and potential stakeholders and projects in the municipality.

b) Focus groups and stakeholder mapping

The main aim of conducting Focus Group Discussions (FDGs) was to have an in-depth look into the various factors affecting the Production Protection and Inclusivity (PPIs) aspects in an effort to realise workable solutions for sustainable landscape management within the municipality. It was used to get a deeper understanding of outstanding issues related to sustaining the cocoa-producing landscapes in the specified area.

The selection of participants was done so as to cover as much as possible, diversity in terms of gender, societal classes, and engagement levels in different types of land use activities particularly cocoa farming. This was done with the assistance of village leaders. The latter were all contacted prior to the FGD.

Specifically, the team made a curtesy visit to the chief of each selected village where the village leaders were briefed about the objectives of the visit the preferred characteristics of FGDs participants and agreement made on a date for FGD proper. More explicitly, the village leaders were asked to invite 10 to 12 village members who are familiar with the population, and highly active as producers or member of community development association or that usually participate in community development initiatives. Besides, they were asked to ensure the representativeness of all social classes (men, Women and Youth, migrants and Baka). One or two days before the discussion, a follow-up visit was made to ensure that the population had been informed.

The FGDs on sustainable production, markets and social inclusion were conducted in two phases. Phase 1 focused on the selection of the most promising resources and products, and Phase 2 on the value chain analysis. 8 FGDs involving 10-15 cocoa farmers and women from the community were used to collect production, market and inclusion baseline information. On average, phase 1 lasted two hours, phase 2 lasted two and a half hours. The FGDs on natural resources management and environmental-related challenges were conducted in one round and aimed at understanding the associated explanations and societal understanding of the features observed within the landscapes. It also encompassed challenges that the community is facing within their respective landscapes and what solutions or measures they would propose as to the potential solutions against the problems identified. Additionally, eight FGDs of 10-15 people were conducted to collect information on the environmental baseline. These FGDs lasted on average two and a half hours.

Stakeholder mapping and inventory of projects in the landscape: During the focus group on sustainable production, markets and social inclusion, a session was reserved for stakeholder mapping. The assumption here was that landscape-level activities are derivatives of the interests, capacities and objectives of the landscape actors. When it involves commodities such as cocoa and timber, the chain of actors expands widely including national level players. Hence, mapping the stakeholders in the landscape was crucial. Together with the focus group participants we characterised the stakeholders, their roles, the supply chains and how they interact with the community. We did an inventory of projects and programs in the landscape and how they relate to the three pillars of sustainability.

c) Landscape level practices assessment – Field transects

The transects were largely to understand the cross-sectional overview of the state of land use practices, land cover attributes and specific vegetation characteristics. For this, we used a nested sampling approach (Figure 4) wherein the different plot sizes were used for different types of vegetation types.

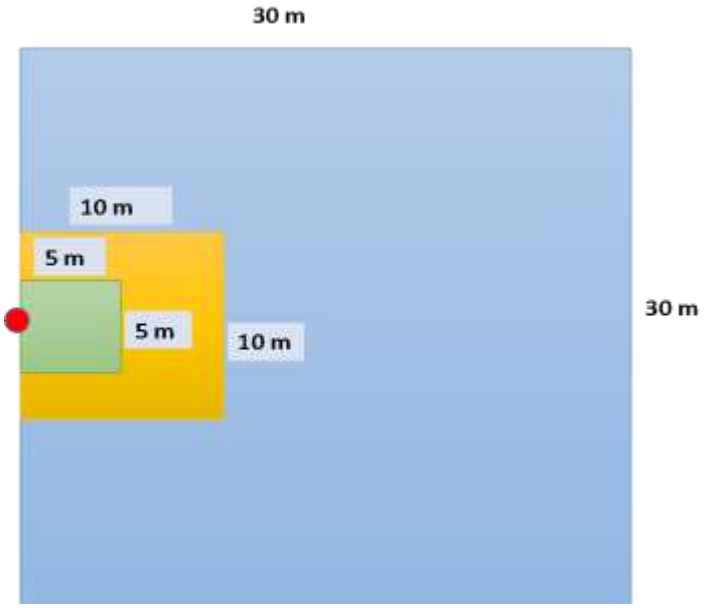


Figure 4: Nested plots for land use land cover characterization

For trees greater than 10 cm diameter at breast height (31 cm circumference), a 30m-by-30m plot was used. For trees less than 10 cm diameter and above 3m height, a plot of 10m by 10m was used. For seedling and small saplings, a 5m-by-5m plot was used. All the plots were aligned in a nested manner as indicated in figure 4. All spatial coordinates of the plots were recorded in a clockwise manner at each corner starting with the lower left point. To avoid any dislocation a centre point was also recorded for the main plot for ease of calibrating the location (Figure 5).

Table 6: Plot level data characterization

Plot types	**Specific details**	**Data types**
30m*30m	Trees greater 31 cm circumference	Species (local and common names), circumference, living status
10m*10m	Trees less than 31 cm circumference	Species (local and common names), circumference, living status
5m*5m	Seedling and sapling	Counts by species

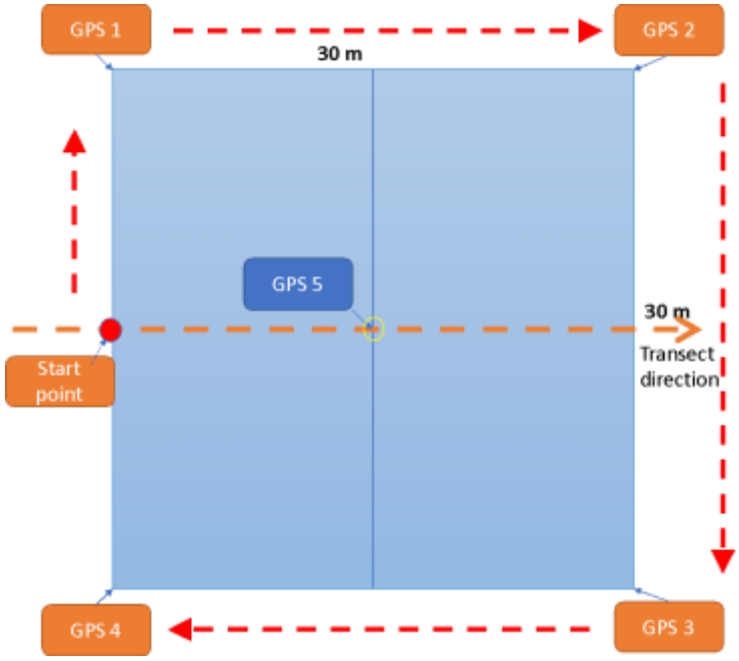


Figure 5: Georeferencing of plots

In Mbangassina, the interval between plots was set to be 1 km. Four transects were sampled in Mbangassina, each with a length of between 8-10 km. It took at least two days to complete one transect. In Mbangassina, we sampled 5 forest plots and 24 cocoa agroforestry plots. Within the four transects. At each sampling point data was collected for different data types.

d) Farm sketches

Farm sketches were done for all selected interventions that are predominantly characterizing the activities of the communities. For selected plots, along the transects, farm sketches were developed to characterize the 30m*30m plots to understand the features of the different land use practices and land cover elements. Theses sketches give a visualization of what the plot looks like. It is noteworthy that the sketches are only done for some selected representative plots.

e) Household surveys

Households surveys were conducted to collect additional information on sustainable production, markets and social inclusion to be triangulated with data from FGDs. HHS respondents were selected based on their availability and willingness to contribute to the study.

82 households' surveys (HHS) were performed in 08 villages. HHS lasted between 45 min and 120 min with an average of 75 min. Duration depended on the ability of the respondents to understand and answer the questions.

f) Rapid reconnaissance market surveys

Rapid reconnaissance market surveys were conducted in the study villages and nearby towns like Bafia. The objectives were to understand the dynamics of the flow of food crops and cocoa from the community to main purchasing canters. Through the rapid reconnaissance survey, we also tried to understand the structure, conduct and performance characteristic of the marketing system for food crops and cocoa. Table 3 gives an overview of the data collection tools and approach.

3.3.3.Research team

The transect team was generally composed of 8 to 9 members including: a core team of 5 university graduates with at least a first degree and four village youths. The core team members had experience in the forest and cocoa sector and had performed similar activities with ICRAF in the Grand Mbam landscape. The core team was divided into 2 sub-groups; one group of 2 persons in charge of focus group and the other group of 3 persons in charge of transect and farm sketches. The transect and Farm team was assisted by 3 or 4 village youths. The villages youths served as guides into the forest, open up paths, and helped in identification of species. In this regard efforts were made to select at least one member in the community who was experienced in identifying tree species in local and scientific names.

Table 7: Data collection tools and number of participants

Villages		**FGDs identification most promising resources and value chain analysis**	**FGDs Environmental baselines**	**Number of Household surveys completed**	**Coverage by the transects**
1.	Talba	Yes	*Yes*	10	Yes
2.	Biakoa	Yes	Yes	10	*yes*
3.	Goura 1	Yes	Yes	10	*Yes*
4.	Mbangassina centre	Yes	Yes	12	Yes
5.	Elangana	Yes	Yes	10	*No*
6.	Boura 1	Yes	Yes	10	Yes
7.	Bilomo	Yes	Yes	10	*Yes*
8.	Badissa	*No*	*No*	10	Yes
Total		***7***	***6***	**82**	

The table below provides details about the participants in the focus group discussions and household surveys.

Table 8: Summary information on participants (respondents)

Location	FGDs Environmental protection	FGDs identification of key products	HHS
Total number of participants	77	94	82
Participant is male (%)	69.3	75.81	75.61
Mean age of participant (sd)	44.8(12.4)		46.8 (16.1)
Age of oldest participant	86	86	
Age of youngest participant	19	19	
Mean household size	8.4 (5-12)		7.65 (4.08)
Mean number of years in area (sd)	27.7 (18.3)		36.06 (18.16)
Highest number of years lived in area	79		
Fewest number of years lived in area	<1		
Ethnic Groups	Sanaga	Sanaga	Native (Sanaga) (80%), Immigrants (20%),

The FGDs team was composed of one facilitator and one note-taker. The team completed most of the households' surveys and contributed to some of the transects, including the verification of forest plots. The core team was trained for at least a week in the use of the various tools and contributed to testing and finalising the tools. The general data collection was supervised by a senior ICRAF scientist who visited the team on the field to address pending methodological issues and also took part in collecting data from key informants. The data collection team spent a total of 5 weeks on the field.

Table 9: Synthesis of methods and tools in relation to the tasks

Activity	Method and tools	Specific data/ details	Source of data
1. Data collection and analysis: Sustainable production			
1.1 Inventory and analysis of all productive activities in the landscape	-Literature review, consultation with key stakeholders with specific attention on the rainbow study. -Interview and consultations	Main agricultural and forest activities in the area., Main agricultural lands. Mining and logging activities	-Interview with Key landscape stakeholders -Review of land use maps

1.2 Diagnosis of landscape-level projects	-Literature review of project reports and initiatives in the municipalities about key productive areas -Analysis of information in PINs developed earlier Consultation with key stakeholders	Initiatives aimed at improving sustainable production, environmental protection, and social inclusion.	Producer organisations, research centres, etc., -Key informant interviews with project heads operating or that operated in the area.
2. Data collection and analysis: Forest protection and restoration			
Environmental baseline Deforestation/ land use change drivers	Cross-sectional transect, Focus group discussions, Landscape actors' consultations	-Forest cover and trends, farming activities, (illegal) mining, logging, fallow land, agro-commodity suitability, etc. -Identify major natural resources: riparian areas, wetlands, sacred areas, hunting lands, etc.;	Primary field data, Spatial maps Documents
3. Data collection and analysis: Social inclusion			
	Cross-sectional transect, Focus group discussions, Household interviews, Stakeholders mapping, Landscape actors' consultations	-Towns, villages, major human settlements, and their population including migration. -Map different types of land tenure, ownership and use rights, highlighting areas with land disputes or conflicts.	Primary field data, Spatial maps Documents
4. **Integrated production, protection, inclusion targets and plan:**			
This involves in-depth consultation with the local actors and communities in the said municipalities. In-depth discussions through with the communities through focus group discussions will help to prioritize and agree on targets that are realistic.			

3.3.4.Description of indicators

A list of indicators was agreed upon after an extensive consultation process between the ICRAF implementation team and IDH and WWF. The indicators are presented in table 3 and are grouped per pillar.

Table 10: Indicators selected for use as benchmarks

Baseline Indicators	**Metrics**
Land use	ha
Land categories	ha
COCOA PRODUCTION	
Ratio of field facilitators/extension workers per farmers	Ratio
Shade cover	%
Average size of cocoa farms	ha
Number of cocoa and non-cocoa trees per ha of farm	# per ha
Municipality level production disaggregated by quality level	Tonnes / year
Average Price for Grade 1 and Grade 2 cocoa	CFA/KG
Existing programs focusing on cocoa production	#, budget invested, # of farmers covered by these programs
Number of farms geolocalized	
Number and names of companies active in the landscape who have taken up sustainable production models	Number
Number of projects that aim to diversify cocoa farmers income streams	Number
Farm-level data including production costs, profit, diversification, savings, credit etc Also include: - Net income from cocoa - Net income from non-cocoa activities	
PRODUCTION (Other crops)	
Productivity per crop (e.g., palm oil, cassava, etc)	Kg/ha
Price	CFA/KG
Existing programs focusing on XXX production	#, budget invested, # of farmers covered by these programs
PROTECTION	
# of ha of intact forest	Ha
Ha of forest cover under improved management for conservation	Ha
# of ha of degraded forests	ha
Ha of forest protected against conversion / Deforestation rate against current baseline.	%
Fire occurrence	#/year # ha burned / year
Forest fragmentation	
Biodiversity	
Drivers of deforestation	
No of threatened species	
Existing programs focusing on forest production	#, budget invested, # of ha to be protected
Carbon stock MtCO2e ER against current baseline.	MtCO2e ER
No of companies that are effectively implementing best sustainable wildlife management practices.	Number
INCLUSION	
Demographics	

Households income	#/% of farmers above/under poverty line, #/% of farmers above/under Living Income benchmark
Demographics of cocoa farmers household	
Food security: • The proportion of the population experiencing moderate food insecurity • The proportion of the population experiencing severe food insecurity	% of population
Existing programs focusing on communities' livelihoods	#, budget invested, # of community members targeted
Child labour	
Access to ICT	
No of FPIC contracts signed	Number

3.4. Data analysis

To monitor and ensure quality data collection, ICRAF deployed an automated data collection process which used Android Tablets and Phones as main data input platforms. For each of the data types collected through the above methods, appropriate data forms were developed and validated in close consultation with the IDH. The validated forms were then converted into an excel spreadsheet that was then uploaded into SurveyCTO™ software which functions both online and offline. The choice of this software was to enable data collection and saving during the day and relaying it to the ICRAF server at night for subsequent analysis.

As most of the data was based on past and current practices in the field, we used descriptive statistics with central tendency measures (mean, median, mode), standard deviation and standard error computation where it applies and is relevant. Univariate, bivariate and multivariate analysis was also deployed to capture the distribution, relations and prediction of the important variables linked to the indicators of interest in the three pillars of sustainability

Context analysis was specifically used for qualitative information and data that were gathered both from the field and also past works. This was instrumental for policy issues, market related aspects e.g., cocoa prices and other perception of deforestation and other development trends in the community. Additionally, the qualitative data were analysed by examining and providing an explanation of respondents' answers.

3.5. Ethical issues

At the beginning of each focus group or interviews, the enumerators explained the objectives of the research to the potential respondents and also sought their consent to participate. Interviews and focus group discussions were conducted under strict condition of confidentiality and privacy especially for individual interviews. The respondents were advised to withdraw whenever they felt to do so.

3.6. Limitation

The fieldwork overlapped with the beginning of the raining season. Most farmers were busy in preparation of their farmland. This reduced their availability to attend FGDs and respond to the household surveys.

The poor book-keeping habits, the usual selling of food crops at the doorstep and the non-uniformity of measurement and selling units among farmers made it difficult to collect robust data on production and revenue.

The population was generally reluctant to participate in FGDs and Households Surveys. The reasons stated was that they have been consulted in the past by several organisations and actors from both the public and private sectors with no follow-up and little or no benefits for them. However, with tact, the right number and participants administered the interviews.

Data collection also coincided with the declaration of municipal elections and it was not predicted that municipality elections would hold during the same period. This retarded data collection as most municipality authorities were occupied by the elections and the celebrations and could not be available for data collection.

4. Results /Findings

The results presented in this section are based on Literature and empirical data collected within the framework of this assignment. The Information is organised under each of the 3 pillars of sustainability as described in the methodology and constitute baseline data for the municipality.

4.1. Production

In this section, main productive activities in the landscape will be identified. This relates to the main livelihoods' strategies or the main sources of income of the inhabitants of the municipality.

4.1.1.An Overview

Livelihood strategies and main sources of income in the municipality

Agriculture is the main source of livelihood for a majority of the population. It accounts for more than 80% of food consumed in the municipality and about 70% of household revenue (PCD Mbangassina, 2015). Other income generating activities in the municipality include hunting (rodents: hedgehog, porcupine, rats, snakes); fishing; animal rearing (cattle, pigs, goats and poultry), sand digging, and artisanal timber exploitation. Household surveys reveal that the highest contributors to household income in the municipality are: cocoa, pension, small business, food crops and tree crops (see table below) .In all the sampled villages, farmers were asked to list by decreasing order of importance, what were their five most main sources of income in 2019? what proportion comes from each: (The assumption was that a higher proportion is linked with a high importance/rank). Table 11 below summarises the findings.

Table 11: Ranking of income generating activities: Proportion of income contributed by activity

	Activity	Mean proportion of income by activity (%)	Median proportion of income by activity (%)
1	Cocoa	74.93	80.00
2	Pension	41.00	41.00
3	Small business	33.67	30.00
4	Food crops	24.46	20.00
5	Tree crops	7.47	10.00
6	Livestock	3.00	1.00
7	Small jobs in the community	5.00	5.00

The table above shows that cocoa accounts for 74.93% of farmers' incomes, thus underlining its importance as source of income to farmers. Pensions come as the second most important source of income and account for 41% of incomes of those who listed this, small businesses and food crops comes in the 3rd and 4th positions with contributions of 33.67% and 24.46% respectively to incomes. Table 12 shows the distribution of the sampled population by source of income. The sale of cocoa beans remains the main source of income for its producers.

Table 12: The distribution of the sampled population by source of income

Activity	Mbangassina (n = 82)	%
Cocoa	79	96%
Food crops	65	79%
Livestock	4	5%
Pension	3	4%
Remittances	0	0%
Small business	9	11%
Small jobs in the community	1	1%
Tree crops	19	23%
Total	**82**	

Source: survey data 2020

It can be seen from the table above that farmers have multiple sources of income, however, 96% of the sample indicated that they earn income from cocoa, 79% earn income from food crops, thus cocoa and food crops are the most dominant source of income to the population of the municipality. Pension, remittances,

small businesses and small jobs in the community was a source of income to 5%, 4%, 11% and 1% of the sampled population respectively.

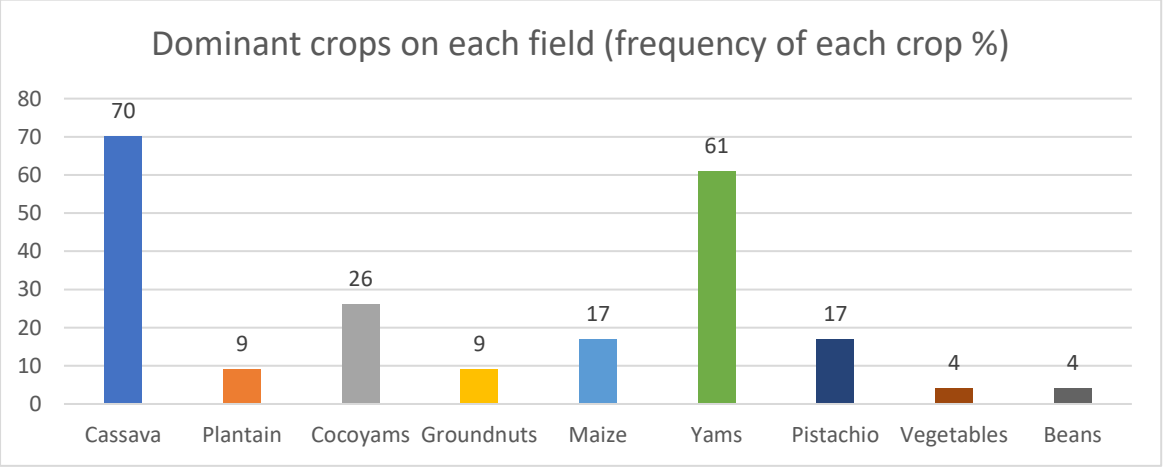
In addition, we can note that the flora of Mbangassina is rich in non-wood forest products such as mushrooms, lianas, *gnetum*, *djansang*, cola nuts, medicinal plants, wild mangoes, rattan, bamboo, and wild fruits. The table above shows that tree crops are a source of income to 23% of the sample. All these products contribute to the revenue of many households though in dissimilar proportions (Nieboukaho et al., 2016). Mounjouenpou et al. (2014) underscores that average annual income varies between $200 and $2,000, with average of $1,000 for Mbangassina.

4.1.2.Main feature of the agricultural sector in Mbangassina

Agriculture in the Mbangassina municipality is characterised by subsistence and cash crop farming. Subsistence agriculture is characterised by mixed cropping with a dominance of slash and burn agriculture. The most common crops in this municipality are plantain, maize, cocoyam, groundnuts and cassava. Cocoa is one of the main cash crops produced in the municipality, production averages 5810 tonnes per year (PCD Mbangassina, 2015). Plantain is another major source of income to farmers in the Mbangassina municipality , about 2500 tonnes are produced annually. Other crops considered as cash crops within the municipality include cassava, with over 72500 bags of flour sold per year and 2500 tonnes of cassava roots produced per year. Yams equally serve as a major source of income to households, with production averaging 2000 tonnes per year (PCD Mbangassina, 2015).

The importance of the other crops to livelihoods vary from one village to another (figure 6). Plantain and fruit trees are often planted in cocoa farms to provide shade, especially when the cocoa plants are young, yams, cassava and other food crops are cultivated on small portions of food crop fields usually less than 1ha in a mixed cropping system. Food crops are equally cultivated for consumption and sales, the figure below shows the dominant food crops in the municipality.

Figure 6: Dominant crops on each field (frequency of each crop %)



Source: Survey data (2020):

Cassava and yams emerge as the dominant food crops in most farms in the municipality, with 70% and 61% of respondents mentioning these as their major food crops. Cocoyams, maize and 'egusi' or pistachio are equally highly cultivated in the area. Plantain is often planted in agroforestry systems.

The dominance of these food crops is not homogenous across the forest zones and the savannah transition zones. The table below shows the dominant food crops in the forest and savannah transition zone.

Table 13: Livelihood activities in the municipality of Mbangassina

Name of village	**Main livelihood activity**	**Secondary livelihood activity in other of importance**	**Comment**	**Landscape**
Talba	Cocoa	Yams, plantain, cassava, fruit trees	Plantain cultivated in cocoa farms with fruit trees, yams, cassava and other food crops cultivated on small farms around houses	Forest
Biakoa	Cocoa	Yams, plantain, cassava, fruit trees	Plantain cultivated in cocoa farms with fruit trees, yams, cassava and other food crops cultivated on small farms around houses	
Boura 1	Cocoa	Cassava, yams, cocoyams, maize and egusi	Plantain cultivated in cocoa farms with fruit trees, yams, cassava and other food crops cultivated on small farms around houses	
Elangana	Cocoa	Cassava, yams, egusi, plantain	Food crops are cultivated in the savannah.	Savannah/forest
Goura II	Cocoa	Plantain, fruit trees, cassava, yams		

Badissa	Cocoa	Cassava, yams, plantain, egusi and maize		
Mbangassina	Cocoa	Cassava, yams, plantain		
Bilomo	Cocoa	Yams, Plantain, Macabo and maize		

Source: Focus Group Discussions

In the savannah, just like in forest, plantains are often planted in cocoa agroforestry systems with food trees, however, food crops are essentially planted in the savannah. This is because there is enough land and the soil allows for the growth of these crops, shifting cultivation is very common on such land, farmers often plant in a mixed cropping system, crops such as yams, cassava, cocoyam, maize, groundnuts and beans. Beans, groundnuts and maize are harvested after 3-4 months, yams after 8-9 months and cassava is often the last to be harvested after 12 months. When all crops are harvested, most farmers leave the land to fallow. With new knowledge in cocoa cultivation in the savannah, some farmers have started planting plantain, with fruit trees and cocoa after cultivating food crops. Some of these farmers say they use food crop cultivation to prepare the land for their cocoa plantations.

4.1.3.Characteristics of Agricultural farms.

a) Number of farms and size of food crop fields

Based on the table below, farmers own averagely 2 farms in most of the sampled villages composed most often of cocoa and food crop fields. Food crop fields are generally small, ranging between 0.25-0.5 ha.

Table 14: Average size of cocoa and food crop fields

Name of village	Average number of farm plots (both cocoa and food crops)	Average size of food crops field
Talba	4	0.5
Boua 1	2	0.5
Elangana	2	0.25
Goura II	2	0.5
Badissa	2	0.25
Mbangassina	2	0.5
Bilomo	2	0.25
Biakoa	3	0.5
Average	**2**	**0.41**

Source: Survey data 2020.

Some of these food crops are equally cash crops to women who are heavily involved in their cultivation, processing and sales. The figure below shows the percentage of food crops consumed and percentage sold by farmers in the municipality.

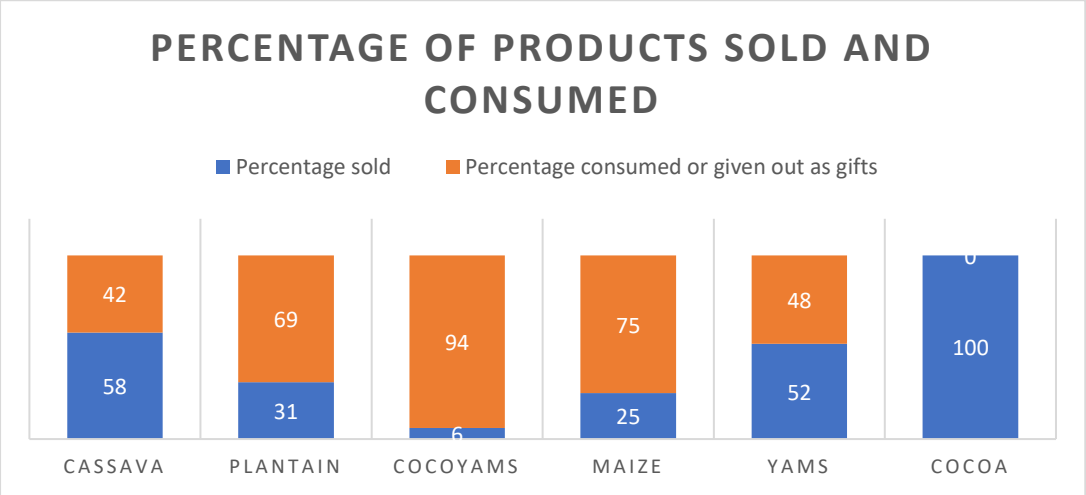


Figure 7: Percentage of products sold and consumed

The figure above shows that more than 50% of cassava and yams are sold while 42% and 48% is consumed respectively. We can see that cassava production and sales is a major cash crop to women followed by yams, cassava is favoured because women can harvest, process and sell throughout the year, thus giving them a regular source of income. All of cocoa produced is sold this, therefore, confirms the role of cocoa as a major cash crop in the region. Other crops such as maize and cocoyam are essentially for consumption, plantain is equally sold in large quantities (31%) this underscores the role of food crops in stabilising family incomes during off season for cocoa, these food crops ensure households have income to meet other family needs.

b) Access to land and land markets

Land ownership through inheritance is very common in the municipality of Mbangassina for both cocoa and food crops. The figure below shows that 59% and 52% of the sampled population both confirm that they obtained their land through inheritance for cocoa and food crops respectively. Obtention of land through purchase is equally very common, people immigrate to the municipality for cocoa and buy land, this explains why 32% of the sample population obtain cocoa farms through purchase and 13% obtain food crop land through the same means (purchase).

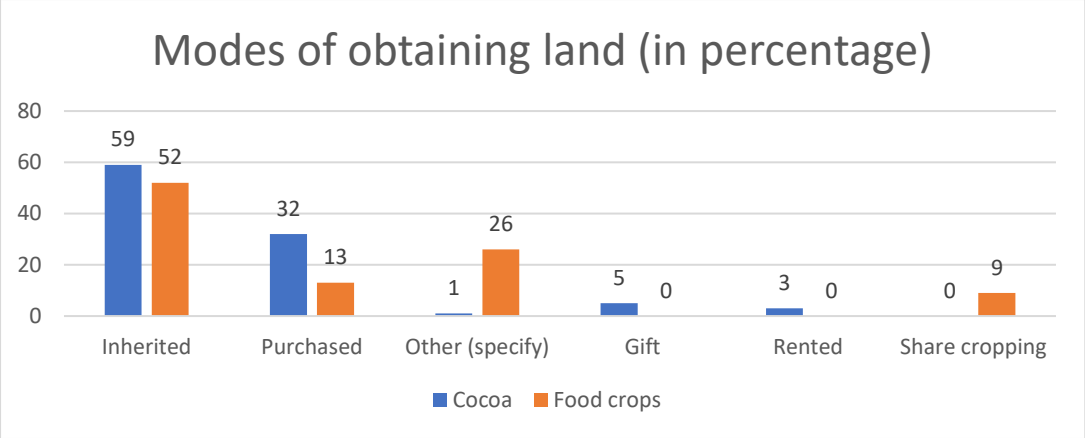


Figure 8: Modes of obtaining land in Mbangassina

Farmers have different rights to their farmland; some have occupancy rights while others have the right to sell. The figure below shows that 39% of farmers sampled have occupancy rights over their cocoa farms, they often see this as family heritage and should not be sold. However, 61% of the sampled population reported that they have the right to sell their cocoa farms meanwhile all sampled farmers confirm they have occupancy rights over food crop fields. This is because food crops produce food for the family and culturally it's not meant for sale. So, although customary land ownership prevails, they are national lands. Ngono (2013) reports that in Talba, 75% of farmers secured cocoa farms by creating farms through conversion of forest land to cocoa plots, 22.5% through inheritance and 2.5% through purchase of land.

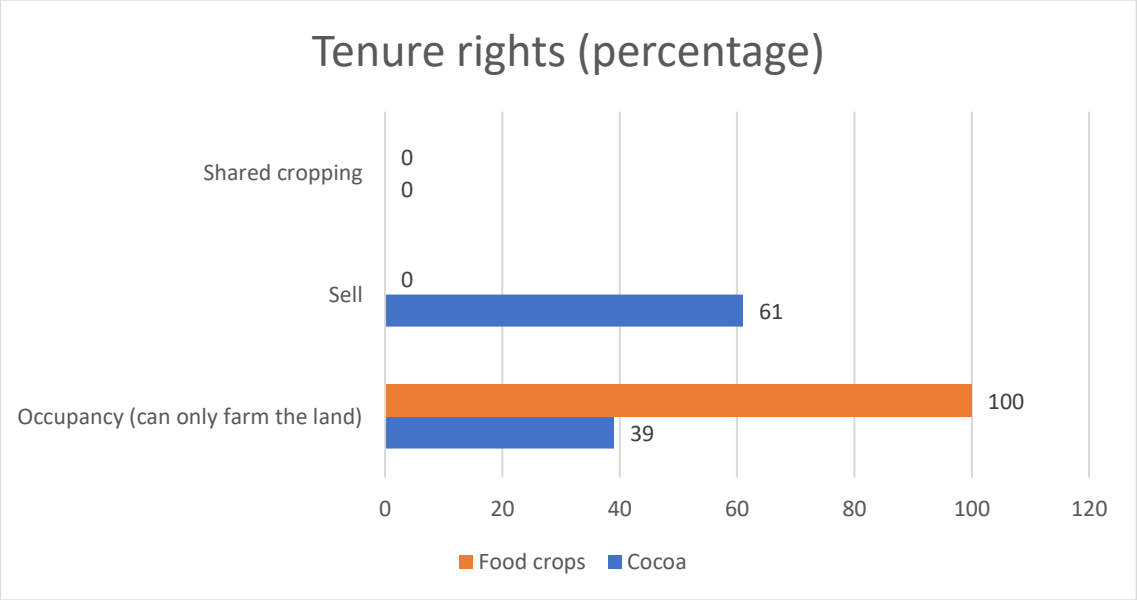


Figure 9: Tenure rights over land in Mbangassina

Customary land ownership remains the major land tenure system in Mbangassina municipality. Pioneer families to settle in the villages claim customary rights to the land with boundaries per family well established (GCLP, 2019). Only a minority of the land is registered under private property as they are well managed under customary laws, but members have no security under national laws until formally titled.

4.1.4.Cocoa production and the cocoa value chain

Demographic characteristics of cocoa farmers.

Cocoa farming in the municipality of Mbangassina is dominated by men and household heads with average age of 48 years, they often have an average of 07 dependents with 6 of them fully under the care of the household head (Todem, 2015). Youths are not very engaged in cocoa production in the municipality. Ngono (2013) reports that 42.5% of cocoa farmers in Talba are aged 51-60 while 25% are aged 41-50 and farmers aged 61-70 account for 22.5% of the sampled population. Access to land and required capital to establish cocoa farms have been advanced as major obstacles to cocoa production by youths of less than 30 years.

a) Level of education of cocoa farmers

Most of these farmers have primary school education (43%), 35% went through secondary school and 15% of the farming population went through high school and only 4% went to the university (Ngono, 2013). The table below shows the distribution of sampled population by level of education.

Table 15: Level of education of respondents

Level of education	**Mbangassina (%)**
None	1
Some primary	26
Completed primary	18
Some secondary	45
Completed secondary	2
Beyond secondary	7

Source: Field data

The table above shows the dominance of farmers with some primary education (26%) while only 18% completed primary education. The table equally illustrates that 45% of the sample have some secondary education while only 2% completed and only 7% went beyond secondary school. This underscores the fact that most cocoa farmers are either primary or secondary school dropouts.

b) Partition of labour

The table below shows the partition of labour by gender for food crops and cocoa which is the main cash crop of the area. Ngono(2013) reports that in Talba, the socio-economic profile of producers shows that 60% of farmers are Eton, 30% of Sanaga, 8% of Yambassa and 2% of Bamoun practice farming in Talba village. The producer ages range from 30 to 71, with 75% of producers at most 60 years.

Table 16: Partition of labour by sex

Product	Dominant sex	Collection	Drying/processing	Marketing	Decision on use of income
Cocoa	Men	Women	Men	Men	Men
Food crops	Women	Women	Women	Women	Women

The table above shows that men dominate the cocoa value chain, women only appear during gathering and opening of cocoa fruits, however, for food crops, women dominate all aspects of the value chain. The characteristics of farms in this locality have changed very little since the 1960s. The workforce is essentially familial, if it is not the sole producer who takes care of the maintenance of his farm, he is accompanied by a close relative or one or more employees. Which is interesting in the observation of the graphics is the involvement of the producer in maintenance of operations (Champaup, 1966). We are far from the big owners who manage their farms by only instructions to employees. In this case the owner manually participates in the maintenance of his farm. In certified farms, the producer is 78% involved, while 54% of producers are involved in conventional farms (Gue et al., 2017).

4.1.5.Cocoa agroforestry system and their functions:

Cocoa farming in this area is dominated with the association of timber species and or fruit trees with cocoa (GCLP Grand-Mbam, 2019). The Cocoa agroforestry system (CAS) is rich in different tree species estimated at more than 40 different species of trees and crops. The vertical structure shows the presence of three strata in cocoa. Only the agroforestry system (AFS) full sun is left with two strata because the intermediary stratum is negligible (very weakly represented) (Jagoret et al., 2018).

Cocoa agroforestry systems are created (LTS, 2019), by converting forest land to cocoa farms, in which crops such as plantain, and cocoyam are planted with cocoa trees. As the cocoa mature, the crops are gradually removed, and fruit trees introduced into the system or some trees are left in the system during forest conversion (Ngono, 2013). Within the Talba village, Madountsap et al (2018) counted an average of 1030 cocoa trees/ha and 21 associated trees/ha for innovative cocoa agroforestry systems, as for traditional agroforestry systems, an average of 1133 cocoa trees were counted with 84 shade cocoa trees. These findings underscore the complex nature of cocoa agroforestry systems in this part of the country. Fruit trees such as *Dacryodes edulis* (safou), *Persea americana (avocado) and timber species such as terminalia superba (frake), triplochiton scleroxylon (Iroko) and other NTFPs such as Ricinodendron heudelotii (Njangsang) are* associated with cocoa trees and provide socio-economic and ecological services to producers in the municipality.

Analysis and field observation show that cocoa plots dominated most of the areas on which we laid transects during data collection. Shade trees left in the plots often make the vegetation look like a forest with a domination of cocoa in the under-canopy. Within the cocoa plots, the most important attributes were to

understand the cocoa tree density and the shade tree density, and the types of trees maintained in the cocoa farms. This depicts the multi-functionality of trees in the systems and consequently give farmers different income options.

Table 17: Multifunctional uses of tree species found in the cocoa plots

Species	Common uses	Market potentials
Njansang (*Ricinodendron heudelotti*)	Edible fruits consumed in almost all households	One of the very highly marketable wild crops
Fraquet (*Terminalia superba*)	Timber for construction and medicine	It is among the highly demanded timber globally.
Azobé (*Lophira alata*)	Timber for construction	Highly demanded timber for outdoor construction
Baobab (Adansonia digitata)	High value fruits that are used to produce juice for human consumption	Highly demanded even in high end hotels, restaurants and eateries
Fruit trees (oranges, mandarins, avocado)	For consumption and sales, becoming a viable income source to farmers	The municipality is becoming a viable purchase point for fruit wholesalers, incomes from fruits often come during back-to-school period.

To better understand the shade tree management system in Mbangasina, A total of 24 cocoa plots each with 30m*30m were sampled in the municipality. Of this, 49% are cocoa trees while the rest 51% are shade trees that also provide other benefits such as fruits, firewood and timber. Most of the saplings and seedling of other tree species are often cleared thus no figure for those growth forms in the cocoa plots. The mean circumference for the non-cocoa trees was 117.12 cm (dbh = 37.28 cm). The most frequently encountered shade tree species is Njansang (Ricinodendron heudelotti) occupying about 8.4% of all non-cocoa trees density and occurring in 29% of the cocoa plots sampled. Fraquet (Terminalia superba), occupying about 7.5% of all non-cocoa trees' density in the cocoa plots and occurring in about 29% of the plots is the second most predominant shade trees. Azobé (Lophira alata) is another shade tree commonly occurring (in 25% of the plots). Baobab (Adansonia digitata) is another dominant tree in the cocoa plots occurring in 17% of the cocoa plots. However, it occurred at a high density (33 trees per ha) with respect to its potential to grow into big size trees. Nonetheless, the encountered baobab trees had only 140 cm circumference on average.

This is because farmers are now planting these trees due to increased knowledge of its medicinal and potential financial benefits.

Cocoa-based agroforestry is less damaging to the environment than other forms of soil management in humid forest areas in southern Cameroon (Kotto Same et al., 2000). Duguma et al. (2001) adds that cultural practices associated with cocoa farming cause less damage to the fragile resources of the region compared to the dominant crop-based land use system based on slash and burn. The complex structure of CAS, similar to that of the forests they have replaced, allows conservation of forest biodiversity (Sonwa et al, 2000). In areas where forest degradation is quite advanced, as in Lékié, cocoa plantations remain the only places that are reminiscent of extinct forests (ibid). They host a great diversity of flora and play an important role in thermal regulation and the cycles of nutrients. Woody species provide varied ecosystem services in cocoa plantations amongst which limiting wind and water erosion; providing wind breaks and reducing, soil temperature (Dupriez and De Leener, 1993, Todem 2005).

Similarly, woody trees in cocoa plantations are also useful for the production of goods consumable by humans and / or animals: fruits, vegetables, seeds, fodder, wood, fibres, drugs, without forgetting the role of fertilizer production by dead leaves, branches or roots (ibid). To further support this, a study by Duguma et al. (2001) reveals that 6 to 8.5 tonnes of litter (leaves, wood, flowers and fruit) fall into the cocoa plantations per year from South Cameroon. This fall provides the soil with 50 to 55 kg of nitrogen annually, 3.5 to 4 kg of phosphorus, 35 to 40 kg of potassium, about 90 kg of aluminium and 25 kg of magnesium. Still from an ecological point of view, (Saj et al., 2017) showed in a study that the cocoa SAFs of Centre Cameroon store a considerable quantity of carbon (70 t/ha-1 which corresponds to 150 t of woody biomass) which contributes to the mitigation of climate change and could also contribute to other ecological services such as conservation.

4.1.6.Cocoa farm size

Discrepancies in cocoa farm sizes are often reported by farmers, and some studies over/under-estimate size of their cocoa farms (Balineau et al., 2016). Data on farm sizes for cocoa was collected from a variety of sources, through focus group discussions, household surveys and farm measurements from several randomly selected plots. Farm measurements by Olam Cameroon for 11 villages covering 30 plots were used. The figure below summarises information gathered for farm sizes from the different sources.

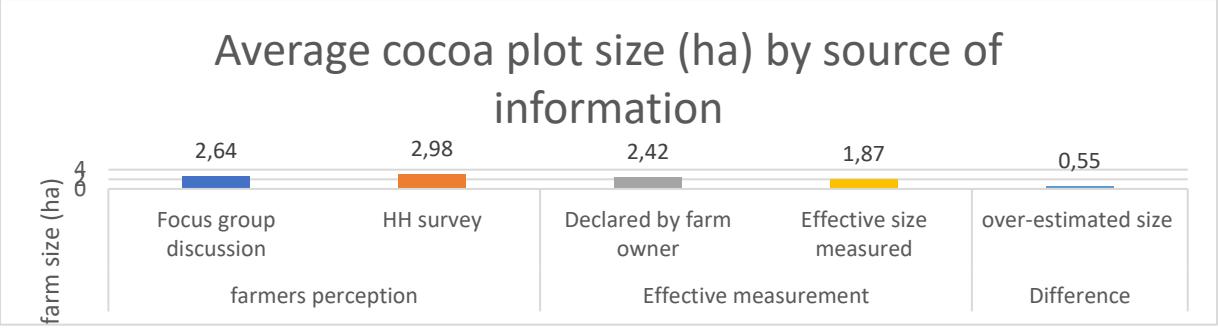


Figure 10: Size of cocoa farm by source of information

Figure 10 above shows that in Mbangassina, there is an average difference of 0.55 ha between declared farm size and real farm sized measured, this thus illustrates that farmers on average overestimate their farm sizes by half a ha. This overestimation thus gives an illusion of very poor productivity of cocoa fields which is not always the case.

Typology of producers are often classified by the size of their farms, generally three types of producers can be mapped in the Mbangassina locality. GCLP (2019) reports an average of 4 ha per farmer. Ngono (2013) identified small producers having cocoa farms of less than or equal to 5 ha, whose area of cocoa is strictly greater than or equal to 10 ha and large producers who have more than 10 ha of cocoa farm. It turns out that almost 75% of farms in Talba have cocoa farms greater than 5 ha. Pedelahore et al (2014) sampled 46 cocoa farmers in Talbs and classified farmers ferm size into small ($0<x \geq 2$ ha), medium ($2>x \geq 6$ ha), large ($6>x \geq 30$ ha) and very large (≥ 30ha). His findings revealed that 25% of the cocoa farms are small, 45% medium, 25% large and 5% very large.

4.1.7.Cocoa productivity

The average age of the cocoa farms in the municipality is 33 years, with new cocoa farms of 1 year (minimum) and very old cocoa plots of up to 124 years (maximum), the municipality have a modal cocoa plot age of 40 and median age of 30 years. This thus shows that most of the cocoa farms are old, thus productivity is not at its optimal level. The table below shows average cocoa productivity from the sampled villages. The general trends observed is that most villages perceive productivity of their farms to be on downward trends compared to a few that perceive increasing productivity. However, the range is generally very wide from a low of 300 kg/ha to high 1500 kg/ha with a mode of about 500 kg/ha

Table 18: Declared productivity by farmers and perception of changes over time

Source of data	**Name of village**	**Productivity (kg) /ha**	**Perception of productivity (1. increasing, 2 same, 3 decreasing)**
Focus group discussions	Talba	1500	1
	Boua 1	850	2

	Elangana	880	3
	Goura II	1000	1
	Badissa	1350	3
	Mbangassina	1200	3
	Bilomo	1000	3
	Biakoa	900	1
Household survey	All 08 villages	300-1500	3

Cocoa productivity varies across the landscape and between individual farmers for several reasons; some are common to most farmers while others are particular. The common factors that affect farm productivity are:

Knowledge on cocoa farm rejuvenation: Most of the farms are managed by household heads who inherited these farms with limited knowledge of cocoa rejuvenation. Knowledge on propagation techniques to rejuvenate old cocoa farms can help farmers change this trend. Farmers in organised cooperatives such as Mbangassud attested to have received training on how to improve productivity of old cocoa farms, however, majority of the farmers still claim that they have not mastered the technology.

Pest and disease management: Although agroforestry systems help in pest and disease control, some diseases and pests are still a major problem to farmers. Diseases such as Cocoa vascular streak "dieback" is very common and a major setback to cocoa farmers in the municipality. Other reasons that lead to increase in productivity include improvement in soil fertility through practice of good agroforestry practices by farmers. Other reasons advanced by farmers that lead that lead to low productivity include climate change, rodent, sickness and impoverishment of the soil.

4.1.8.Cocoa post-harvest handling

Transformation/processing and technology activities in the landscape: Cocoa harvesting is done by cutting the stalk with a cutlass using traditional cutting-knife. Extraction of cocoa beans is done by opening the cocoa pods, this is often done through family labour and mutual assistance amongst producers or through task work. Some farmers organise into groups and extract cocoa in successions from one group member's farm to another, the hosting farmer provides drinks and food. Most of the farmers do not ferment their cocoa, sun drying is the most important and common method of drying cocoa within the municipality, farmers construct drying space for cocoa in open sun (Mounjouenpou et al., 2014).

Table 19: Cocoa drying situation Mbangassina

Product	Who is generally involved in this activity (men, women, youth)	Are buyers generally exigent with regards to the quality of dried products (yes very, often somehow, No emphases on quality)	List equipment currently used for drying	Current levels of skills and local technical options available for drying (high, medium, low)
Cocoa	Men	Yes: very dry	Cement floor or drying mat "bac de trempage"	High

Buyers are generally demanding when it comes to quality of cocoa. The most important quality criteria is humidity. Generally, buyers prefer to buy properly dried cocoa. Drying is usually done on concrete floor or drying mats. Farmers complain about traders using "refraction" to cheat on them. It is a procedure used to unethically cheat on farmers by reducing measured volume by a given percentage to compensate for humidity or improperly dried cocoa. Further training on tools and techniques of drying cocoa is important to remedy the situation

4.1.9.Description of the marketing systems for cocoa

Main buyers in the value chain, presence or absence of middlemen: Within the Mbangassina municipality, there are many cocoa companies with buying stations Ecom, Barry Callebout, Cargill. BV and Olam Cam S. Ecom and Barry Callebout run farmer field schools and supply farmers with improved planting material, They have also mapped individual farmers and have put in place a traceability system to source certified cocoa (UTZ, Rainforest alliance). Ecom is supporting a well functional cooperative. Telcar is also running her Cargill cocoa promise program in the landscape (GCLP Grand-Mbam, 2019). Other private buyers are equally present, but they are not very visible. These companies buy from producer cooperatives such as MBANGASSUD and middlemen often called "coxeurs" (Nkott et al., 2017). These buying companies were all mentioned during focus group discussions Besides it was also noted that there are some individual buyers commonly called "coxeurs" who buy from farmers in the municipality to sell in Douala.

Profitability of cocoa agroforestry system: Profitability of cocoa of diverse cocoa systems were investigated by Lescuyer et al. (2019) in Cameroon. Their analysis reveals average net profits of 13,167 FCFA from 1.5ha per year for small farmers without assistance, with average productivity of 280kg/ha. Small cocoa producers in forest areas with support make an average profit of 308,968 FCFA per year with average farm size of 2.5 ha and average productivity of 600 kg/ha. Small producers in savannah zones with average size of 3ha and register a net profit of 187,316 FCFA. Medium scaled farmers are owners of farm sizes averaging

12 ha with productivity of 700 kg/ha, they make an average profit of 603,507 FCFA per year. For big farmers with average farm size of 25ha with average productivity of 1500kg/ha, they make losses averaging -2,339,736 FCFA, this is principally due to high expenditure on labour cost. Commercial intermediaries "coxeurs" are important actors in the value chain, they often buy grade 2 cocoa, they often buy from farmers (producers) and sell to cocoa exporters. They generally make an average profit of 50 FCFA per kg, and make an average profit of 1,282,737 FCFA. Lescuyer et al. (2019) also investigated the profitability of cocoa cooperatives that buy both certified cocoa and non-certified cocoa, their analysis reveal that they make an average profit of 537,300 FCFA from 72 tonnes of cocoa traded, which is less than 1%. However, cooperatives that deal only in non-certified cocoa make an average of 811,198 FCFA. Table 15 below summarises average profits made at each stage.

Table 20: Average profits from different type of farm holders in Cameroon

Cocoa value chain actor	**Average Profits made (FCFA)**
Small scale farmers without assistance (1.5ha)	13,167
small scale farmers with assistance (2.5ha)	308,968
Small scale producers in savannah zone (3ha)	187,316
medium scale farmers (12ha)	603,507
Large scale farmers (25ha)	(2,339,736)
Commercial intermediaries "coxeurs"	1,282,737
cocoa cooperatives (certified and non-certified cocoa)	537,300
cocoa cooperatives (only non-certified cocoa)	811,198
Cocoa exporting companies (Certified and Non-certified)	527,036,938
Cocoa exporting companies (Certified only)	4,723,091,310
Cocoa processing	26,333,056,012

Source: Lescuyer et al., 2019

Cocoa exporting companies of certified and non-certified cocoa make an average of 527,036,938 FCFA in profits from the export of 9,177 tonnes of cocoa. However, cocoa companies dealing exclusively in certified cocoa make an average profit of 4,723,091,310 FCFA from the export of 28,534 tonnes of cocoa, thus 11.8% profit compared to 4.9% profits made by exporters of both certified and non-certified cocoa. Profits made from the transformation of cocoa for exports are largely superior, processing of 50,000 tonnes of cocoa yields 26,333,056,012 FCFA, thus net profits above 29%. The figure below shows the percentage of profits captured by the different stakeholders in the cocoa value chain in Cameroon.

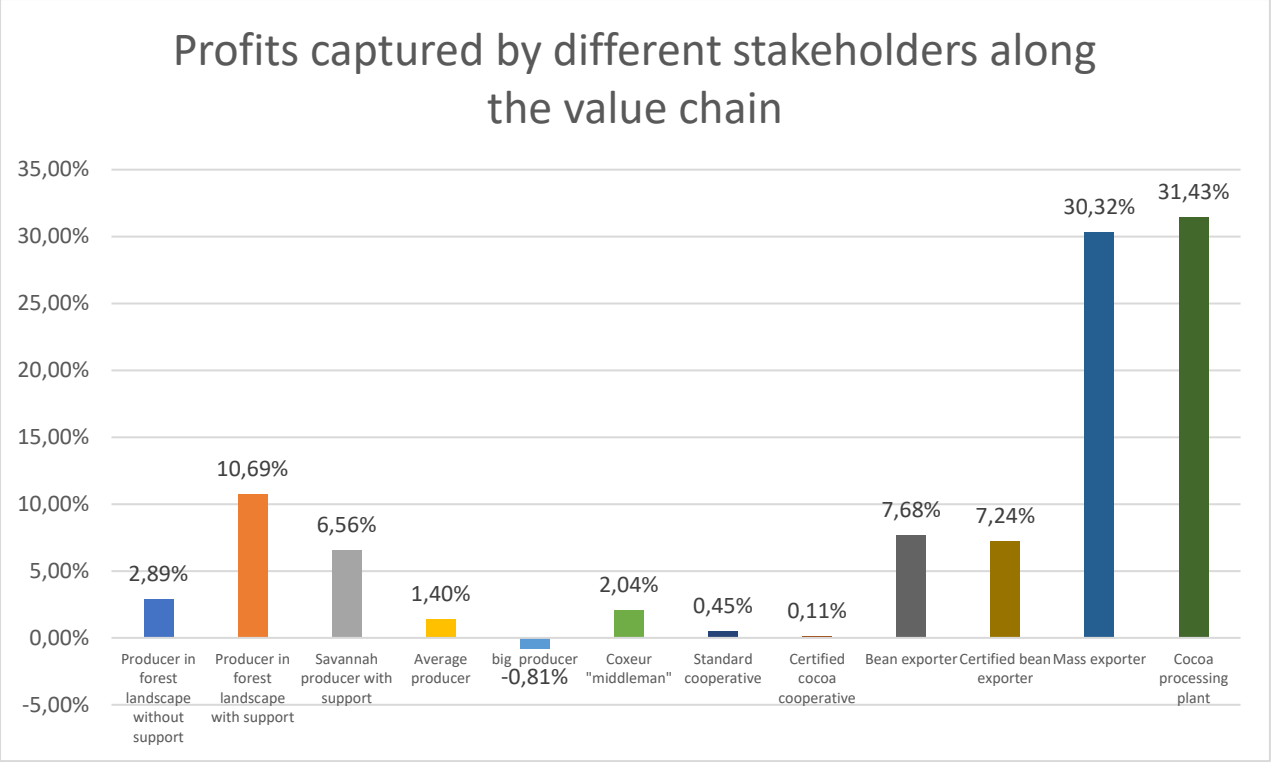


Figure 11: Profits captured by different stakeholders along the value chain. Adopted from Lescuyer et al., 2019

The figure above shows that cocoa processing companies capture the lion share of value-chain profits (31%) followed by mass exporting companies with 30% of profits, beans exporters make an average of 7%. It can equally be seen from above that only 21.54% of profits from the value chain is captured by producers, middlemen, exporters and processing companies get the lion share.

4.1.10. Cocoa farm management system and profitability in Mbangassina

Cocoa farms in Mbangassina are managed by old farm owners or young men who inherited the farms from their parents. Labour is a major constraint in the municipality. Generally, farm owners, develop a contract farming system with labourers. Within the Mbangassina municipality two forms of contract farming systems exist: The percentage system and the fixed amount system.

In the percentage system, the labourer oversees all activities in the cocoa farm, the farm owner provides the inputs (fertiliser, pesticides and insecticides) after harvest, the labourer is paid an agreed percentage of final production for the year. The agreed percentage varies depending on the age and productivity of the farm; for farms at optimal production, an average of 30% is given to the labourer, however, when the farm is very old and yields are low, 50% is given to the labourer. Generally, 30% is the average percentage used within the municipality. The table below summarises activities done by the labourer and expenditures made by farm owner over the year for an established cocoa farm.

Table 21: Summary of cocoa farm labour arrangements

Activity	Done by contract labourer	Paid by farm owner
Weeding the farm	Yes	No
Purchase of equipment and inputs	No	Yes
Transplanting	Yes	No
Pruning	Yes	No
Treatment, for fertilizer application and harvesting	Yes	No
Breaking of the pods	No	Yes
Fermentation and drying of cocoa	Both	Both

The fixed amount contract is a system where at the beginning of the season, the owner of the farm and the labourer agree on a number of activities to be carried out during the season, after harvest a fixed amount is paid to the labourer irrespective of the yield for that year.

Generally, plantains are also included in the agroforestry systems, but above 15 years, production is very small, and replanting of new plantain suckers is not common, farmers prefer to plant more of fruit trees, thus remaining plantains are mainly for home consumptions and gifts to family members, a small or negligible quantity is often sold to meet farmers immediate needs. The profitability of cocoa agroforestry systems depends on the age of the farms, due to the dominance of old farms within the landscape. The table below shows average profitability of 1 ha cocoa agroforestry system with fruit trees. Marketing of fruits is still a challenge in the area, it is assumed that 40% of fruits produced are sold and that 30% of cocoa revenue is allocated to labour considering the percentage system.

Table 22: Cost-benefit analysis of a standard 1ha cocoa agroforestry system in Mbangassina

Cost element (for 1 ha of cocoa agroforestry)	Amount (XAF)	Revenue element	Number of units (kg)	Average unit price	Total revenue (XAF)
Inputs and small equipment	90 000	cocoa	1000	1050	1 050 000
Depreciation equipment	97 000	Citrus	2080	215	447 200

Labour (30% cocoa sales)	288 000	Avocado	1680	250	420 000
		Safou	2040	400	816 000
Total Expenditure	475 000	Total revenue			2 733 200
Profits from the agroforestry system	**Total Revenue- Total cost**				**2 258 200**
Profits from cocoa cultivation	**Total Revenue cocoa-Total cost**				**575 000**

Source: From field research 2020

The analysis above shows that fruit trees offer significant opportunity for farmers to make significant profits from their agroforestry systems. This is principally because productivity of these fruit trees is high and extra maintenance cost is not required for them. Thus, market research and linkages with buyers can significantly improve farmers profitability

4.1.11. Incorporation producer organisations to farmers

Talla Sadeu (2017) conducted a cost-benefit analysis for certified cocoa producers (CCP) and non-certified cocoa producers (NCCP), his results illustrate that CCP incur an additional expenditure of 41 820 FCFA/ha compared to NCCP. Dugué et al. (2014) reports that this extra cost is a delimiting factor for producers to engage in certified cocoa production. However, the same study equally illustrates that CCP make an additional profit of 59 605,68 FCFA/ha compared to NCCP. This difference is explained by the fact that CCP sell through the cooperative MBANGASSUD which uses a better balance compared to that used by "coxeurs" to whom NCCP sell. Certified producers equally benefit from a premium of 40 FCFA/Kg given to certified cocoa producers in the region. Belonging to such producer organisations accrue advantages such as access to cheap inputs, training and financial management thus increasing farmer productivity and incomes. The percentage of farmers belonging to farmer organisations and the types of farmer organisations from 08 sampled villages are shown in figure 12.

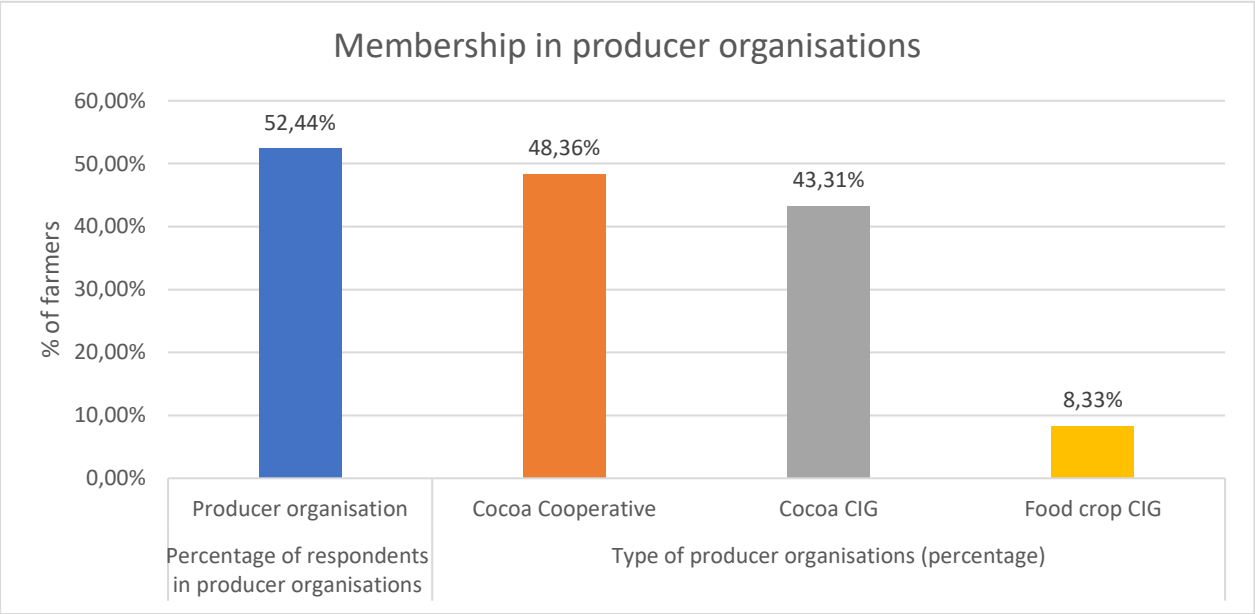


Figure 12: Percentage of farmers belonging to farmer organisations and type of farmer organisation

It can be seen from the figure that 52.44% of farmers belong to producer organisations, 48.36% of these belong to cocoa cooperatives, 43.31 % to cocoa common initiative groups (CIG) while 8.33% belong to food crop CIGs. However, most of these members except for those in Biakoa and Mbangassina are not active due to governance issues. Food crop cooperatives around cassava and yams are also emerging in some villages, with principal objective to improve access to markets and inputs. One of the major problems mentioned by MBANGASSUD producers about certified cocoa is that farmers have no guarantee that all certified cocoa produced will be purchased as certified cocoa (Nkott et al., 2017). They underscore that exporters indicate the quantity of certified cocoa demanded by the world market and the excess is bought at normal market prices, thus farmers don't benefit from premium of all the certified cocoa they produce.

Due to lack of finance, even when producers are organised into cooperatives, they still find it difficult to access credit from banks and local financial institutions, in cases where they offer these loans, the amount is often small and the rates very high (Nkott et al., 2017). Producers in this zone are thus forced to sign contracts with "coxeurs" or middlemen who pre-finance the production process and often fixe very low prices with the producers, thus limiting their profit margin. Nkott et al., (2017) discussed with members of MBANGASSUD coorperatives about formal relations with exporters, their findings reveal that they often sign contracts with these exporters and often sign formal contract of 03 years renewable with risk of purchase of certified cocoa at the price of normal cocoa.

Due to lack of proper governance systems within these producer cooperatives, incidences such as embezzlement of funds my managers of cooperatives, delays in payment of cocoa after supply with the cooperative and lack of running capital refrains producers to adhere to cocoa producer organisations (Nkott et al., 2017).

4.1.12. Major challenges with cocoa and food crop production systems

The most prominent challenges with cocoa production in Mbangassina are shortage of labour (table18), followed by cocoa disease, pests and fluctuating prices. Low productivity and input shortages were mentioned in the area but not as a main challenge. Moving the greening of the cocoa production systems towards greener alternatives thus needs ensuring that some of these challenges are addressed effectively in a sustainable manner for the farmers to make a living in an environmentally friendly manner.

Table 23: Key challenges for cocoa production

Challenges	**Mbangassina (n =7, np =77)**
Shortage of labour force	57%
Disease	43%
Pests and insects	43%
Low productivity	29%
Input shortages	29%
Fluctuating prices (low prices)	43%
Low market demand	14%

Although the challenges above were mentioned by farmers during household surveys, focus group discussions equally highlighted poor management of finance from cocoa as a major problem. They explained that they are often indebted prior to sales, but after settling their debts they are left with barely anything to survive or manage their farms the next production season

Table 24: Most important crop in Mbangassina and main problems around the five areas of enterprise development

Products/resources	Market/economy	Resource/ management	Social/cultural	legal	Technology
Cocoa	- High price volatility, thus no certain profit margin to farmers - False scales	Very old farms thus reducing productivity, Pest and diseases	Labour shortages		-Farmers lack adequate knowledge in improved farm regeneration techniques and management. - Farmers lack knowledge on cocoa cultivation in the savannah although some people are creating cocoa farm in savannah. -Poor knowledge on diseases and pest management with diseases such as “dieback” and “pourriture jaune” very common
Cassava		Poor knowledge on bush fire management in the savannah	Lack of labour for large scale farming		-lack of modern equipment for processing. Poor knowledge on cassava processing. -
Yams		Poor knowledge on bush fire management in the savannah	Lack of labour for large scale farming		-Poor knowledge on storage of yams and seeds, thus difficult to produce in large quantities. -
Plantain	Bad roads in the raining season makes marketing very difficult, thus prices are low during this period	Poor knowledge in bush fire management in the savannah	Lack of labour for large scale farming		-
Egusi		Productivity very vulnerable to	Lack of labour for		-Poor knowledge in bush fire management in the savannah

		climate change, yields vary between even and odd number years	large scale farming		
Maize		Productivity very vulnerable to climate change	Lack of labour for large scale farming		-Poor knowledge in bush fire management in the savannah
Groundnuts		Productivity very vulnerable to climate change	Lack of labour for large scale farming		-Poor knowledge in bush fire management in the savannah
Fruit trees (oranges, madarine, pears, mangoes; Njansang)	poor access to competitive market	-Access to improved tree planting material and tree multiplication techniques is low			
Livestock rearing Goats, sheep, birds	No major market in the area		Small scale mostly for home consumption, Area not reputable for commercial animal rearing		Lack knowledge in large scale management of livestock.

4.1.13. Production challenges and opportunities:

Challenges

Pest and diseases: Cocoa production in the municipality of Mbangassina suffers from several challenges, prominent amongst these challenges are low productivity per ha, which can be explained by the ageing cocoa trees with 40% of cocoa trees planted before 1960 (Mpé, 2002). Diseases are equally a major challenge to farmers. Bisseleua (2007) reports that diseases such as Phytophthora species: P. megakarya; are causing 80-90% losses without chemical control. Poor soil fertility due to continuous cultivation on the same farmland leads to poor soil fertility. Vascular-streak dieback (VSD) is one of the diseases that are problematic to farmers in the municipality. David et al. (2006) underscore the prominence of this disease in this municipality). Mirids also known as capsids, are insects that suck the sap of cocoa trees and inject toxic saliva in the process into the plant which leads to minor direct losses and increases vulnerability of plant to black pod which often destroy the plant more than the mirid itself (Ngala, 2015). Young trees can die within a year and losses can increase up to 30% if the infection is severe (David, 2005; Ebewore et al., 2013).

Poor farmer organisations: In many villages of the municipality, farmers are registered in common initiative groups (CIGs), associations and even cooperatives but only a few of these farmer organisations are operational today. Most of them are not active anymore due to governance issues related to human resource and financial management. Villages such Talba which is a high production zone had a cooperative before (Coopérative du Secteur Talba Sud (CoopSecTas)) but it is no longer operational due to governance issues. Thus, most farmers sell their products at their doorsteps at lower prices and equally suffer from high losses due to unethical practices of legalised buying agents (LBAs) from different buying companies and individuals. Farmers that are not members of cooperatives do not often benefit from other training opportunities offered by cooperatives such as management of funds and purchase of inputs. As they do not benefit from these advantages, most of them consume all revenues from sales of cocoa and nothing is left for purchase of inputs and farm maintenance for the next production season. Farmers engage in very expensive credit systems ranging from 35-100% interest rates, others leave their farms as they are, thus low productivity and yield per ha. Most of the farmers say they don't want to be members of farmer organisations due to management and overall governance.

Production opportunities:

Cocoa in degraded Savannah (forest-savannah transition zone):

The forest-savannah transition landscape of the Grand Mbam is currently one of the major cocoa producing landscapes in Cameroon and remains attractive for cocoa expansion (Lescuyer 2020). In Central Africa, studies showed a natural phenomenon of forest encroachment into the savannah in the past decades (Schwartz et al 1996 and Nasi 1997, Guillet et al 2002, Cuny-Sanchez et al, 2016). But this natural trend is currently disrupted by human activities including farming and burning for hunting, leading to degraded savannahs corresponding to gramineous fallows periodically cultivated, and a halt to the forest progression.

Scarcity of suitable forest land, a natural habitat for cocoa cultivation, has pushed farmers to innovate and set up diversified CAFS on degraded savannahs (Jagoret et al, 2012). Initial studies have shown that, CAFS can help to rehabilitate degraded savannah and provide ecosystems services in the long term, resulting from improved biodiversity (ex. association with shade trees) and a rational management of the entire system (Nijmeijer et al, 2019). CAFS can thus be used to avoid further encroachment of cocoa plantations into remaining forest reserves.

The municipality of Mbangassina stretches across the forest-savannah transition zone, a larger majority of the forest land in the municipality has been converted to cocoa agroforestry. Some years back, many community members in villages neighbouring the savannah migrated to less populated villages in forested parts of the municipality in order to create cocoa farms because their grandparents converted the small forest land in their villages to cocoa agroforestry. With increasing population, farmers are obliged to go to other villages with virgin forest land for creation of cocoa farms. However, with the advent of improved agricultural techniques that permits the cultivation of cocoa along the forest-savannah transition zone, many farmers are creating cocoa farms in degraded savannah. This presents a great opportunity to increase cocoa forest without deforestation by increasing research on climate smart techniques of cocoa production.

This new concept of cocoa production within the zone comes after the works of CIRAD and IRAD on cocoa production in Bokito which is more of a savannah. Farmers in the savannah, part of Mbangassina, have copied the techniques used in Bokito and are applying in their respective villages, however, success rate is not homogenous from one village to another and vary largely. Farmers report that cocoa in savannah is an interesting opportunity for them because it will permit them to expand cocoa farming in their villages without leaving their families for other villages. They equally underscore that with increasing agroforestry in the savannah, it will gradually reduce the increasing temperatures, late rainfall and prolonged dry season.

Enhancing productivity through farmer organisations: Although farmer organisations are poor in the municipality of Mbangassina, there is a success story that underscores the potential to use farmer organisations as a pathway to improving cocoa production and livelihood of farmers. Société Coopérative des Producteurs de Cacao de Mbangassina Sud (MBANGASSUD) is one of the few active cocoa farmers cooperatives in the municipality. They have more than 350 members who are active in various aspects of the life of the cooperative and benefit significantly from services offered by the cooperative. Members of MBANGASSUD did not complain of unethical practices or lack of funds for purchase of inputs as cocoa farmers who do not belong to groups. This, thus, underscores that through proper capacity building on governance of farmer organisations, farmers can better manage their farms professionally and benefit from the outputs.

4.1.14. Main food crops cultivated in Mbangassina.

Cropping system

Farms are distant from homes, depending on whether the production system is that around the house or far in the bush (bush house farm). Food crop fields around the house are of small area not exceeding 0.3ha, with corn and groundnuts as the main crops. On the other hand, far away farms (bush house farms) are more distant and larger; tubers (cassava and yams) are grown there in addition to the other species (Maize, groundnuts and Egusi). The producers manage their fields with a mixture of cropping system and cultivation techniques so that the fields are divided into several plots intended to accommodate different crops during a given season. The following season, the plot may be fallow or seeded with a different species. In the case of plots having received crops associated with tubers in the first season, after the harvest of these associated crops, corn may be added to the plot in sides of the said tubers in the next season. Over the years, the producers rotate crops (or crop associations) between the plots of the field. The logic of the producers is to precede the Cassava by the groundnuts or to associate them because, the groundnuts enriches the soil by its capacity to fix atmospheric nitrogen and by the decomposition of the debris after the harvest. On the other hand, the cassava precedes the fallow because of its great capacity to exhaust the soil. The fallow will allow the field to be at rest for a year and improve its productivity.

Todem (2015) reports that maize occupies on average 0.40 ha and 0.32 ha respectively in Bokito and Mbangassina. Yams follow as the second most cultivated crop occupying on average 0.28 ha and 0.30 ha respectively in Bokito and Mbangassina. Groundnuts and cassava occupy 0.26 ha and 0.24 ha in Bokito, against, 0.18 ha and 0.14 ha in Mbangassina. But statistical analysis has revealed that, these average areas of the soils occupied by these dominant food crops are not significantly different regardless of the study area.

Plantains/bananas, Yams, maize groundnuts, Cassava, vegetables/home garden are the dominant food crop production systems practised (mixed cropping, subsistence, commercial farming, plantation farming) (Todem, 2015). The following crops are particularly dominant in agroforestry systems yam, pistachio cassava and macabo/taro, which are very often associated with plantain and other food crops in a continuous way or sequential system (Todem, 2015). Todem (2015) studied farmers' occupation of farmlands in Bokito and Mbangassina, his findings reveal that crops occupy 4% of the land on the farms of the two areas and are cultivated for household self-consumption and part is sold occasionally to provide for certain household needs.

When cultivating a fallow or a new plot from a preceding secondary forest or savannah, the first dominant crop cultivated during the first year is either yam, cocoyams / taro or Egusi. During the second year, in the first agricultural season, the dominant crop established on the same plot is either groundnuts or corn. In the second season of the same year, maize is generally produced in monoculture. The rotation cycle is completed by cassava during the 3rd year, and the plot fallow for an average period of three years which

varies from one farmer to another, depending on the availability of land (Todem, 2015). The production, processing and marketing attributes of some of the main crops are below.

Cassava

Production: Cassava is often produced in association with other crops, average production ranges between 8-10 tons/ha, due to high perishability and landlocked nature of Mbangassina. Farmers often leave cassava on farms for 15-24 months and harvest gradually depending on cash needs of the household. The use of improved root varieties has been promoted, however, adoption by farmers is low because they don't have the capacity to transform in large quantities and the improved varieties cannot stay for more than 2-3 months on farm.

Processing: Cassava is either consumed by local farmers as tubers or processed into other by-products such as garri, fufu, waterfufu or "cossette". Artisanal equipment such as buckets, hand graters, drying mats and water are often used for processing by farmers. Processing is often done for consumption or sold for extra income for the family.

Marketing: Farmers within the Mbangassina municipality sell cassava and by products at their doorsteps or on village market days. The biggest market is that of Mbangassina centre, farmers from other villages take their products to the Mbangassina market on Sunday (which is the market day). Farmers also sell products in other markets in the municipality, e.g Talba on Tuesday, biakoa on Thursday. Some women prefer just to sell at their doorstep to customers that pass by the roadside. Average price of a 50kg bag of "coucous" vary between 12,000 FCFA and 18,000 FCFA during periods of abundance and scarcity respectively.

Yam

Production: It is produced in association with other crops such as maize, egusi on farmers crop fields, yam farms are often larger and far away from the homes. On average a ha produces 17.8 tons of yams.

Marketing: Yams is harvested between November right up to April. Farmers sell in 15L basins around their houses or in neighbouring markets on market day. On average a 15L basin is sold between 10,000 FCFA and 15,000 FCFA depending on the season. Some few farmers cultivate yams in large quantities around Mbangassina centre and negotiate directly with buyers from Yaounde who buy and load into trucks.

Maize

Production: Just like yams and cassava, maize is cultivated in association with other crops on crop fields, for example, groundnuts, Egusi and yams. On average a hectare produces 714.4kg per ha of maize

Marketing: As for the market, the selling price of grain corn does not vary according to the variety, but rather according to the period. There is no approved price. The sale price is fixed by mutual agreement between producers, traders and buyers (consumers). This price is mainly influenced by supply and demand

in the market. The period of the year when maize registers its lowest price comes after the harvest months (August-September) when the average minimum price is 100 francs per kilogram. The period when it is most expensive is during sowing (March-April); the maximum price is 250 FCFA, even 300 FCFA per kilogram.

Plantain

Production: Plantain is grown principally in cocoa agroforestry systems in association with cocoa trees. During the first year of creation of a cocoa farm, plantain dominate the farm and provide shade, after 1 year when cocoa trees take over and harvesting of plantains continue. The density of plantain trees is gradually reduced as cocoa trees grow bigger. On average a hectare of plantain in a cocoa agroforestry system produces 900 bunches per ha

Marketing: Plantain marketing is done through three channels in the locality, when farmers sell in small sets staggered over time, they sell at their doorsteps or in neighbouring markets. When they decide to sell in large quantities, they contact "buyams" who come with a truck and buy directly from the village or farm for the city. Prices ranges from 2,500 FCFA to 5,000 FCFA depending on the size of the bunch and the period.

Egusi (Pistache)

Production: It is produced in farmer crop fields in a mixed cropping system with tubers such as yams, cassava and maize. On average a hectare of cocoa can produce 3 bags of 50 kg of egusi

Marketing: It is generally sold at doorsteps or in village markets on market days, they are often sold in 15 L buckets at prices ranging from 6,000 FCFA to 12,000 FCFA depending on the season and period abundance or scarcity).

Processing, drying and storage of major food crops in the area.

Processing: Amongst the major crops produced within the municipality of Mbangassina, cassava is the most commonly processed to other products. Table (25) shows a summary of the food crops processed by farmers in the municipality.

Table 25: Major crop processed at landscape level and actors

Product	Gender involved (Men, Women, Youth)	Final product processed product	Quality exigencies by buyers (yes, very often, somehow, No, emphases)	Processing equipment used	Current levels of skills and local technical options available: (high, medium, low)
Cassava	Women	Cassava paste"coucous"	Yes-very often: the cassava paste	Buckets or basins, drying	High

			should be very white	mat “bac de tempage”	
		Baton	Yes, very often:	Buckets or basins, pots	High
		Garri	Yes, very often:	Buckets or basins, drying mat “bac de tempage”, grinding mill, frying pan	Low
		Cassava flour “farine”	Yes-very often: the cassava flour should be very white	Buckets or basins, drying mat “bac de tempage”, grinding mill	High

Table (25) shows that cassava is processed into several products amongst which cassava paste “coucous”, “baton”, garri and cassava flour “flour”. Buyers always require these products to be of good quality. All products should be very clean, and white for cassava paste and flour, it should be very dry. Farmers use rudimentary equipment such as buckets, basins, pots, grinding mills and frying pan. Women rate themselves to have high knowledge in processing of the different products except for “garri” which is a new product introduced into the community by immigrants from the North-West and South-West regions who are used to processing cassava into “garri”.

Drying: Most of the food crops cultivated by farmers in the area dried before being marketed. Drying is principally carried out by women. The table (26) below summarises the different food crops dried, and rudimentary equipment used for drying. One important conclusion from the drying process is that quality and hygiene is seldom respected, implying these dried products may rarely enter modern supply chains making it difficult for these farmers to penetrate modern supply chains such as supermarkets where they can easily fetch higher margins.

Table 26: Drying of major food crops and actors

Product	**Main actor involved in drying (men, women, youth)**	**Is quality a major requirement for dried products (yes, very often, somehow, no emphases on quality)**	**List equipment currently used for drying**	**Current levels of skills available for drying** **(high, medium, low)**

Maize	Women	Yes, very often	Zinc, aluminium sheets/ "batch"	High
Egusi "Pistache"	Women	Yes, very often	Tapolin sheets "batch"	High
Groundnuts	Women	Yes, very often	Tapolin sheets "batch"	High
Cassava and by-products (coucous, garri, flour)	Women	Yes, very often	Tapolin sheets "batch" Frying pan	High

Storage: Not all products produced in the municipality are stored by farmers. Most of the time, food crops are kept for a few days awaiting sales, only maize and pistache can be stored for a few months. These two crops are the only two for which they have knowledge in keeping them for long periods of time. These crops are stored to be sold at a better price, or for future consumption or as seed for the next production season. Farmers equally expressed their desire to store yams for longer periods but complained they lack the know-how in conserving yams over long periods of time. The implication of this is that farmers sell at peak production periods during which supply is abundant and fetches very low prices.

Description of the marketing systems for food crops

Food crops produced within this landscape have 2 principal types of markets (i) large urban markets e.g Yaounde, Douala, Bafia market and (ii)local markets. Bernard & Hermann (2016) report that 70% farmers sell their products in Yaounde. These farmers target different markets, Mokolo, Mfoundi, Etoudi and Mbankolo. These farmers prefer to sell in Yaounde because they make personal contacts with their customers and they can equally buy other products they need for their families. Bernard & Hermann (2016) equally report that the remaining 30% sell in the villages, they often sell to "Bayam- sellam" who come and buy directly from these farmers at farmgate prices. Most often these buyers take products on credit, sell before giving back the money to producers, generally the prices at which farmers and "Bayam-sellams" agree on is not often respected as they always comeback to say they made a lot of losses and could not pay the agreed price. These "bayam-sellam" often come from Obala, Ntui, Ombessa and Yaoundé, some of them often buy in large quantities to resell in strategic markets such as those of Yaounde.

Bernard & Hermann (2016) equally reports that these traders equally participate in the production by giving inputs such as pesticides and insecticides to producers. The figure below shows the findings of data collected between February and March 2020 in 08 villages in the municipality of Mbangassina. It shows that 59% of sales transactions are with retailers, 17% with coaxers, 14% with wholesalers, 08% with

consumers and 2% with “bayam-sellams”. This shows the dominance of retailers who buy from the municipality and retail in Yaounde, Bafia and other towns. Retailers generally have small operating capital and do not have the capacity to buy huge quantities. This explains why they but on credit from farmers. The implication of this is that to better organise these value chains, efforts should not only be put on farmers, traders should also be organised to raise capital to buy from organised farmer groups.

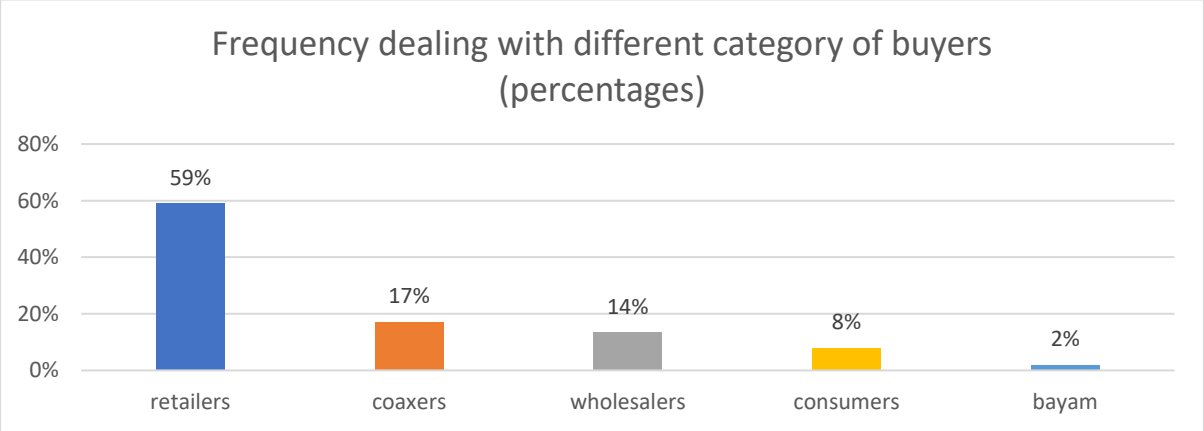


Figure 13: Frequency dealing with different category of buyers (percentages)

Buyers from neighbouring countries often buy food crops from the Mbangassina municipality, these buyers come from Gabon and Equatorial Guinea and notably from the markets of Kyé-ossi et Ebébiying (Bernard & Hermann, 2016). Most often they come for food crops such as cassava, yams, plantain and cassava-flour. Travellers to Douala and Yaounde are equally buyers of food crops from this municipality.

Point of sale: The sale of these crops can be at the doorsteps of farmers (their houses), in an urban market (Bafia, Yaounde or Douala) or in village market. Findings from field data collected revealed that sales at 93% of farmers sell at doorsteps, 5% through urban markets and 1% in village markets. Those who sell through urban market are often “big” farmers who have large food crop fields, such as yams and sell directly to urban markets so as to make profits. Selling at the doorstep gives farmers the opportunity to concentrate on their production function.

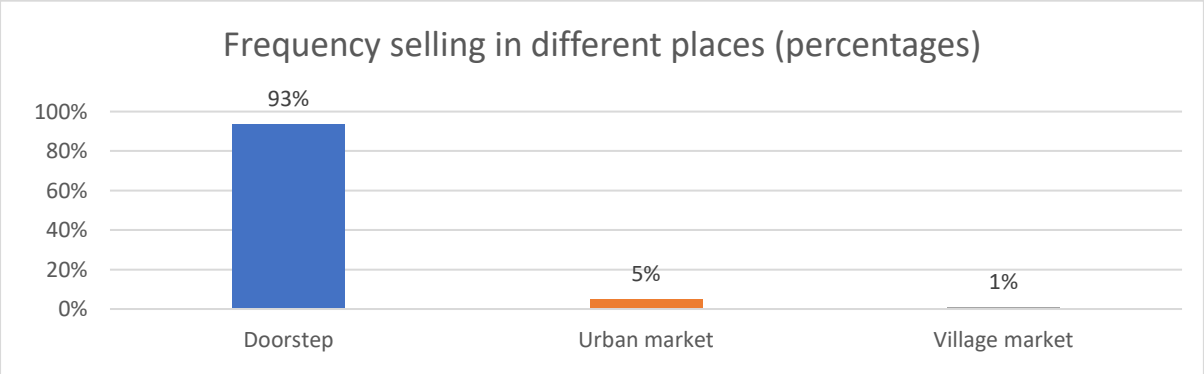


Figure 14: Frequency selling in different places (percentages)

4.1.15. Other income generating activities

Hunting: The forest area and savannah landscape are home to different types of animals that are source of protein and income to households. Hunting is practiced as an income generating activity and equally as a culture to some hunters. Hunting is continuing and non-selective, wastage is often recorded through forgotten traps in the forest. This activity is prominent among a very small proportion of the population and remains prevalent despite the constant control of MINFOF forest guides. The fauna is characterized by the presence of rodents such as porcupines, rats, grasscutters, etc. However, there are other species such as antelopes, civets, monitor lizards, crocodiles, pythons. PCD Mbangassina (2015) reports about 32 wildlife species within the Municipality of Mbangassina. Of these 32 species, 09 are fully protected species in Cameroon (class A), 06 are partially protected (class B) and 17 belong to protection class C.

In the department of Mbam and Kim, to which belongs the locality of Mbangassina, we note the presence of one of the largest wildlife reserves in country: Mpem and Djim national park of more than 97,480 hectares (MINFOF, 2017). This park contains about 100 animal species, including 76 species of mammals. The dynamics of animal populations can explain the presence of valuable animals near cocoa plantations which for the most part is bordering on this park (Gue et al., 2017). Cocoa producers from the Mbangassina recognise that when creating different farms, they could easily find large animals. Farmers however confirm that these animals are hard to see nowadays and thus underscores the disappearance of wildlife due to expansion of agriculture (Gue et al., 2017).

Sand: Sand is one of the natural resources of the municipality. It is very profitable and occupies majority of the youths in the municipality particularly those of Yebekolo. It is carried out on the banks of the Sanaga and Mbam with rudimentary equipment such as canoes, manual shovels and bucket for the benefit of customers who transport the sand using dump trucks to Yaoundé where it is sold. However, sand miners encounter a lot of challenges to conform with administrative procedures. Additionally, the miners are not equipped with the right facilities to transport the sand (dump trucks). insufficiency of means of transport (dump truck). The municipality is also rich in quarry products (laterites, gravel and stones) which if properly organized, could contribute to the reduction of unemployment and thus increase business and purchasing power of the municipality (PCD Mbangassina, 2015).

Fishing: Fishing in the Municipality of Mbangassina is done in an artisanally on the Sanaga river, Mbam, Djim and other small rivers. Fishing techniques used include the use of nets, the traditional dugout, the line, the trap. The species of fish most fished are the Nile Tilapia, the snake fish (Chana chana), red tail fish, carp, and the freshwater captain. As for fish farming, the municipality currently has 14 ponds, only 5 of which are active and 9 others inactive (abandoned).

Fruit trees and Non-Timber Forest products (NTFPs): Fruit trees and NTFPs are increasingly being used as shade trees in cocoa agroforestry systems because of their potential to provide ecosystem services and

extra income to farmers. Buyers often come from neighbouring towns such as Bafia, Yaounde and Obala to buy fruits and NTFPs such as njangsang for eventual retail in major cities.

Arts and crafts: The craft activity remains embryonic with the manufacture of hoods, baskets, machete handles, mortars, pestles, chairs and other rattan materials. That sector bearer deserves to be organized because it is a source of income and of great touristic importance.

Trade: This sector revolves around the activities of wholesale, semi-wholesale and even retail of basic essential products (clothing, food, household utensils, agricultural products, drinks, agricultural inputs, etc.), basic necessities (rice, flour, sugar, etc.) and those from field crops or livestock (tomatoes, vegetables, yams, potatoes, palm oil, celery leeks, peppers, turnip carrots, chickens, eggs, milk etc.). The diversity of agro-pastoral products makes the Municipality of Mbangassina a production hub in the region.

4.2. Protection

4.2.1.Overview

The municipality of Mbangassina is characterised by degraded forest land largely converted to cocoa agroforestry and extensive savannah land principally used for food crop cultivation and cocoa expansion. Part of the municipality is covered by the Bafia forest reserve with a total area of 6,116 ha. This reserve is located in the southern part of the headquarters at Mbangassina town, only few people know about the existence of this forest reserve and it is largely used for agriculture without a management plan. The Mbangassina municipality has no community forest but land use maps suggest patches of two community forests from other municipalities specifically Ngoro and Ntui stretch in to Mbangassina covering 2,000 ha. Communal forests and production forests around the municipality are summarised in the table below.

Table 27: Forest units of neighboring municipalities of Mbangassina

Municipalities	**Community Forest**	**Council Forest**	**UFA**	**Vente e coupe**
BOKITO	2	1	/	/
MAKENENE	2	1	1 (00-004)	/
NDIKINIMEKI	4	1	1 (00-004)	/
DEUK	15	/	1 (08-005)	1
NGORO	3	/	/	1
NTUI	4	/	/	/

Figure (14) shows different land uses in the municipality and indicate that over 30 community forests, 3 council forests and 3 UFA border the Mbangassina municipality with two community forest stretching into municipality.

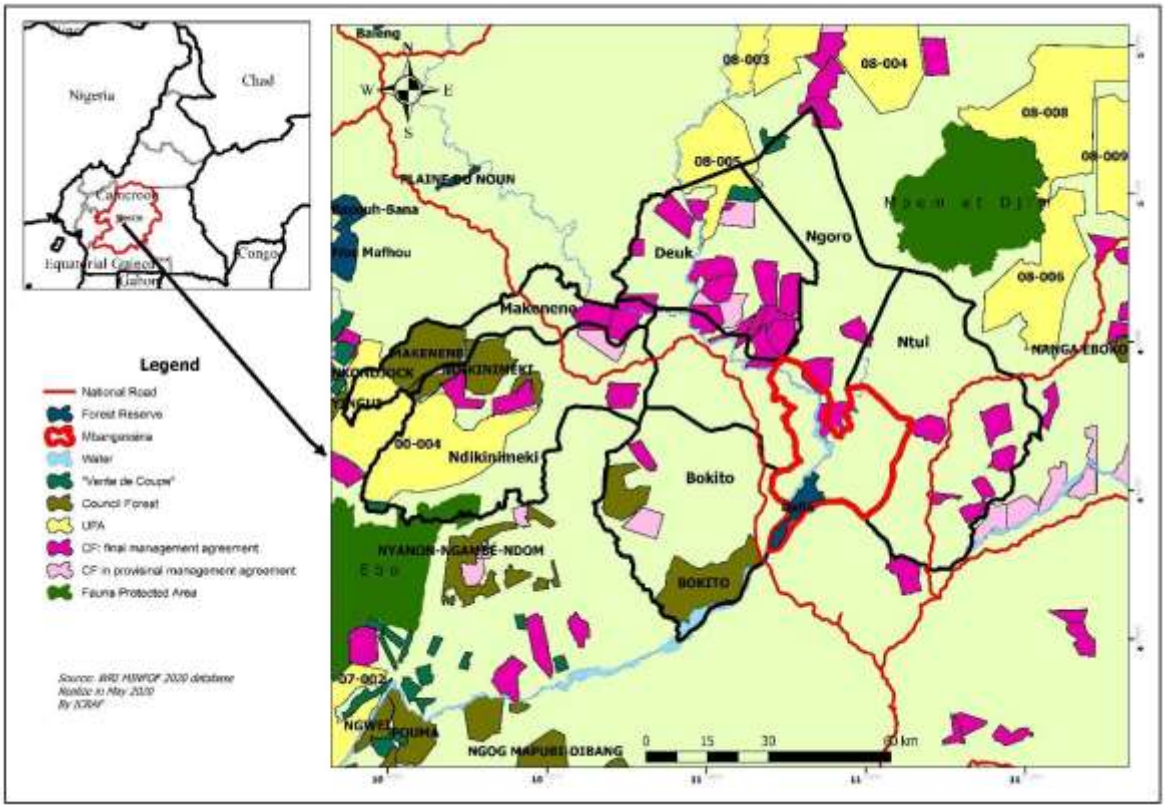


Figure 15: Map of Bafia reserve and community forests within Mbangassina municipality

4.2.2.Forest richness

Across the four transects we laid out in the landscape, 05 of the plots were typically forest plots. In all plots with 30m*30m dimensions, we attempted to count the stump density to understand trends of tree cuttings in the plots. In the sampled plots, the average tree density was found to be **262 trees per ha**. Of this, **10.30% of the trees are bigger than 31 cm circumference** while the remainder 89.6% are of less than 31 cm circumference but taller than 3m viable to be counted as trees. The most dominant tree species in the forest are shown in table (28).

Table 28: Dominant tree species in sampled plots

Tree species	**Scientifics names**	**Tree density per hectare**	**Mean circumference(cm)**
Njasang	Ricinodendron heudolotii(euphorbiaceae)	55.09	139.86
Fraquet	Terminalia superba(combretaceae)	49.07	138.39
Unidentified		40.28	140.53

Baoba	Adansinia digitata(bombacaceae)	33.33	139.25
Asobe/Azobé	Lophira alata(ochnaceae)	18.98	98.69
Mango	Irvingia gabonensis(irvingiaceae)	12.04	35
Ayos	Triplochiton scleroxylon(sterculiacea)	9.72	200
Iroko	Milicia excelsa(moraceae)	9.72	50
Tsonuou Tsounou		7.87	46.5
Ebom	monodora Myristica	7.41	32
Onguro	Leptadenia lancifolia(apocynaceae)	6.48	54.5
Inouti		6.02	250
Kadi	Murraya koenigii(rutaceae)	6.02	38
Berehoume		5.09	40
Eyong	Eribroma oblongum(rutaceae)	5.09	150
Pad		5.09	250
Cerivier sourvage	Prunus avium(rosaceae)	4.63	80
Woho	Fagara zantholoides(rutaceae)	4.63	450
Wonegne		4.63	200
Badouk/Padouk	Pterocarpus(fabaceae)	4.17	38
Cabord/Carbote		4.17	170
Erona- erona		4.17	200
Lever sourvage		4.17	58
Sapeli	Entandrophragma cylindricum(meliaceae)	4.17	120
Bave		3.7	280
Kanliba/Kinkeliba	Combretum micranthum(combretaceae)	3.7	32
Padouk	Pterocarpus(fabaceae)	3.7	33
Wongoro		3.7	240
Fromager	Ceiba pentandra(bombacaceae)	2.78	342.5
Earo		1.85	50
Akouk/Ekouk	Alstonia boonei(Apocynaceae)	1.39	130
Bitter cola	Garcinia kola(Clusiaceae)	1.39	35

Obatoan	Vocanga	1.39	130

4.2.3.Forest contribution to rural livelihoods

Agroforestry was highlighted by community members during focus group discussions as their main forest related activity. Nurseries and seedling production were equally mentioned as the second most important forest activity, production of medicinal plants and bee keeping equally emerged as key forest related activities in the landscape. (Table 29) below summarises the findings from the Mbangassina municipality.

Table 29: Mbangassina Forest related activities

Forest activity	**Mean Rank**	**Frequency**
Agroforestry	1	100%
Nurseries and seedling production	2	86%
Fruit trees growing	1	86%
Medicinal plants production	3	29%
Ecotourism	-	0
Handicrafts	-	0
Bee keeping	4	14%
Seed production	5	14%
Silvo-pastoral activities	-	0%

Forests are home to a variety of products that are of key importance to community members. Table (30) shows ranking of forest-based products by community members. Firewood emerges as the most important forest-based product used by women for cooking, fruits from the forest come in the second position while NTFPs such as *njangsang* that serve as source of income and food are also key forest products and are classified in the third position, harvesting of honey is equally underscored by farmers as a key product from the forest.

Table 30: Mbangassina Forest based products

Forest based products	**Mean Rank**	**Frequency**
Firewood	1	100%

Fruit	2	100%
Medicines	4	100%
Cash crop (Njansang)	3	100%
Food	3	86%
Wood	5	86%
Vegetables	5	57%
Honey	3	14%
Animal feed	6	42%

Forests equally offer a wide variety of services to the landscape and its occupants; community members from the municipality of Mbangassina rank climate regulation as the most important forest service, soil fertility comes second, soil protection and shade share the third position. Forests are equally important to the community because they provide special services related to water purification and disease control. Table (31) summarizes the main findings from the municipality of Mbangassina.

Table 31: Mbangassina Forest based services

Forest based services	**Mean Rank**	**Frequency**
Shade	3	100%
Soil fertility	2	100%
Soil protection	3	100%
Climate regulation	1	86%
Water conservation	3	86%
Water purification	4	86%
Disease control	4	100%
Windbreak	7	43%
Employment	-	0
Recreation (tourism)	-	0

Religious functions (spiritual)	-	0
Aesthetic	-	0
Educational roles	-	0
Cultural services	8	14%

4.2.4.Protected Areas

During focus group discussions, community members did not show any proof of knowledge about protected areas in the municipality of Mbangassina, however, through literature research, the Bafia Forest Reserve was highlighted as the lone legally classified forest in the municipality, it is located south of Mbangassina town and covers about 6116ha. The other lands occupied by community members within the municipality are acquired through customary land tenue system (GCLP Grand-Mbam, 2019). Community forests are equally found in neighbouring villages to the municipality that extend to the municipality. Table (32) shows the amount of legally allocated protected land within the municipality.

Table 32: Protected areas in Mbangassina

Protected area	**Total Area (ha)**
Part community forest	2000
Bafia forest reserve	6116
Total	8116
% total area	10%

Deforestation and forest degradation in Mbangassina

Deforestation is defined as the conversion of forest to another land use or the long-term decline of forest cover (canopy) below the minimum threshold of 10% (FAO, 2006). In general, forest resources have a broader genetic base than that of plants cultivated. The forest in Mbangassina is much more vulnerable because they are constantly threatened by anthropogenic (predictable) and natural (unpredictable) factors. Contrary to deforestation, tree cover is defined as vegetation greater than 5 meters comprising natural forests and plantations, tree cover loss is thus described as mortality or removal of tree cover due to diverse factors such as diseases, fire, mechanical harvest or storm damage, which is not the same as deforestation. Between 2001 and 2019, Global forest Watch in partnership with MINFOF reported total tree cover loss of over 3,529ha and tree cover gain between 2000 and 2012 to be over 45 ha of land. The figure below indicates evolution of annual tree cover loss by land class between 20001-2019.

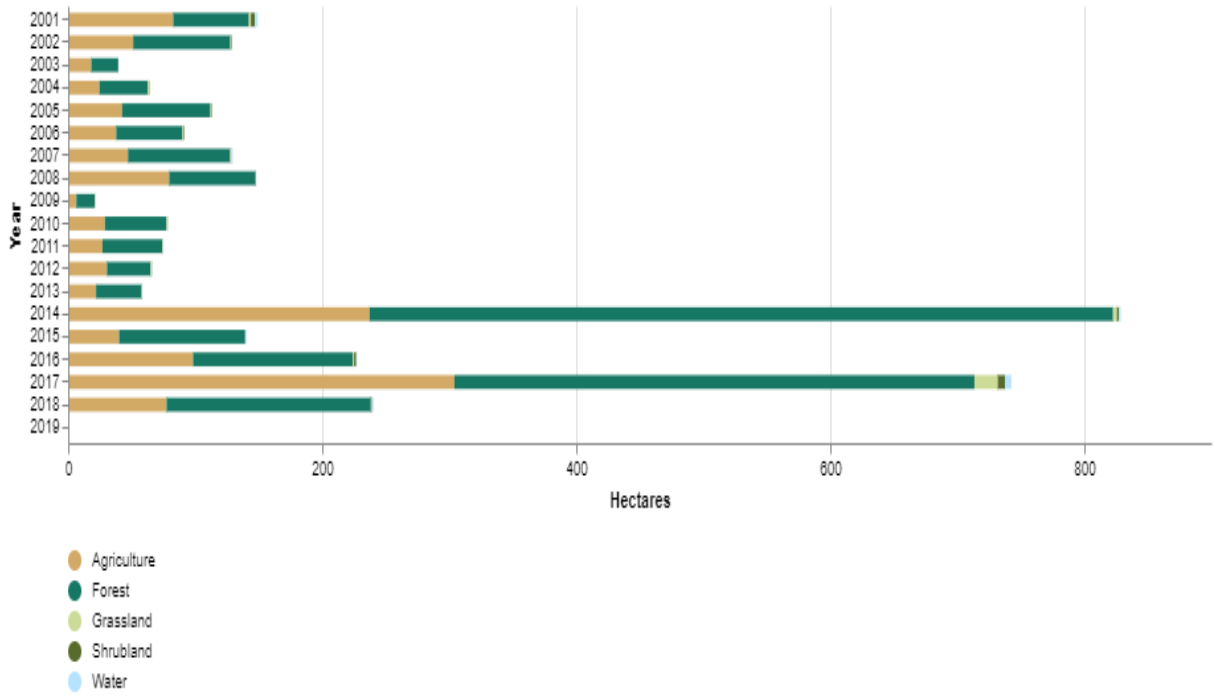


Figure 16: Forest loss graph by land-use for the Grand Mbam. Source: Global forest watch and MINFOF, 2020

It can be seen that tree cover loss in forest and agricultural lands dominate over the years, however, the year 2014 and 2017 showed significant loss due to increased rates of expansion of cocoa farms and immigration.

The biggest factors contributing to deforestation are shifting slash-and-burn agriculture shifting slash and burn agriculture is most common, along the forest transition zone. Increasing population equally comes with increasing demand for land to construct houses, over the past decade, construction of houses and urbanisation is becoming an important driver to deforestation within the municipality. Although cocoa production accounts for almost 30% of land in Mbangassina, deforestation within the municipality cannot be solely allocated to cocoa (LTS 2019). This is because clearance of forest for cocoa often involves planting of annual crops while cocoa matures, thus the agro-forest includes other crops. Deforestation is thus driven by agricultural commodities, small holder food crops cultivation, fuelwood and timber harvesting coupled with urbanisation. Thus, landscape approaches to counter deforestation are more appropriate.

The forest area of the municipality when seen through google map shows different levels of secondary forest, however, field visit show that, they are basically cocoa farms with different levels of shade trees. The municipality of Mbangassina is highly degraded with cocoa agroforestry system replacing the degraded secondary forest that existed before. Only small patches of forest can be seen within the municipality now, almost all forest land have been converted to cocoa agroforestry system with some community members moving to other communities to create cocoa farms where there is still forest. Results of data collection reveals that in 6 out of the seven FGDs in Mbangassina participants believed forest area is decreasing significantly while for one of the groups in the area there really is no more forest left as it is all cocoa plots

and there is no change in the forest size. These changes have significant impact on the potential of biomass to sequester carbon, fFgure(13) shows annual CO2 emissions from biomass loss between 2001 and 2018.

Figure 13: Carbon emissions over time from Grand Mbam

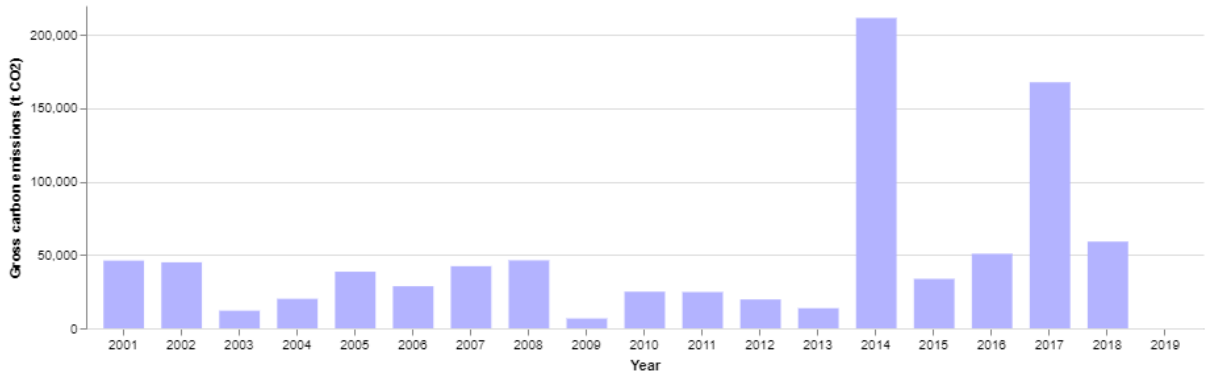


Figure 17: Carbon emissions over time from Grand Mbam. Source: Global forest watch and MINFOF

It can be seen from figure (16) that years of high tree cover loss, coincided with high CO2 emissions from biomass loss, 2014 and 2017 registered the highest losses. This equally affects the temperature of the area and the micro-climate due to land-use change.

Ecosystem encroachment

Through focus group discussions held with the communities living in the landscape, we identified key drivers of deforestation that are playing a crucial role in driving forest cover loss in the municipality. As expected, farming and settlement are the most common drivers of ecosystem encroachment, 86% of the population highlighted these as major drivers of ecosystem encroachment.

Table 33: Major drivers of forest encroachment

Location	**Percentage of focus group in Mbangassina (n=7, np= 77)**		
	Increasing	**No change**	**Decreasing**
Farming	86%	0	0
Settlement	86%	0	0
Overexploitation	29%	0	0
Roads	29%	0	0
Mining	14%	0	0
Overgrazing	29%	0	0

Power lines	0	0	0
Telephone lines	0	0	0
Water pipes	0	0	0

Overexploitation, roads construction and overgrazing were underscored by 29% of focus group members as drivers of ecosystem encroachment. The top-ranking drivers were found to be expansion of cash crops such as cocoa and oil palm and expansion of settlements associated with the increasing human population in the landscape. Mbangassina being one of the main cocoa production areas in the country, people from outside the community and even from other countries have migrated into the areas as farm labourer to work on the cocoa plots. The availability of labour from outside meant that the expansion of the cash crop areas could continue expanding at the expense of forests. The migrants who come into the villages in and around Mbangassina gradually transition from seasonal workers to settlers who begin to build their staying houses in the area. Once they get acquainted with the locals, they begin to engage in shared cropping where they get the cocoa produces as pay rather than getting paid in cash. Once they accumulate some wealth, they begin to go into deeper and unoccupied parts of the forest where to establish their own farms. Through time, they become part of the society and continue expanding their farms with little knowledge of the surrounding communities. It is this migration process that led to the expansion of settlements in the area.

Table 34: Key drivers of deforestation in Mbangassina area – farmers perceptions

Location	**Importance ranking [Most important factors =1]**	**Trend (% of FGDs)**
Food crop area expansion	3	Increasing (57%)
Cash crop – oil palm, cocoa, etc.	1	Increasing (57%)
Settlement	2	Increasing (71%)
Timber exploitation (logging)	4	Stagnant as forest are getting finished.
Firewood	4	Increasing
Charcoal	4	Increasing

The table (34) shows that according to farmers, cash crops (cocoa and palm oil) and settlement are the most important drivers of deforestation, the trends are equally increasing, with 57% of focus group members affirming this for cash crops and 71% for settlement. This is principally due to increasing population

through childbirth and immigration into the area. Other drivers such as firewood and charcoal are increasing while timber exploitation is stagnant because forest is becoming thin.

The connected chains of issues therefore drive the whole land cover changes and even losses of vegetation that is crucial for biodiversity conservation in the Mbangassina area. ***No efforts of restoring the forests or protecting them*** is being done except the efforts of the cocoa farmers who are trying to maintain selected species of trees in their farms.

The community members who participated in the FGDs (n=77) confirmed that since most of the surrounding is already taken by different people for cocoa farm development and other agricultural practices, they are now moving into the ***savannah areas to develop cocoa*** which they think is now a new frontier for expansion.

Deforestation trends

Despite the laying out of the transects in what seemed to be a continuum of forest and cocoa farming systems and savannah, we found out that most of the closed canopy forest looking vegetation is dominated by cocoa plantations and hence we classified them as cocoa agroforestry plots. That is why most of the plots sampled in Mbangassina municipality are cocoa agroforests. This classification is thus based on the observed land use and land cover than the designated official land cover types of the areas sampled. For instance, some plots may still lie in the forest but are more like cocoa plots than forest. They had very few shade trees which close the upper canopy layer with cocoa trees taking the secondary canopy layers.

To understand the state of the clearance of trees, we tried to count the stumps, but we found out that during cocoa farms' establishments, the remaining stumps of the trees cut are often burnt and it is not possible to trace any. It is also important to note that most of the forest in this area is highly degraded likely due to the timber exploitations that happened in the past and subsequent extraction of timber for the booming construction of residential areas for farm workers and the firewood they needed for cooking, heating and lighting.

Within our transects, we were only able to find five plots which could typically be characterized as a forest plot. In these plots the mean tree density was about 316 trees per ha. 76% of the trees encountered in this area are less than 10 cm in diameter (at 1.3 m above ground) (diameter at breast height- dbh). The remainder have dbh greater than 10cm with mean being 59.12 cm.

To understand the successional structure of the forest, we also assessed the sapling and seedling counts. In fact, there is a remarkably high density of seedlings and sapling with a per ha density of 8,480. This in fact is quite promising in that there is a high chance the forest can be restored from its current degraded form to a dense forest if it is possible to nurture the young plants recorded. However, as will be discussed later, the dominance of forest fire in this area especially at the savannah frontier is a risk for this restoration to happen easily.

Table 35: Summary table for forest vegetation characteristics

Attributes	Density per ha (n=5)	Mean circumference (cm)
Trees >31 cm circumference	75.56	187.56
Trees < 31 cm circumference	240.00	24.37
Saplings and seedlings	8480.00	NA

4.2.5.Biodiversity:

Wood species: Wood species often found in this forest are *Milicia excelsa* and *Terminalia superba* and *Triplochyton scleroxylon*. Furthermore, it can be noted that the flora of Mbangassina is rich in non-timber forest products such as mushrooms, vines, Gnetum, Djansang, colanuts, medicinal plants, wild mangoes, rattan, bamboo, wild fruits (PCD Mbangassina, 2015).

Animal Species: The fauna of this region is very diverse and abundant. It consists mainly of mammals (rats, monkeys, deer, porcupine), reptiles (viper, crocodile), birds (partridges, toucan, parrot), fish (catfish, carp, tilapia), there are also in this area crustaceans and insects. Most of the captured aquatic species is by net fishing, fishermen are mostly of Malian origin, while the hunt of the mammals is mostly the work of indigenous peoples (PCD Mbangassina, 2015). Caterpillar, black flies are very common within the landscape and attacks cocoa plants, thus reducing yield, however, farmers reported a reducing trend of these invasive species. Animal species such as buffalo, chimpanzees, gorilla and red monkeys are becoming scarce within the landscape.

Wildlife abundance: With exploitation of timber before the advent of cocoa agroforestry, the natural habitat of many animals has been affected. Thus, wildlife abundance has seriously been affected. Rats, Hedgehog, Squirrels, Porcupine, Rodents, Monkeys and Mole are commonly found in the landscape. All species hunted for meat, they are often consumed by the hunter, with excess sold for income. Gorillas, Monkeys, Panther, Elephants, Rats, Porcupine, Tortoise, are hunted for medicine.

Insect pests, disease and invasive species participants perception: Participants of focus group discussion were asked about their perception of the existence of insects, pest, diseases and invasive species. Figure 14 shows the most dominant insects, pests, diseases and invasive species in the municipality as listed by respondents.

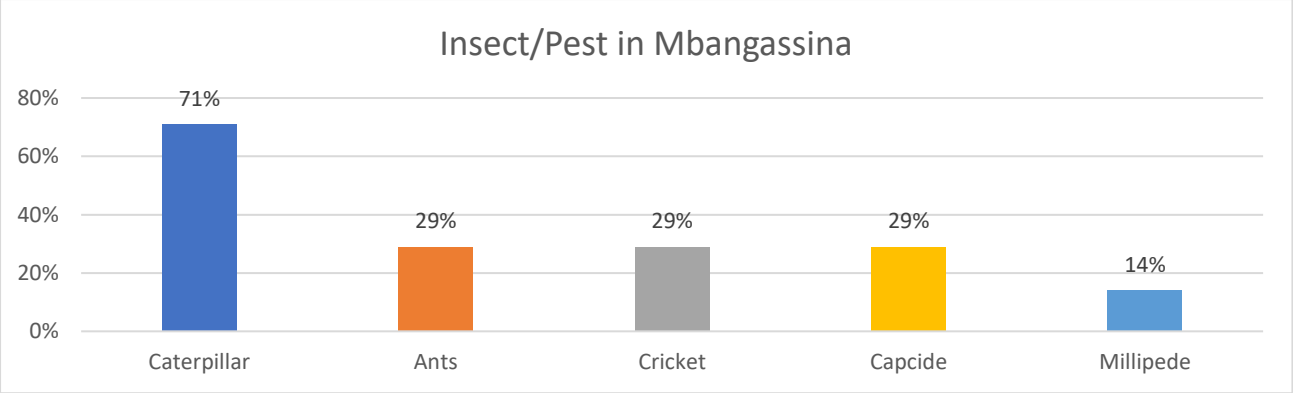


Figure 18: Dominant Insect/Pest in Mbangassina

The figure above shows the dominance of caterpillars, 71% of the respondents affirm the presence of caterpillars, 29% of focus group members confirm that ants, crickets and capcide are major pest ravaging plants in the municipality while 14% confirm the presence of millipedes that attack cocoa.

Threatened or extinct species: With the change in land use, population growth and hunting of animals, many animals previously visible in the landscape are now threatened or extinct. The table below shows a summary of animals reported during focus group discussions as being threatened or extinct.

Table 36: Threatened animal species in Mbangassina

Animal	**Mbangassina (n =7, np =77)**	**Sighting**
Chimpanzees	29%	Not seen in a few years
Antelope	14%	Not seen in a few years
Buffalo	14%	Not seen in a few years
Gorilla	14%	Not seen in a few years
Hare	14%	Not seen in a few years
Lions	14%	Not seen in a few years
Panthers	14%	Not seen in a few years
Red monkey	14%	Only seen once a year

Compared to other animal species listed in table 36, chimpanzees were the most highlighted by focus group members (29%) to be threatened. The other animal species were perceived by a relatively smaller proportion (14%) of the respondents to be threatened. The animal species in this category included antelopes, buffalo,

gorilla, hare, lions, panthers and red monkeys are threatened or extinct species. They underscored that all the species have not been seen in a few years but for red monkeys that are seen once in a year. They equally underscored that these animals are hunted for meat while buffalo and chimpanzee are also hunted for cultural use

Conflicts human-wildlife-livestock: The presence of wildlife and livestock in the landscape poses conflicts with humans, the figure below summarises the major types of conflicts identified by focus group participants in the municipality of Mbangassina.

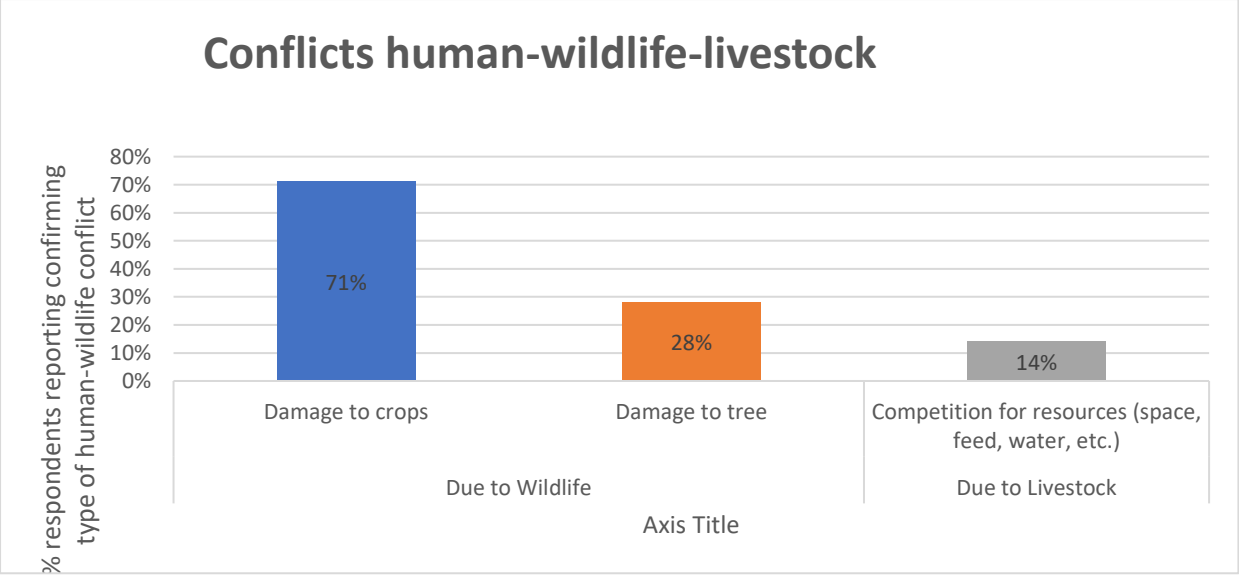


Figure 19: Human-wildlife-livestock conflict

The figure above shows that 71% of respondents' highlight damage to crops as major conflicts with wildlife, this is especially true to rodents while 28% talk of damage to tree. Conflicts with livestock was mainly with respect to competition for resources especially water.

Trends of the problem caused by conflicts

Damage to crops by wildlife remains the major conflict with humans in the municipality, with 42% of respondents saying the trend is increasing meanwhile 43% highlight that the trend is decreasing. Increasing trend was also reported for damage to trees by wildlife by eating the trunk of trees and destroying young trees and competition for resources by livestock.

Table 37: Trends in human-animal conflict

Location	**Mbangassina (n =7, np =77)**		
Conflict drivers	**Increasing**	**No change**	**Decreasing**
Damage to crops	42%	0	43%
Competition for resources (space, feed, water, etc.	14%	0	0
Damage to tree	29%	0	0

Fire occurrence

The savannah zone of the municipality is characterised by constant and random fire incidents during the dry season, these fire incidents are a result of a variety of reasons. Through focus group discussions, farmers evoked the following reasons for these fires.

Table 38: Drivers of bush fires in Mbangassina

Drivers of bush fires	**High**	**Medium**	**Low**
Fire due to farm management	14%	14%	14%
Deliberate fire	28%	14%	14%
Hunting	43%	0	0
Grazing land fire	0	0	14%
Natural fire	0	0	0
Cross border fire	0	0	0

Fire due to hunting is by far the main cause of fires, 43% of the sample rate hunting as the major cause of bush fires. Hunters in the savannah set fires to chase animals out of their hiding places so as to hunt them for meat. Deliberate fires (28% of sample) are used especially in the savannah zone as first line of clearing. Farm preparation in this zone starts with farmers setting fire to kill herbs to facilitate tilling of the soil and reduce expenditure in clearing the soil. Grazing land fire is reducing due to increased discussions and understanding between chiefs in the savannah area and nomadic herds mens on how to manage grazing fire. Management measures include Fire belts, Awareness creation (sensitization), and Fire management committee.

4.3. Social Inclusion

4.3.1.Overview.

The Municipality of Mbangassina has an essentially agricultural population, Mbangassina is the political and economic capital of the municipality. The municipality is made up of 19 villages. The demographic structure of the population coupled with the receptive nature of the population contributes to an increasing population. These also calls for the development of adequate social infrastructure and services to meet the needs of the increasing population. This sub-section captures different aspects of social inclusion.

4.3.2.Demography

The population of the municipality averages 68 208 inhabitants with Voundou village being the most populated with about 12100 inhabitants. Other important villages in the municipality in terms of population size Biakoa, talba and Elangana. About 44% of the population are male and 56% females. (figure 19).

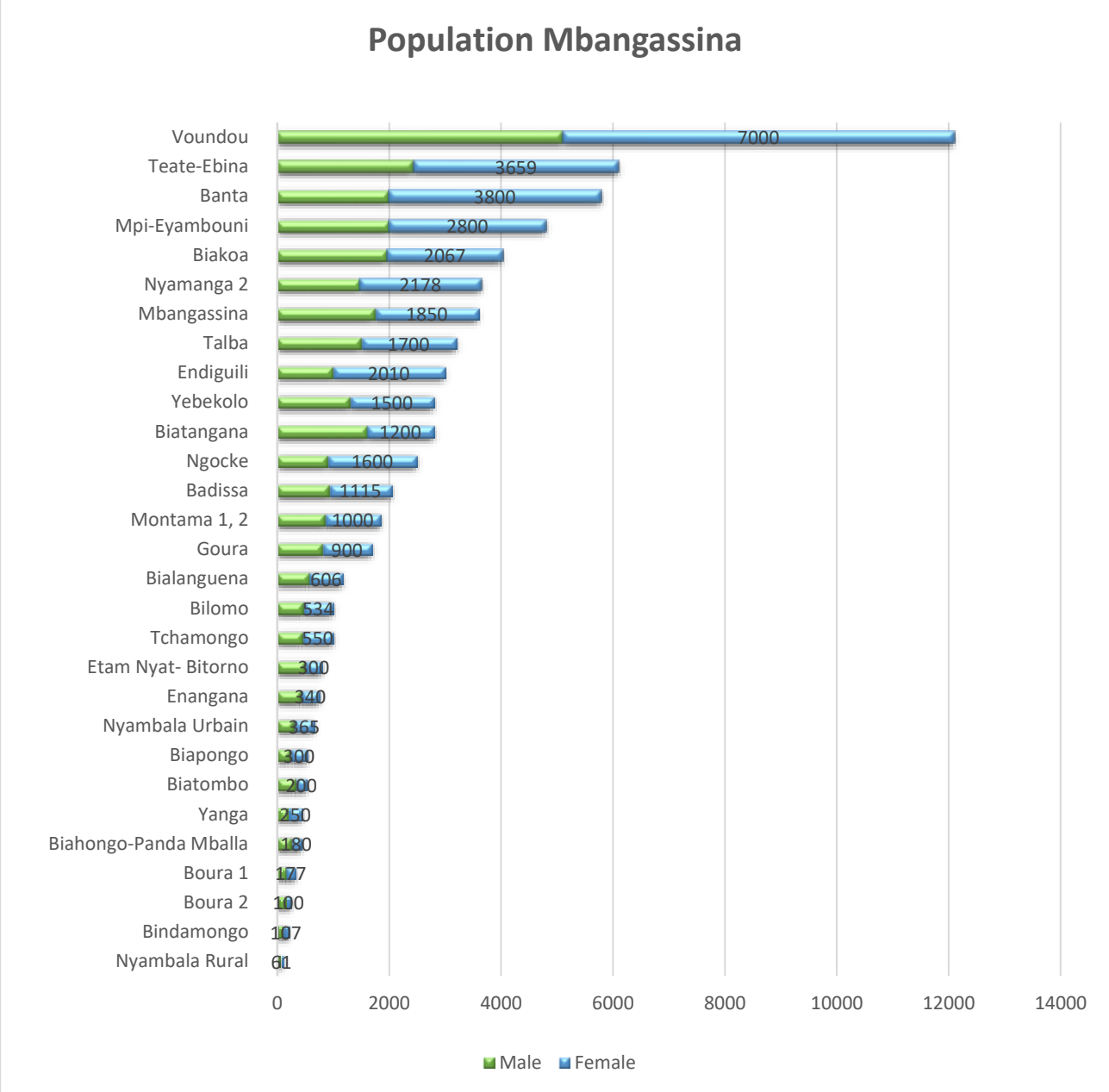


Figure 20: Population of Mbangassina

Table 37: Distribution of population by village and sex

The table below shows that 44% of the population are male and 56% women, thus highlighting the dominance of women.

Table 39: The village population of Mbangassina area

POPULATION				
No	**VILLAGE**	**Male**	**Female**	**TOTAL**
1	Nyambala Rural	45	61	106
2	Bindamongo	102	107	209
3	Boura 2	150	100	250
4	Boura 1	153	177	330
5	Biahongo-Panda Mballa	250	180	430
6	Yanga	199	250	449
7	Biatombo	330	200	530
8	Biapongo	241	300	541
9	Nyambala Urbain	300	365	665
10	Enangana	420	340	760
11	Etam Nyat- Bitorno	500	300	800
12	Tchamongo	450	550	1,000
13	Bilomo	467	534	1,001
14	Bialanguena	571	606	1,177
15	Goura	800	900	1,700
16	Montama 1, 2	850	1,000	1,850
17	Badissa	930	1,115	2,045
18	Ngocke	900	1,600	2,500
19	Biatangana	1,600	1,200	2,800
20	Yebekolo	1,300	1,500	2,800
21	Endiguili	990	2,010	3,000
22	Talba	1,500	1,700	3,200
23	Mbangassina	1,750	1,850	3,600
24	Nyamanga 2	1,470	2,178	3,648
25	Biakoa	1,962	2,067	4,029
26	Mpi-Eyambouni	2,000	2,800	4,800

27	Banta	1,990	3,800	5,790
28	Teate-Ebina	2,439	3,659	6,098
29	Voundou	5,100	7,000	12,100
	TOTAL	**29 759**	**38 449**	**68 208**

Sources: Figures from different diagnoses (DPNV, DEUC)

Recent population trends including migration

Due to high fertility of soil in this municipality, and proven success in cocoa and other food crop production, migration of other ethnic groups to this municipality is very common and has been increasing over the years. For example, the population increased from 41,180 inhabitants in 2005 to 68,208 inhabitants in 2015, (39.6%) over 10 years. The table below shows the distribution of the population amongst the villages (PCD Mbangassina, 2015). The population of the municipality is made up of natives " the Sanaga" and immigrants from other ethnic groups such as Bafia, Balom, Bamiléké, Bamoun, Haoussa, Eton, Yambassa, Manguissa, Mambila, anglophones from the North-West region and foreigners from Chad and Mali (PCD Mbangassina, 2015). This migration has resulted in increasing population of the municipality and development of more dense settlements, coupled with increasing pressure for land.

It is worth noting that migration into the municipality dates back to the 1965 when neighbours, Eton and Manguissa from the Lékié region started crossing the Sanaga in search of agricultural land (Elong, 2004). Migration into the municipality was facilitated after the construction of the bridge over the Sanaga (childhood bridge) in 1979. Within the same period a government-sponsored migration movement called operation 1,000 families triggered a massive migration plan that favoured the movement of different groups of people from neighbouring municipalities and into Mbangassina (Elong, 2004).

Habitat

The habitat of predominantly rural neighbourhoods is grouped and made up of rectangular houses. These houses are mostly made of permanent and temporary materials such as uncooked clay brick. Some are on clay called locally (potopoto) with 90% roofs made of corrugated iron or tiles. The houses are built at the edge of the tracks serving the districts of the city and the dwellings are uncontrolled and ill-arranged.

Religion

Several religions, predominantly Christian, are practiced within the Common. These include Catholicism, Protestantism, Pentecostalism and Islam.

Availability social infrastructures and access to basics facilities

The Mbangassina municipality just like many municipalities in Cameroon is at different levels of development from one village to another within the municipality. Generally, the road network in the community is earth graded road, people have access to water through bore holes and wells.

Roads: The municipality of Mbangassina is fragmented by a rich network of roads although most of them are not passable in the rainy seasons. These roads were originally created for forest exploitation (both legal and illegal).

Access to electricity: Electricity is not in all villages of the community, officially, electricity network passes through the following villages Badissa, Biakoa, Biahongo, Biapongo, Biatangana, Biatombo, Bilomo, Boura 1, Enangana, Goura, Mbangassina, Nyamanga 2, Nyambala Rural, Nyambala Urbain and Yebekolo. However, these villages suffer from constant power failures.

Access to health services: Access to health care services is equally an important problem in the community, PCD Mbangassina (2015) reports 10 public integrated health centres, with only 08 operational, 01 functional medical health centre in Mbangassina and 04 private integrated health centres with that of Ngocke in a bad state.

Access to Education: Just like access to health, access to education is not evenly distributed in the municipality, there are about 13 private kinder-gardens, 19 public kinder-gardens (PCD Mbangassina, 2015). A total of 43 primary schools have been reported in the municipality with over 32 being public primary schools and 11 private schools. At the level of secondary education, PCD Mbangassina (2015) reports 2 government bilingual secondary and high schools in Ebina and Mbangassina, the villages of Biakoa, Voundou and Yebekolo boasts of 3 secondary schools while 2 technical secondary schools are reported in Talba and Enangana. There are equally 4 private secondary schools in the municipality, Voundou (2), Biakoa and Talba.

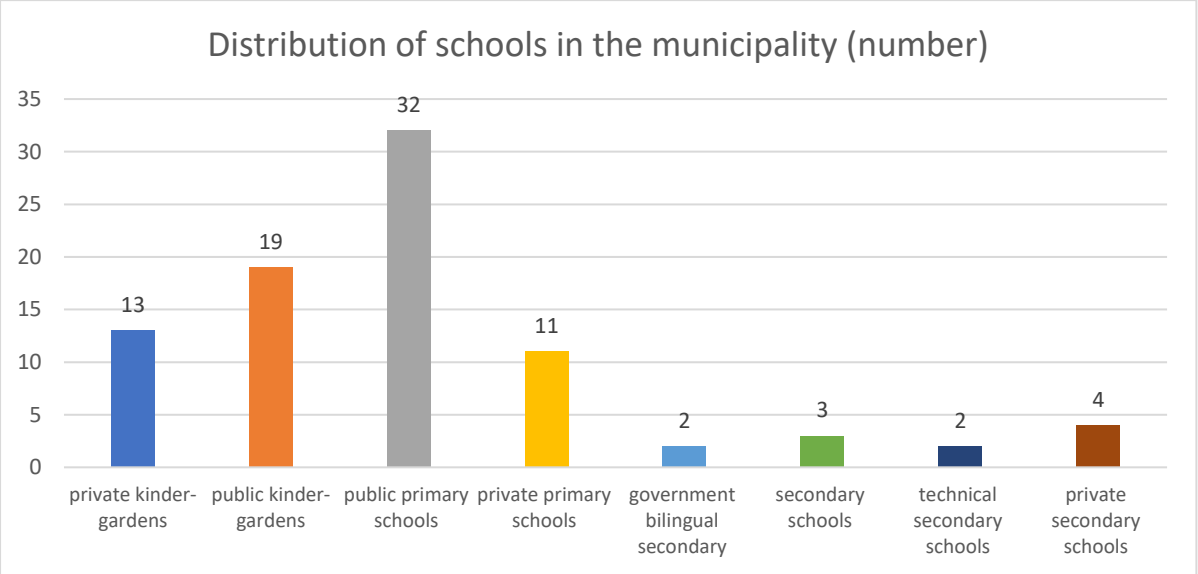


Figure 21: Distribution of schools in the municipality (number)

Shops and markets: Mbangassina, the headquarters of the municipality is equally the commercial hub of the municipality, commercial activities revolves around wholesale, semi-wholesale and even activities related to retail of basic necessities (clothes, food, household utensils, agricultural products, drink,

agricultural inputs, etc.), those of basic foodstuffs (rice, flour, sugar, etc.) and crops or livestock (tomatoes, vegetables, yams, potatoes, palm oil, celery leeks, peppers, turnip carrots, chickens, eggs, milk etc.). The diversity of agro-pastoral products makes the Municipality of Mbangassina a production centre in the region.

Table 40: State of social infrastructure in Mbangassina

Social service	Level of appraisal
Road	Dominantly earth graded road
Electricity	In 15 villages (constant power cuts)
Access to health	10 public integrated health centres (08 operational). 01 functional medical health centre in Mbangassina 04 private integrated health centres (03 operational)
Education	32 kindergartens (13 privates, 19 public) 43 primary schools (32 public, 11 private) 02 government bilingual secondary and high schools 03 secondary schools 02 technical secondary 04 private secondary
Access to water	48 wells (33 operational) 36 bore holes (21 operational)
Warehouses	30 warehouses (28 operational)

Source: PCD Mbangassina

The Mbangassina municipal council evaluated development needs for the different villages and ranked them in terms of importance to guide interventions. The table below summarises the ranking of villages in terms of development needs and justifications for the rankings.

Table 41: Ranking of development priorities in the municipality

Villages	Rank	Justification
Mbangassina	1	As an urban space, it is urgent that important appropriate investments for the city be made in the city
Voundou	2	Although dependent on Talba, the need for investment is glaring in this locality
Badissa	3	There is a health center created without a building
Boura 2	4	Not a single trace of a drinking water source exists in this town
Yebekolo	5	There is a sand quarry in this village. However, the state is not good
Enangana	6	The table/benches in schools are insufficient
Bindamongo	7	Difficult access to drinking water (only one existing water point)
Montama	8	Difficulty accessing drinking water. Not a single well or borehole
Banta	9	Insufficient table-benches
Biahongo-Panda	10	Bad state of the road
Biatombo	11	It is imperative to reshape the dilapidated road network
Mpi-Eyambouni	12	Insufficient table-benches
Nyambala Rural	13	Access to drinking water remains a major problem.
Nyambala Urbain	14	Access to drinking water is difficult
Etam Nyat-Bitorno	15	Access to drinking water remains a scarce commodity.
Ngocke	16	However, a health center exists, the buildings are dilapidated, without adequate equipment
Nyamanga 2	17	Gateway to the village, the road network is dilapidated
Boura 1	18	Poor road network
Bialanguena	19	The market in this village was created long ago, but no building or market infrastructure
Biapongo	20	Difficult access to drinking water
Bilomo	21	Bad state of the road
Biatangana	22	Poor condition of the road and the service tracks
Endiguili	23	Large agricultural production basin, the construction of a bridge connecting to Bindamongo village is neccesary
Goura	24	There is an undeveloped market
Talba	25	Very bad road, especially at the entrance to the village with too much dust during the dry season and mud during the raining season
Biakoa	26	Although there are a few potable water points, the construction of more bore holes is necessary
Tchamongo	27	There are two non-functioning health centres

Food Security situation of cocoa farmers: Mbangassina being a major cocoa producing area, cocoa can also be a driver for food insecurity when cocoa significantly occupy land for other food crops. Todem (2015) investigated food security issues in Bokito and Mbangassina, his results illustrate that in terms of non-aggregated scores, households in Mbangassina have diversified their food by 41% against 38% in Bokito. When the fruit and vegetable food groups are aggregated, households diversify their food by 53% in Mbangassina and 51% in Bokito. The results of Todem (2015) equally shows that almost 10% of households in Bokito meet the conditions of food insecurity compared to no household in Mbangassina.

Breaking down food security scales further, Todem (2015) underscores that 21% of households in Bokito are food secure compared to 12% in Mbangassina. Almost 11% of households in Bokito are in a situation of slight food insecurity compared to 0% in Mbangassina. While 53% of households in Bokito are in moderate food insecurity compared to 82% in Mbangassina.

Access to finance: Just like in all societies, access to finance is an important parameter for development and investment. In the municipality of Mbangassina, community members access finance mostly through informal saving and loan schemes often called 'tontines'are very common in almost all villages, often dominated by women. However, members are limited to their savings and often interest rates are very high. The table below shows that on average maximum loan offered in such schemes depend on the saving ability of the members, which can go up to 3,000,000 FCFA.The cocoa farm of the farmer and a guarantor is often required for such loans, which often cover a duration of 1 year (cocoa production season) and are very accessible to members. Microfinance institutions such as Express union, MC^2 and CVEACA are all found in the headquarter of the municipality and provide financial services such as savings, loans and funds transfer to members. These institutions can give out loans to members' up to 7,000,000 FCFA depending on their ability to payback, they are not readily accessible like the tontines, however, when members show a good saving history and convincing guarantee they easily have access to such loans.

Table 42: Source of financing Mbangassina municipality

Village	Source of credit	Number in community	Maximum loan offered (FCFA)	Guarantee	Credit term (interest rate)	Duration	Comment
Talba	Tontine	>20	50,000	Guarantor and cocoa farm	55%	1 year	Both male and female have access, loans are for any activity
Boura 1	Tontine	>10	50,000	Guarantor and cocoa farm	50%	1 year	Both male and female have access, loans are for any activity
Elangana	Tontine	10	100,000	Guarantor	50%	1 year	Both male and female have access, loans are for any activity
Goura II	Tontine	>20	3,000,000	Guarantor and a good cocoa farm	30%	1 year	Accessible only to members who meet

							the requirements and for any activity
Badissa	Tontine	10	200,000	Guarantor and a good cocoa farm	65%	1 year	Accessible only to members who meet the requirements and for any activity
Mbangassina	MC^2	1	5,000,000	Guarantor, cocoa farm and land	15%	1 year	Accessible to qualified members and can be given for any reason
	CVEACA	1	7,000,000	Guarantor, cocoa farm and land	15%	1 year	Accessible to qualified members and can be given for any reason
	Express Union	1	5000,000	Guarantor, cocoa farm and land	15%	1 year	Accessible to qualified members and can be given for any reason
	Tontine	>20	500,000	Guarantor, cocoa farm	50%	1 year	Accessible to qualified members and can be given for any reason
Bilomo	Tontine	12	300,000	Gurantor and farm	50%	1 year	Accessible to members who meet conditions and given for any reason
Biakoa	Tontine	6	100,000	Guarantor	50%	1 year	Accessible to members who meet

							conditions and given for any reason

4.4. Stakeholders/actors analysis

4.4.1.Roles/ Responsibility, Resources, Rights of stakeholders in the landscape (4Rs)

There are several categories of stakeholders intervening in Mbangassina. They either pursue completely different, complementary or similar goals. These stakeholders 4Rs are recapitulated in table 43 below.

Table 43: 4R Role, responsibility, returns/resources, rights and relationship of stakeholders with farmers

Category	Subcategory	Name/Number	Role/Responsibility	Resources	Rights
Producer organisation	GIC	45	Ensure farmers sell products at best prices and help in purchase of inputs, ensure members abide to rules and regulations governing sustainable management of all kinds of resources in the landscape of landscape resources;	Social, natural (land and forest resources) and human capital	Rights to access land and forest and benefits from resources and opportunities in landscape; right to negotiate and obtain better prices for its members, inputs at lower prices; rights to lobby and participate in policy processes concerning their future
	Cooperatives	12	Ensure members produce good quality products, sell at good prices and facilitate purchase of inputs; lobby for training of members, sustainable management of landscape resources	Social, natural (land and forest resources) human, and financial resources	Rights to access land and forest and benefits from resources and opportunities in landscape; right to obtain better prices to members; rights to participate in

					decision over their future
Finance	Micro fiancé	Express union, MC2 de Mbangassina, CVECA de mbangassina	Collect savings, funds transfer and give out loans to members. Ensure savings of members are secured, transfer money as requested by client and give out loans to deserving members	Financial	Right to offer savings and services to members and rights to recover loans
	Tontines	Tontines (30)	Collect savings and give out loans to members. Ensure savings of members are secured, and give out loans to deserving members	Financial, social	/
Research organisations	International	ICRAF, CIRAD	Enhance sustainable landscape management and improvement of the livelihood of farmers through evidence based research. Ensure farmers adapt evidence-based climate smart interventions with improved livelihood options	Human, social	Right to conduct research with farmers, share research results with farmers and respect research ethics especially confidentiality

	NARS	IRAD	Research on agriculture forest and livelihoods. Enhance agricultural productivity through research, provide results to farmers		/
Government Programs		Office National du Cacao et du Café (ONCC) , Conseil Interprofessionnel du Cacao et du Café (CICC)	Develop the cocoa and coffee sector through sector development initiatives. Ensure increase production of cocoa and coffee, improve farmers livelihoods		
		Programme de Consolidation et de Pérennisation du conseil agropastoral (PCP-ACEFA)	Provide agricultural advisory services, modernise production apparatus, strengthen farmer organisations, disseminate important research results in order to increase production and productivity	Human, social, financial	
		FODECC (Fonds de Développement des Filières Cacao et Café)	Fund cocoa and coffee sector development initiatives		
		MINFOF	Control exploitation of forest resources; monitor and control forest activities		Rights to enforce forest policies: issue and withdraw permits to community

					members and sanction if need be
		MINADER	Provide agricultural innovations to farmers		
Private companies	Cocoa buyers	SIC CACAOS, OLAM, TELCAR, AMS, Barry Calebaut	Buy cocoa beans and support farmers produce good quality cocoa and improve their livelihoods	Financial, human	/

4.4.2.Diagnoses of landscape level projects and beneficiaries' satisfaction level

Most of the projects in Mbagassina were on good agricultural practices in cocoa farms and were implemented by either ONCC or CICC. Like in Mintom, Government ran projects except those by IRAD did not receive good grades. Reasons advanced were related to governance and the fact that the intended beneficiaries did not gain anything from the project.

Other projects in the community not mentioned by the sample population

AFOP: The purpose of the Support Program for the renovation and development of vocational training in the agriculture, livestock and fishing sectors - Consolidation and Sustainability phase (AFOP-PCP) is to contribute to youth employment and inclusive and sustainable growth of rural areas in Cameroon. Specifically, the program aims to continue the renovated training and professional integration scheme in the agriculture, livestock and fishing sectors.

In Mbangassina, AFOP has two training centres in Talba and Mbangassina. AFPOP has trained about 36 youths on cocoa production out of which 28 successfully graduated. Out of the 28, 25 of them were financed to the tune of 1,500,000 XAF to invest in cocoa farming. As from the 2020 production season, AFOP plans to begin a new program on yam that will train about 200 farmers a year on yam production.

ACEFA: The Programme for the Consolidation and Sustainability of Agropastoral Counselling, PCP-ACEFA, is the continuation of the ACEFA Programme. It has three objectives:

- To improve the income of family farm enterprises by consolidating and improving the public agro pastoral counselling system.
- To modernise the production apparatus (equipment, buildings, and infrastructure) by financing investment projects of producer organizations.
- To institutionalise the agro-pastoral counselling system through the creation of an agency jointly managed by the Profession and the State and strengthen the representation capacity of producers,

so that they participate actively in the consultation, management and conduct of development activities and in the design of agricultural policies.

4.4.3.Inventory of landscape related projects aimed at improving Production

Project aims at improving livelihood through sustainable forest management

- Rainforest Alliance (RA) works with the private sector on cocoa certification as well as certification schemes. There is an ongoing merger of the RA and UTZ certification scheme on cocoa.
- TELCAR- Cargill Cocoa Promise is pioneering certification initiatives in the landscape, the the Cargill Coop Academy is equally training and professionalising cocoa farmers.
- Le Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) is conducting research on the productivity of cocoa agroforests established in the forest-savannah transition zone-: with research sites in Bokito Municipality and in Talba village in Mbangassina Municipality, funded by AFD
- The *Institut de Recherche pour l'Agriculture et le Développement* (IRAD) is conducting research on the productivity of cocoa agroforests established in the forest-savannah transition zone in collaboration with CIRAD. Specifically, IRAD is conducting Agroforestry Systems trials under different shade tree species in the village of Bakoa in Bokito Municipality - funded by GoC
- Barry Callebaut is implementing its Forever Chocolate program in the landscape by training farmers, provision of inputs, financing and equipment acquisition.
- Projects aimed at improving livelihoods through agricultural development activities
- FODECC provides farm inputs to farmers.
- Project d'appui à l'utilisation des engrais dans les filières cacao café (PAUEF2C) - Subsidized Fertilizer application with total cost 1.8billion FCFA ($0.9 million) annually, funded by FODECC and implemented by MINADER has distributed fertiliser to 17 production basins in 2015; According to the Cameroonian government, this new phase of the above-mentioned project will provide cocoa and coffee producers with a total shipment of 2800 tonnes of fertilizer over a 6-year period.
- Project to support quality improvement in the cocoa-coffee sectors
  Promotion of cultural control methods (school field) for the maintenance of orchards. Emphasis is placed on good agricultural practices to limit the use of plant protection products.

Projects aimed at improving institutional arrangements including farmer's organisations, saving and loan groups

- CICC provides training of farm and post harvesting training to farmers to improve on yields as well as group dynamics training for cooperative organizations.

Table 44 below summarises the main project reported by communities during FGDs, the stakeholders promoting the project and communities' satisfaction level and its explanation.

Table 44: Summary of landscape projects and level of community appreciation

Partner (Government, NGO, Cocoa buyer, Timber company, Mining company)	**Name of project**	**Village**	**Resources targeted by the project (list crops, NTFPs etc)**	**Specific intervention of the project or objectives**	**Estimated number of beneficiaries participating in the project**	**Perception of impact of the project:** **1.Very good,** **2. Good** **3.Average,** **4.No impact**	**Explain your grading**
IRAD		BADISSA	cocoa	Research with sample farm plots	4	4	Community did not benefit, results not known
		TALBA					
CIRAD			cocoa	Agroforestry systems research: farm samples	25	2	Devoted farmers learned improved cocoa agroforestry management techniques
ICRAF			Cocoa	Agroforestry systems research: farm samples	25	2	Devoted farmers learned improved cocoa

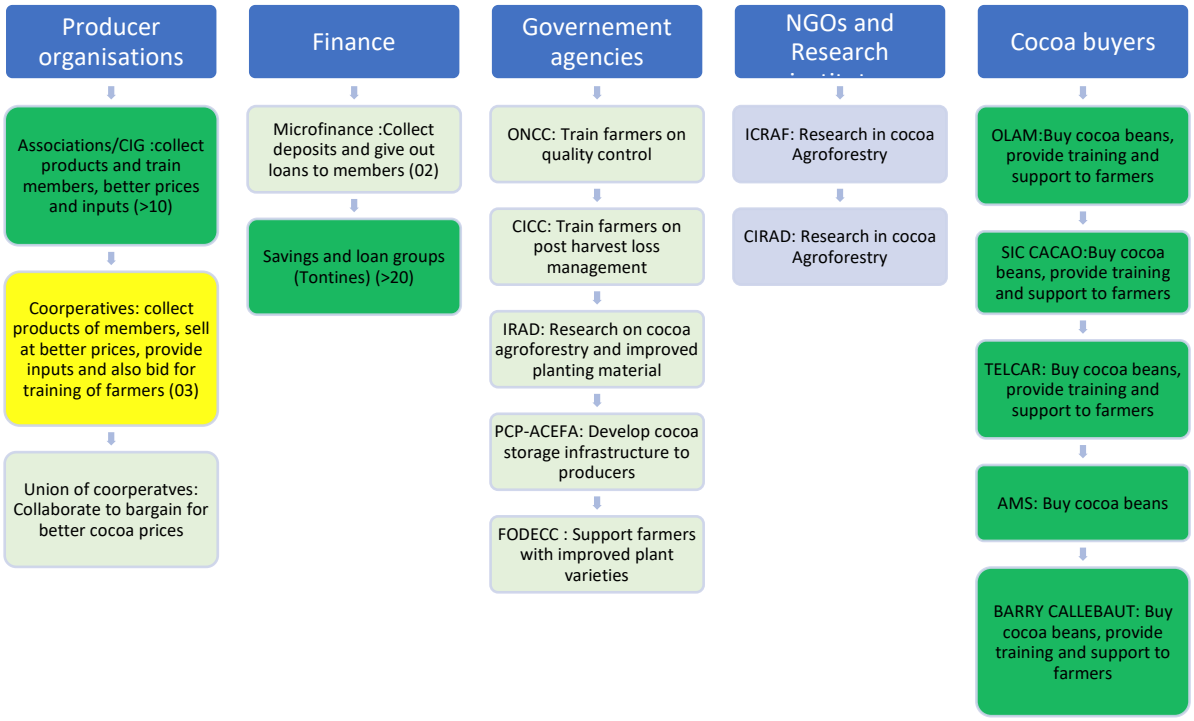
							agroforestry management techniques
IRAD			cocoa	Cocoa agroforest farm management and provision of improved cocoa seedlings	>50	2	Many cocoa farmers learned improved farming techniques
BIAKOA							
ONCC			Cocoa	Training on quality control	3	1	Members understand better how to control for cocoa quality
CICC			Cocoa	Post-harvest less management techniques	50	2	Many members manage losses better
SIC CACAO			cocoa	Production and sales of cocoa	400	1	Members had a better understanding of the marketing and production process of cocoa

BILOMO							
MINDADER	Projet Manioc		Cassava, maize	Project did not go on as planned because funds did not arrive the community	0	4	Project did not start
Mbangassina							
ACEFA			cocoa	Develop producer storage infrastructure	Ongoing		
FODECC			cocoa	Supply improved cocoa seeds to farmers		4	Only politicians benefitted from the project, youths did not benefit from anything.

Stakeholder level of influence and interest

The Municipality of Mbangassina is dominated by different stakeholder with diverse interests and influence. The figure below gives a synoptic view of the major stakeholders in the landscape and their level of influence.

Figure 19: Stakeholder mapping in Mbangassina



Level of influence of stakeholder

Low

Medium

High

5. Summary of Opportunities and Implications

5.1. Main challenges identified and existing opportunities

Table 45: Challenges and opportunities of cocoa in Mbangassina

Challenge	Opportunity
Poverty of cocoa farmers resulting from low production and productivity influenced by aging farms; poor quality beans	Possibility of improving cocoa productivity, develop alternative income generating activities & strengthen farmer organisations
High forest degradation and deforestation due to timber & agriculture (cocoa) threats to savannah biodiversity due to food crops and expanding cocoa farms;	ICRAF, IRAD, CIRAD, WWF, MINFOF experience on the subject can be of help,

Depleted soil fertility, pressure from pests and diseases and the use of non-resilient farm management practices, inadequate extension service	Existence of improved soil fertility management techniques and farm management practices
Unavailability of statistics and the absence of information on the behaviour of operators make it impossible to trace products	Ongoing mapping initiatives by cocoa companies, studies by CIRAD, ICRAF and other research organisations can serve as starting point for data compilation
Poor drying and storage & limited transformation and added value options, poor rural infrastructure	Good will of existing programs and Government policy to enhance processing and added value
Fluctuating market prices of cocoa and other food crops, weak producer organisations and low bargaining power, over dependence on buyers/coaxers. Poorly functional inputs and output markets,	Multi-stakeholder platform at National level & opportunity to replicate in Municipalities

5.2. Emerging Business Ideas/models to be developed Mbangassina

5.2.1.Improving cocoa productivity and diversifying cocoa production systems: Pillar Production

This initiative will target all categories of farmers (small, medium and large) involved in cocoa and tree crop production. This business modes will centre around developing good agricultural practices along the entire cocoa value chain. It is based on the assumption that farmers involved in deforestation activities because they lack adequate knowledge and resources to invest in good agricultural practices that improve productivity. The model will use the opportunities of reforesting savannah lands by developing cocoa based agroforestry systems in forest-savannah transition areas. Interventions will include:

- Using improved planting materials and new cocoa varieties, regenerating old unproductive farms using agroforestry techniques,
- Afforestation of degraded savannah through introduction of cocoa agroforestry as entry points /establishment of new plantations in areas degraded savannah landscapes
- Diversifying cocoa production systems
- Supporting the development of green cocoa by implementing PES
- Improving farm management practices including proper and timely use of inputs, diseases and pest management in cocoa farms.
- Management of bush fires in the savannah.
- Improving harvest and post-harvest practices including proper fermentation, drying and sorting

- Developing viable producer organisations around the cooperative business model capable of playing major roles: policy forums, negotiating profitable business deals for its members, management of funds, accountability and overall cooperative management principles; moving up the value chain and embracing other functions such as buying and processing (long-term goals)
- Developing a viable micro finance system around cocoa production

5.2.2.Community based sustainable management of forest resources- Pillar protection

This business model will reinforce community based sustainable management of forest resources by developing community-based forest initiatives including REDD+. The business model will include restoration of degraded lands. Two main type of activities are targeted:

Developing community Forest enterprises

- Support the municipality to develop a decentralised development of land and forest landscapes.
- Development Non-timber forest product enterprises centred around lead entrepreneurs: bush mango, Njansang, fishing, processing and sales
- Secure existing forest through development of communal and community-based enterprises
- Develop PES project idea in communal, village lands, family and individual farms
- Develop strategies to reduce the effect of fire on crops and forest

5.2.3.Developing alternative sources of income around promising value chains

These food crops include yams, plantain, cassava, egussi, maize, groundnuts, fruit trees.

The marketing system of these food crops is characterised by small – medium scale and dispersed farmers, diseconomies of scales, poor access to information, technology and finance, inconsistent volume and quality. The municipality has established itself as a major production basin and its closeness to Yaoundé, Bafia and Bafoussam gives it a competitive advantage. The key assumption here is that organising producers and buyers is central to overcoming the related transactions associated with the above gaps.

The business model will involve organising landscape stakeholder in priority value chains as follows:

- *Producers:* through producer organisations/cooperatives and other informal networks of producers to achieve new market opportunities provided by an emerging middle class in the above cities. The model will ensure higher prices, secure niche markets, higher bargain power, empower farmers, access to inputs and technical assistance. The model will target the participation of the most motivated farmers for the initiative to succeed.
- *Buyers /traders*: this could be wholesalers, retailers, processor to assure market for producers and thus stimulate production., increase supplies, reduced transaction costs

- Build capacity of national *NGOs and partner with National agricultural and research institutions:* to build the capacity provide to adequate business advisory services to producers and provide technical services in given value chains depending on main bottlenecks identified. This may include provision of quality planting materials, technical advice on farm managements including pest and disease, value addition through place, harvest and post-harvest including transformation/processing, quality and standards
- Development of savings and loan schemes to increase farmers capacity to save and ensure sources of loans for business growth

The house diagram below shows a summary of possible development projects that can be implemented to fill landscape gaps related to the green cocoa landscape for Mbangassina.

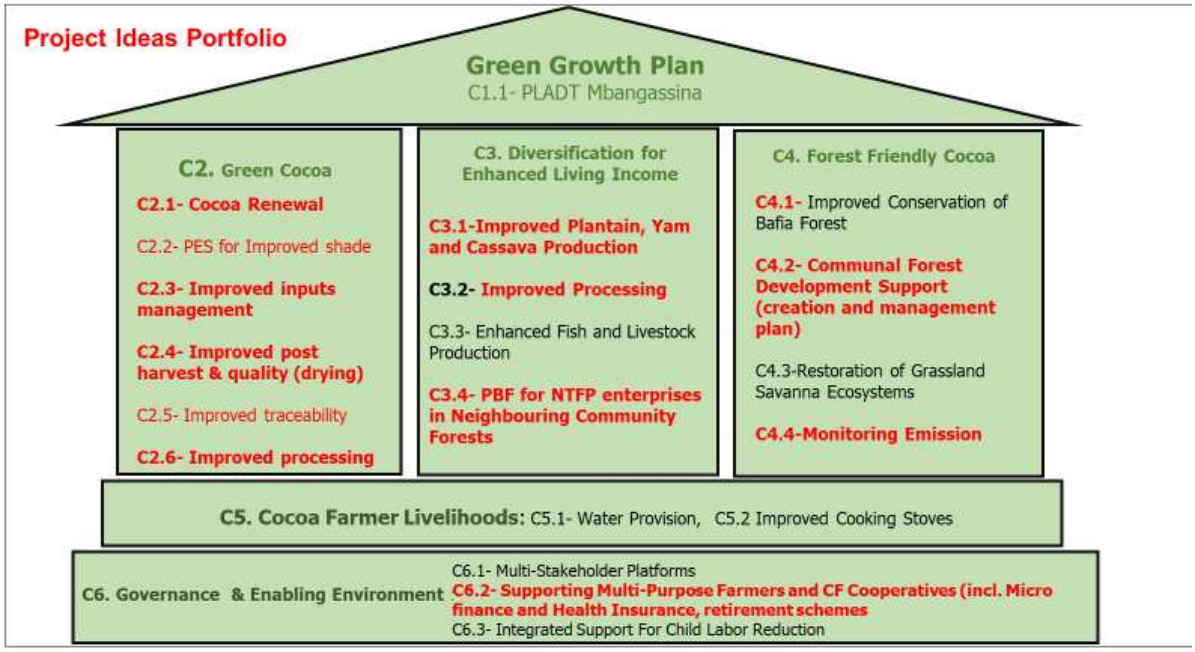


Figure 22: Project Ideas Portfolio Mbangassina

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7. Appendix

7.1. Stakeholder mapping

Category	Subcategory	Name	Main interest /Activities	Level of influence (Low, Medium, high)	Level of interest

Producer organisation	GIC	GICAM II	collect products and train members, better prices and inputs	Medium	High
	Cooperative	Société Coopérative des Producteurs de Cacao de Mbangassina Sud (MBANGASSUD)	collect products of members, sell at better prices, provide inputs and also bid for training of farmers	medium	High
		Coopérative du Secteur Talba Sud (CoopSecTas)		medium	High
		Coop MBANGA SUB à Mbangassina		medium	Hig
	Unions Cooperative				
Finance	Micro fiancé	Express union	collect savings and provide loans to members	medium	Low
		MC2 de Mbangassina		medium	Low
		CVECA de MBANGASSINA		medium	Low
	Tontines	Totines (30)	collect savings and provide loans to members	High	Low
NGOs and research insitutions		ICRAF	Carries out research on cocoa agroforestry and livelihods and the environment	medium	Low
		CIRAD	Carries out research on cocoa agroforestry and livelihoods and the environment	medium	Low
Government bodies		Office National du Cacao et du Café (ONCC) ,	train farmers on quality control	High	High
		Conseil Interprofessionnel du Cacao et du Café (CICC)	Train farmers on post-harvest loss management	low	
		IRAD	Research on cocoa agroforestry and other food cropsa	medium	

		Programme de Consolidation et de Pérennisation du conseil agropastoral (PCP-ACEFA)	Develop cocoa storage infrastructure to producers	medium	Low
		FODECC (Fonds de Developpement des Filiéres Cacao et Café)	Support farmers with improved plant varieties	High	Low
Private companies	Timber exploiters		Exploit timber from the community	Medium	Low
	Cocoa buyers	SIC CACAOS	Buy cocoa beans, provide training and support to farmers	high	Low
		OLAM CAM	Buy cocoa beans, provide training and support to farmers	high	Low
		TELCAR	Buy cocoa beans, provide training and support to farmers	high	Low
		AMS	Buy cocoa beans, provide training and support to farmers	high	Low
		barry callebaut	Buy cocoa beans, provide training and support to farmers	high	Low