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FOOD-FUEL-FIBRE PRODUCTION POLICIES AND STRATEGIES IN THE CONTEXT OF CLIMATE CHANGE IN CENTRAL AFRICA



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Food-fuel-fibre production policies and strategies in the context of climate change in Central Africa

Eugene Chia, Kevin Enongene and Kalame Fobissie

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Acronyms and Abbreviations

3Fs	Food, fuel, fibre
CAR	Central Africa Republic
CB	Congo Basin
CDC	Cameroon Development Cooperation
CEMAC	Central Africa Economic and Monetary Community
COMIFAC	Central Africa Forest Commission
CSO	Civil Society Organization
DRC	Democratic Republic of Congo
ECCAS	Economic Commission of Central African States
ER-PIN	Emission Reduction Programme Idea Note
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FPIC	Free Prior and Informed Consent
FRA	Forest Resource Assessment
GDP	Gross Domestic Product
GHG	Green House Gases
NGOs	Non-Governmental Organizations
NTFPs	Non-Timber Forest Products
REDD+	Reducing Emissions from Deforestation, Forest Degradation and the role of Conservation, Sustainable Forest Management and Enhancement of Forest Carbon Stocks
RoC	Republic of Congo
RPP	Readiness Preparation Proposal
RSPO	Round Sustainable Palm Oil
SFM	Sustainable Forest Management
SIAT	Société d'investissement pour l'agriculture Tropicale
USD	United States Dollar

Executive Summary

The Congo Basin (CB) forest is highly rich in biodiversity and contain mineral deposits of economic importance. The forest is under threat as a result of human activities including: agriculture (slash and burn and agro-industry plantations), mining, logging, infrastructural development, fuelwood extraction. Underlying factors that pose threat to the forest cover include: demographic pressure, political instability, weak governance and institutional arrangements and the quest for economic growth. The forest cover has witnessed a change over the last three decades. The deforestation rate for the CB forest between 1990 and 2000 was estimated at 0.09% while the forest degradation rate for the same period was estimated at 0.05%. Between 2000 and 2005, the deforestation and forest degradation rates of the region was estimated at 0.17% and 0.09% respectively. Of the CB countries, the Democratic Republic of Congo (DRC) has the highest rate of deforestation and forest degradation while Equatorial Guinea emerged as the country with the least deforestation rate.

In the Central Africa sub region, a greater proportion of the population rely on firewood and charcoal to meet their energy needs for heating and cooking. Almost all Central Africa states are committed to becoming emerging nations in the next decade and are therefore pursuing policy actions towards achieving poverty alleviation, amelioration of living conditions, and green and sustainable growth. At the national level, countries have elaborated respective time bound visions for achieving economic growth. The visions are dominated by strategies to boost agricultural productivity since agriculture plays a pivotal role in guaranteeing food security and the socio-economic development in the sub region. Such agricultural strategies will likely encourage the expansion of agricultural fields into forested areas.

The CB countries for instance are currently experiencing rapid expansion of palm plantations for food security and biofuel production with ongoing and planned expansion occurring in forested zones. The expansion of these biofuel crop plantations has potential of decreasing the capacity of the forests to provide food, fibre and fuelwood to forest dependent communities and is likely to as well compete with arable land for the cultivation of food crops. This study looks at policy options and strategies in the Central African sub region pertaining to food-fuel-fibre (3Fs) nexus within the context of climate change, with a focus on Cameroon, DRC and the Republic of Congo (RoC). The study builds on in-depth review of literature, policy and sectoral strategy document analysis and expert interviews conducted in each of the three countries.

Current practices related to the 3Fs are a serious threat to forest and biodiversity in Central Africa and there is no policy framework that guides and links the demand and supply of the 3Fs. Policy development in this context is at a very infant stage.

Expansion of biofuel type crops e.g., palm oil is driven by factors such as biophysical suitability, availability of cheap land, the quest for economic development and the increasing demand in the Asian and European markets. However, experts opine that it is possible to reconcile biofuel crop production with forest and biodiversity conservation for climate change mitigation and if carefully planned, the development of biofuel crops can contribute to economic development, food security and poverty reduction in the region by directing agriculture expansion to degraded lands and the design and effective implementation of integrated land use planning methods are the main proposed strategies that can ensure food and biofuel crop production with limited forest loss.

National programmes to reduce carbon emissions through deforestation and forest degradation have identified wood fuel extraction as one of the major causes of forest degradation. On the other hand, fuelwood and charcoal provide social and economic benefits to the population of the CB countries. The wood fuel value chain is generally characterized by unsustainable practices from production to consumption. Strategies geared towards the sustainable management of wood fuel can target the different aspects of the value chain such as plantations, agroforestry, trade control and improved energy efficiency at the level of both producers and consumers.

Central African states especially those of the CB have made commitments to the international community to contribute to the global efforts to mitigate climate change by protecting the CB forests. With the exception of Equatorial Guinea, CB countries are participating in reducing emissions form deforestation and forest degradation and the role of conservation, sustainable forest management and enhancement of forest carbon stocks (REDD+) countries under the World Bank Forest Carbon Partnership Facility (FCPF) initiative. Balancing food production, biofuel production and climate change mitigation in the Central Africa sub region presents a complex and challenging situation that must be handled with caution at the national, regional and international policy levels. In this light, there is a need to link and coordinate the different policy domains i.e. climate change mitigation, biofuels, wood energy, food security and economic development to ensure coherence in policy design and implementation.

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

The Central Africa sub region is home to the Congo Basin (CB) forest which constitutes the second largest tropical forests in the world after the Amazon (Wilkie and Laporte, 2001) covering six countries: Cameroon, Central Africa Republic (CAR), Democratic Republic of Congo (DRC), Equatorial Guinea, Gabon and Republic of Congo (RoC).

The CB forest contains diverse flora and fauna species possessing the world's largest number of plants species per unit area and a variety of animal species: about 552 mammals, 460 reptiles, 1000 bird species and 300 fish (de Wasseige et al., 2012). More importantly, the CB forest is home to over 30 million people and supports the livelihood of about 75 million people from 150 ethnic groups in the Central African sub region who rely on the forests for food, health and nutritional requirements (Megevand et al., 2013).

Congo Basin forest, a source of livelihood for local women. Photo © Paul Donfack/AFF

Outside the biological richness of the CB forest, it also serves as a reservoir for minerals of economic importance. According to Thiart and de Wit (2015), the CB forest contains over 1600 mineral deposits of various types. The presence of these mineral deposits have culminated in the proliferation of several mining companies in the sub region. Mining supports the economy of the CB countries since revenues from these mining activities make a significant contribution to the gross domestic product (GDP) of the countries in the sub region. Based on the findings of the African Development Bank (2013), the Central Africa sub region has recorded high economic growth rate which is associated to the exploitation of its natural resources with an average GDP growth of 5.8% between 2001 to 2012 as opposed to 3% for the period 1990 to 2000, putting Central Africa as the continent's sub region with the second highest economic growth between 2001 and 2012.

This study was carried out in Cameroon, DRC and RoC. These countries share part of the transboundary CB tropical rainforest ecosystem. Renewable energy e.g. biofuels and wood energy (fuel wood and charcoal) and agriculture expansion are emerging issues in the CB region that will potentially shape forest and land use management policies in the context of climate change.

The region is experiencing increasing expansion of large-scale industries and an increasing demand for wood energy. However, there are concerns on the economic, social and environmental sustainability of these renewable energy options and agriculture expansion. In order to ensure economic growth while reducing the environmental impacts, the Economic Commission of Central African States (ECCAS) has taken the bold step to elaborate a Central African regional green economy vision whose operationalization and effective implementation at the national levels is yet to be visible.

1.2 PROBLEM STATEMENT

The forests of the CB constitute the second largest standing tropical forest and contain a variety of flora and fauna species. The forests support the livelihood of millions of local populations and contain diverse mineral deposits of economic importance. These countries are keen to pursue economic growth so as to attain emergence, alleviate poverty and ameliorate the living conditions of their respective populations. For instance, Cameroon's vision 2035 is to become an emerging economy. This will require implementation of strategies that will spur up development in the country and such strategies especially those in the agricultural and extractive sector will likely impact on the forest cover.

From an environmental stance, the CB forest plays a very important role in the mitigation of global climate change through its capacity to sequester two-third of the carbon stored in live vegetation in Africa (COMIFAC, 2003). Hence, while CB countries are keen to pursue economic growth on one hand, they are committed to protecting their forests that regulate the global climate on the other hand. This is corroborated by the fact that five of the six CB countries (Cameroon, CAR, DRC, Gabon and RoC) are participating countries in in reducing emissions form deforestation and forest degradation and the role of conservation, sustainable forest management (SFM) and enhancement of forest carbon stocks REDD+ under the forest carbon partnership facility (FCPF) (FCPF, 2015).

Striking a balance between forest/biodiversity conservation and economic activities like those of extractive industries among others is often very complex and challenging (Mboringong and Enongene, 2015). The national economy of CB countries is heavily based on extractive industries with minerals and oils making the most significant contribution to the GDP of majority of the countries (Abernethy et al., 2016), although the activities of the sector are identified as a threat to forest cover (Tegegne et al., 2016).

Furthermore, the forest ecosystem of the region is under threat due to increasing demand for land to produce biofuel crops influenced by national and global macroeconomic policies, and this has potentials to negatively affect fibre and food production. This situation has been further exacerbated by the attention attached to climate change mitigation by the international community.

In order for the activities of the extractive sector in the Central Africa sub region to be shaped in a way that will have minimal impact on the social and natural environment, there is need for an assessment and understanding of the underlying forces and policies that drive extractive activities in the sub region. It is within this framework that this study seeks to analyze policies and the nexus of food-fuel-fibre (3Fs) production in Central Africa (Cameroon, DRC and RoC) in the context of climate change.

1.3 OBJECTIVES

This study addressed the following objectives:

1. Assess trends in forest cover change in the CB and the driving factors;
2. Assess fuel-wood and charcoal policies and other practices that will make fuel wood and charcoal industry a viable business in the CB;
3. Assess and document impact of extractive industries on the 3Fs in the context of climate change; and
4. Examine how the competition on biofuel production can impact on food production, land security and biodiversity habitat.

CHAPTER 2: BACKGROUND OF THE SUB-REGION

2.1 OVERVIEW OF THE SUB-REGION AND COUNTRIES' PROFILES

The Central African region is composed of 10 countries: Burundi, Cameroon, CAR, Chad, DRC, Equatorial Guinea, Gabon, RoC, Rwanda and Sao Tome and Principe as shown in

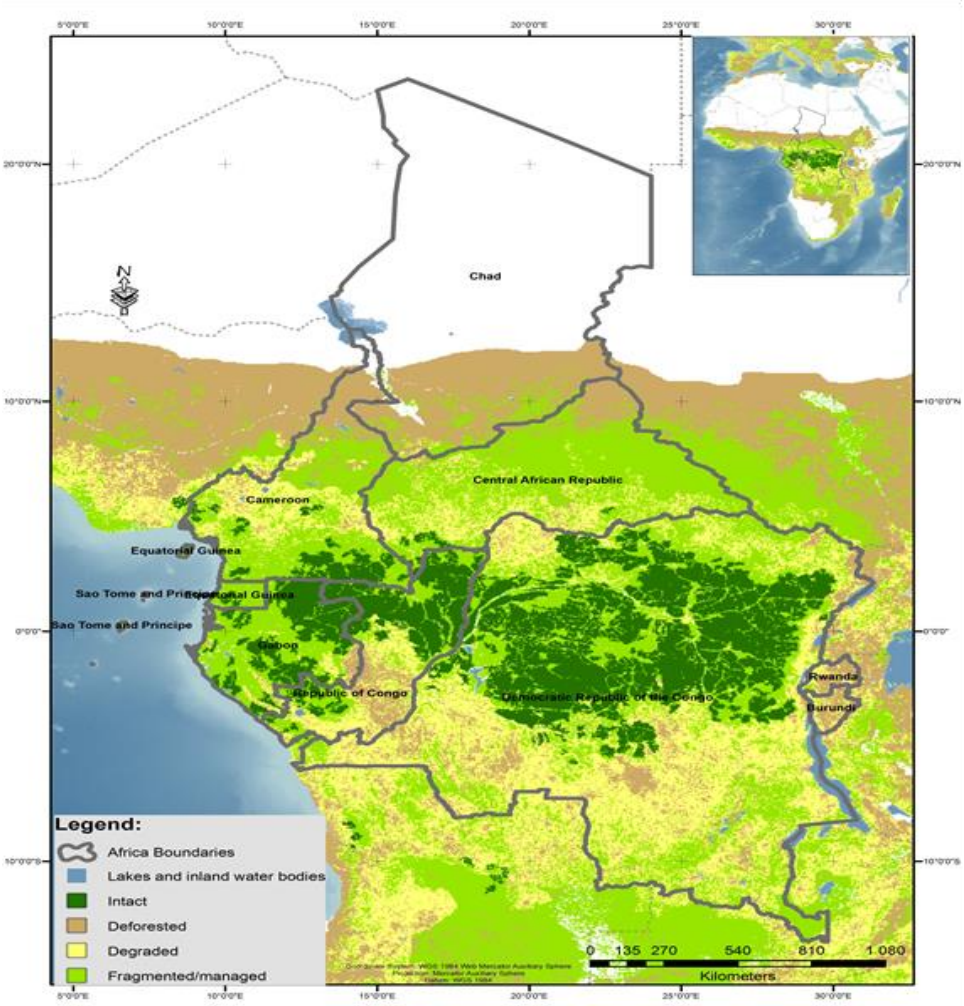

Figure 1: Map showing countries of the Central African Region

2.1.1 Economy

The Economic and Monetary Community of Central African States (CEMAC) is an international organization composed of six of the nine Central Africa countries and is geared towards fostering development and solidarity within the sub region. The CEMAC region has witnessed a fairly strong overall economic growth due to high oil production and revenues (IMF, 2013). CEMAC oil producing countries embarked on ambitious programmes geared towards public investment so as to fill existing infrastructure gaps and this boosted the growth of non-oil GDP within the last few years (See Figure 2). According to the African Development Bank (2013), the sub-region has recorded high economic growth rates emanating from the exploitation of its natural resources over the past decade with countries experiencing an average GDP growth of 5.8% between the period of 2001-2012 as opposed to a GDP growth of 3% obtained between 1990-2000, putting Central African sub region as the continent's region with the second highest economic growth over this period. Albeit the revenue generated from oil, countries in the sub region are rocked by poverty, income inequality and unemployment especially among the youths. According to the IMF (2013), CEMAC's business environment is one of the most difficult in Africa and this constraints investment in the private sector. The GDP of some countries in the sub region from 2010 to 2012 is presented in Figure 3.

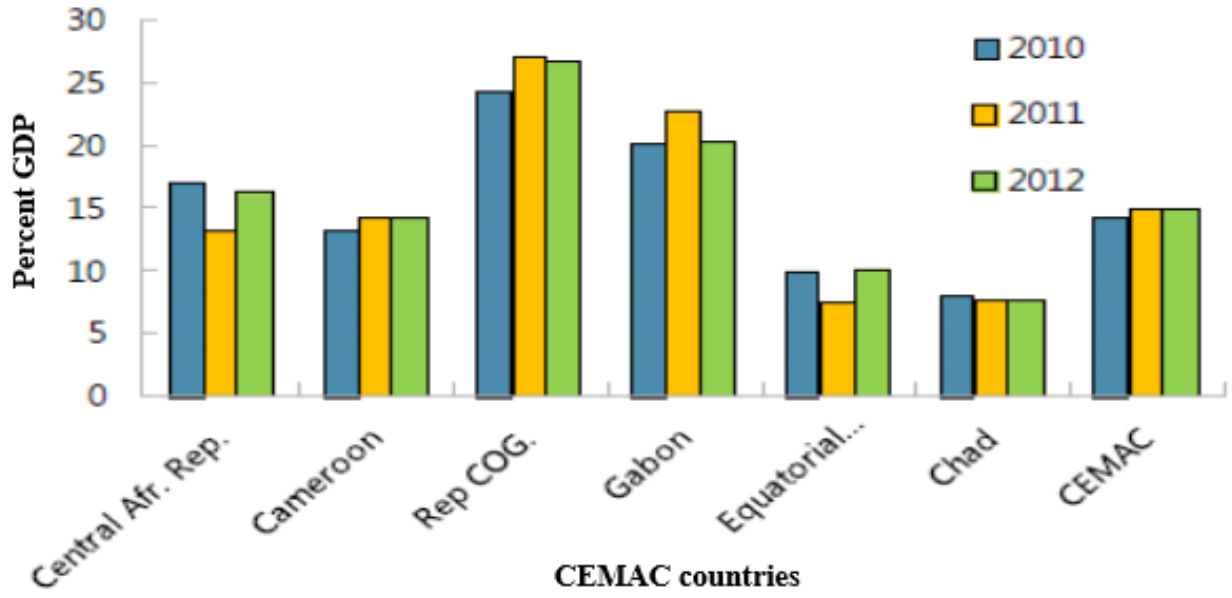

Figure 2: Non-oil revenue (percent of non-oil GDP) of CEMAC countries between 2010 and 2012 (Source: IMF, 2013).

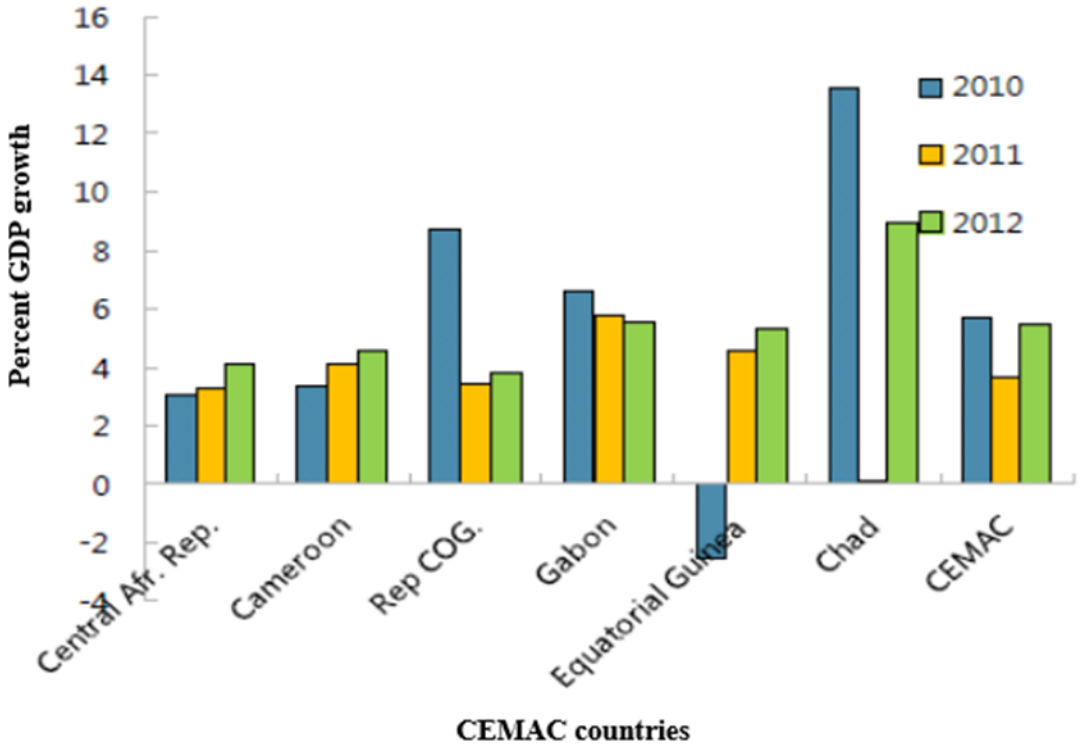

Figure 3: Real GDP growth (percent) of countries in the CEMAC sub region from 2010 to 2012 (Source: IMF, 2013).

The Central African sub region is a fragile zone and this negatively impacts on economic growth in the sub region. The political instability and insecurity from the onset of 2013 in CAR culminated in substantial economic disruptions which led to a sharp decline of the sub region's GDP in 2013 (IMF, 2013). Economic growth in CEMAC is expected to remain constant in the middle term at around 4.5% following the assumption that growth supportive policies that will spur private sector investment will be implemented on one hand while public investment programme that has been scaled-up will gradually taper off on the other hand. Speculated economic growth within CEMAC is associated with risks largely due to the overreliance of the sub-region on oil (IMF, 2013). The likely prolonged drop in the prices of oil and other commodities as a result of a slowdown in global growth constitutes the greatest risk for the Central African countries. Such decline in prices would significantly impact the fiscal and current account balances which would translate into a decline in public investment.

2.1.2 Land surface area and population

The land area of Central African countries ranges from 960 km^2 (Sao Tome and Principe) to 2,344,860 km^2 (DRC) while the 2015 population estimate ranges from 190,000 (Sao Tome and Principe) to 77,267,000 (DRC) as presented in Table 1. The annual population growth in the sub region ranges from 2% (CAR) to 3.3% (Chad).

Table 1: Land area, population estimates and annual population growth rate for some Central African countries

Country	area[1] (km^2)	Population estimates for 2015[2]	Annual population growth rate (%) for 2014[3]
Cameroon	475,440	23,344,000	2.5
CAR	622,980	4,900,000	2
Chad	1,284,000	14,037,000	3.3
DRC	2,344,860	77,267,000	3.2
Equatorial Guinea	28,050	845,000	2.9
Gabon	267,670	1,725,000	2.2
RoC	342,000	4,620,000	2.5
Sao Tome and Principe	960	190,000	2.1

2.1.3 Land use and ecotypes

The Central Africa sub region consists of several land use types including but not limited to: agricultural land, terrestrial protected areas, forest area and arable land. The area of the different land use types expressed in terms of percentage of the total surface area per country is presented in Table 2. The percentage of agricultural land ranges from 8.2% (CAR) to 50.7% (Sao Tome and Principe), forest area ranges from 3.9% (Chad) to 89.3% (Gabon), terrestrial protected area ranges from 0% (Sao Tome and Principe) to 35.2% (RoC) while arable land ranges from 1.3% (Gabon) to 13.1% (Cameroon).

[1] World Bank (2016a)
[2] World Bank (2016b)
[3] World Bank (2016c)

Table 2: Land use types of some Central African countries expressed as percentage of the total land area per country

Country	Agricultural land	Forest area	Terrestrial protected area	Arable land
Cameroon	20.6	38.9	10.9	13.1
CAR	8.2	35.6	18.1	2.9
Chad	39.7	3.9	17.8	3.9
DRC	11.6	67.3	12.1	3.1
Equatorial Guinea	10.1	55.9	25	4.3
Gabon	20	89.3	20.5	1.3
RoC	31.1	65.4	35.2	1.6
Sao Tome and Principe	50.7	55.8	0	9.1

Source: World Bank (2016).

At the heart of the Central African sub region is the CB forest which covers six Central African nations. This forest is highly rich in biodiversity resources and plays a vital role in the provision of food, fuel and fibre to forest dependent communities comprising of 150 ethnic groups (Megevand et al., 2013). Recently, the CB forest has witnessed large scale expansion of palm plantations for the production of biofuels (Rainforest Foundation, 2013) following a global increase in the demand of biofuel and a concomitant decrease in the surface are of palm plantations in Indonesia and Malaysia.

2.1.4 Climate change issues

The African continent represents the most vulnerable continent to climate change and climate variability as a result of the interaction of multiple stresses and low adaptive capacity (Boko et al., 2007). As predicted by experts, dry areas in the Central African region will become drier while wet areas will become wetter and increase in temperature will likely result in the proliferation of pests that will have negative impacts on staple crops in the sub region (IFAD, 2011). The Central Africa states are committed towards climate change mitigation issues. Under the leadership of ECCAS, Central African countries in 2007 adopted the “vision 2025” geared at making green economy a pivotal part of the economic development of the sub region (Yossa, 2013). The green economy concept was adopted by ECCAS as a tool and an approach envisaged to:

- conciliate socio-economic development and the management of natural resources of member states;
- support development of enterprises;
- create jobs; and
- ameliorate the living standards of the population, while also serving as a forum for operationalizing sustainable development in Central Africa in line with the outcome of the Rio+20 conference (ECCAS, 2014).

The countries of the CB with the exception of Equatorial Guinea are participating in REDD+ under the FCPF and a regional body-the Central Africa Forest Commission (COMIFAC) has the mandate for: steering REDD+ activities at the regional level and exploring opportunities for SFM and forest conservation with the prime objective to contribute to national development goals.

CHAPTER 3: METHODOLOGY

3.1 CONCEPTUAL FRAMEWORK OF 3FS WITHIN THE CONTEXT OF CLIMATE CHANGE

Forests play an important role in the mitigation of global climate change through the process of sequestering carbon dioxide from the atmosphere. The forests also serve as a source of food and fibre (non-timber forest products) to both rural and urban populations. Fuel is needed in the preparation of food and a significant proportion of the population of developing countries obtain fuelwood from the forest for heating. As the human population grows, more food is needed to feed the growing population and agriculture especially slash and burn in developing countries drives the clearance of forest which emit greenhouse gases (GHG) into the atmosphere and hence exacerbates the impacts of climate change and reduces the capacity of the forest to provide the 3Fs.

Global environmental concerns over the emission of GHG emanating from the burning of fossil fuels has resulted in an increased importance and recognition of the potential role of biofuels in the mitigation of global climate change (Koh and Ghazoul, 2008). There has been a recent expansion of plantations for the cultivation of biofuel crops to meet the increasing global biofuel demand. In the CB region, expansion of palm plantations has occurred or is to occur within the basin forest resulting in forest clearance (Rainforest Foundation, 2013). In some cases, the expansion of biofuel crop plantations occurs on arable land used in the cultivation of food crops and this is likely to have implications on food security.

3.2 DATA COLLECTION AND ANALYTICAL APPROACH

The study employed data from primary and secondary sources e.g. scientific literature, grey literature and policy documents in relation to the research objectives and research questions. Scientific literature, national strategy documents and reports from conservation organizations were the main sources of data that provided responses to the questions related to forest cover loss and factors driving forest cover loss in the Central African sub region. The assessment of the impacts of extractive industries on the 3Fs and climate change was based on information gathered from scientific literature, national strategy documents and reports from development organizations.

The assessment and analysis of biofuel policies was based on data collected in two phases. In the first phase, a thorough literature review of scientific literature, gray literature and analysis of national strategy documents was done. This review also permitted the identification of actors involved in biofuel related interventions in each country. The second

phase involved data collection through interviews with stakeholders involved in biofuel production and related policy processes. A total of 26 face to face interviews were carried out with resource persons in the three countries (government, non-governmental organizations (NGOs) Civil Society Organizations (CSO), private sector and research) (Table 3). A Likert scale was used to rate the responses of actors, ranging from 1 - meaning strongly agree - to 5 – don't know.

Simple descriptive statistics was used to evaluate the position of the actors in relation to the different stances linking biofuels to forest cover and biodiversity, food security, land use conflicts, environmental policy awareness and implementation etc. Furthermore, the level of satisfaction of actors in relation to the implementation of biofuel related policies were also evaluated on a scale of 1-5, with 1 representing very satisfied and 5 meaning don't know. Analyzing the stances of different actors is important because it gives insights into the direction in which the biofuel policy development process is likely to take. The assessment of wood fuel policies and strategies was based on information gathered from scientific and gray literature, national strategy documents and reports from conservation and development organizations.

Table 3: Number of resource persons interviewed per country

Country	Government (N=)	NGO/CSO (N=)	Private sector (N=)	Research (N=)	Total
Cameroon	1	5	2	1	9
DRC	4	5	0	0	9
RoC	3	5	0	0	8

3.3 SHORTCOMINGS IN THE DATA COLLECTION AND ANALYSIS

The research design was limited by the limited number of days allocated for contacting and collecting data from the countries. In light of this, not all actors identified during the literature review process were interviewed. Although, the data collected provides relevant insights into the perception of some key actors, the results did not take into consideration views of private sector and research institutions in DRC and RoC.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 TRENDS IN FOREST COVER CHANGE IN THE CONGO BASIN REGION

4.1.1 Regional and national statistics

4.1.1.1. Regional

Estimated changes in forest area cover prior to 2000 were uncertain. A number of studies have attempted to determine the changes in the cover of the CB forests. Ernst et al. (2013) conducted a regional study to determine forest cover change in the CB forest. From their studies, the net annual deforestation rate of the CB forest between 1990 and 2000 was estimated at 0.09% while the annual net degradation rate for the same period was estimated at 0.05%. Between 2000 and 2005, the annual net deforestation and degradation rate were estimated at 0.17% and 0.09% respectively which is almost twice compared to the rates obtained for the period of 1990 to 2000. At the country level, the net deforestation rate for Cameroon and Gabon slowed down, remained stable in CAR and increased in DRC and RoC between 2000 and 2005. Conversely, the net degradation rate for Cameroon, RoC and CAR remained stable while DRC witnessed a strong increase in net degradation after 2000. The forest cover change statistics for the entire CB Basin region and for the respective countries is presented in Table 4.

Table 4: National and Congo Basin annual net deforestation and forest degradation rate of the Congo Basin countries

Country	1990-2000		2000-2005	
	Net deforestation rate	Net degradation rate	Net deforestation rate	Net degradation rate
Cameroon	0.08%	0.06%	0.03%	0.07%
RoC	0.03%	0.03%	0.07%	0.03%
Gabon	0.05%	0.04	0.00%	-0.01%
Eq. Guinea	0.02%	0.03%	-	-
CAR	0.06%	0.03%	0.06%	0.03%
DRC	0.11%	0.06%	0.10%	0.12%
Congo Basin	0.09%	0.05%	0.17%	0.09%

Source: Ernst et al. (2013).

Zhang et al. (2005) concluded that the deforestation and forest degradation rate of the Central African forest stands at 0.42% and 0.12% respectively. Studies conducted by Duveiller et al. (2008) revealed that the annual gross deforestation rate for the Central Africa's forest between 1990 and 2000 is estimated at 0.21% while the gross annual degradation rate was estimated at 0.15%. Their results show that deforestation is most active in DRC followed by Cameroon and Equatorial Guinea as shown in Figure 4 while forest degradation is more severe in DRC followed by Gabon and then CAR as can be verified in Figure 5.

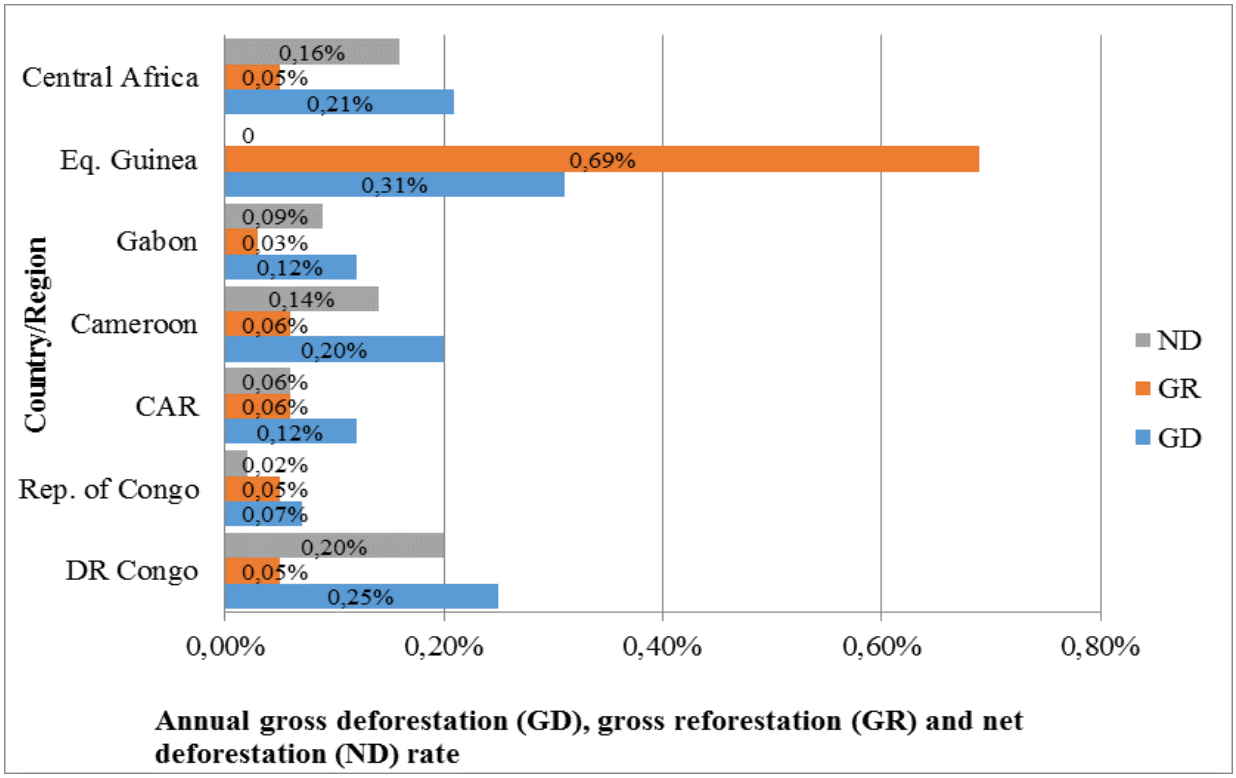

Figure 4: Annual gross deforestation, gross reforestation and net deforestation rate of the Central Africa forests between 1990 and 2000 (Source: adapted from Duveiller et al., 2008).

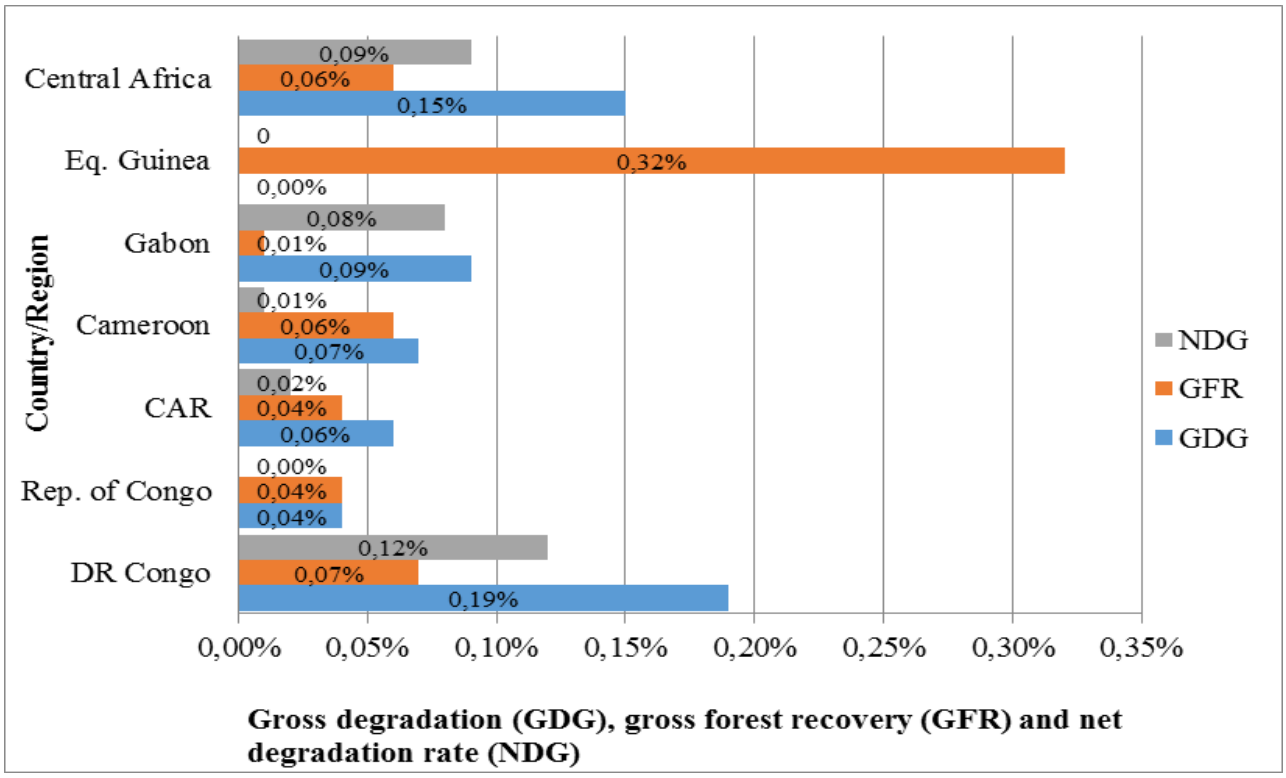

Figure 5: Annual gross degradation, gross forest recovery and net degradation rate of the Central Africa forests between 1990 and 2000 (Source: adapted from Duveiller et al., 2008)

4.1.1.2. National statistics

Using a 20-year series of high resolution satellite-based forest maps that depict forest cover, Kim et al. (2015) estimated forest cover change in 34 tropical countries including five CB countries from 1990 to 2010. From their study, deforestation rate in the humid tropics from 1990s to 2000s accelerated by 62% which contradicts a 25% reduction in deforestation rate within the same period as obtained by the Forest Resource Assessment (FRA) conducted by the Food and Agricultural Organization (FAO) of the United Nations (2010). Between 2000 to 2005, net loss of forest cover was at its peak while gross gains in forest cover accelerated slowly between 1990 to 2000, 2000 to 2005 and 2005 to 2010 (Kim et al., 2015). The estimate of the forest cover for five CB countries for 1990, 2000 and 2010 is presented in Table 5. Changes in forest cover recorded for the CB countries compared to that obtained in the FRA reports is presented in Table 6 while the loss and gain of forests by countries for the period 1990 to 2000, 2000 to 2005 and 2005 to 2010 is presented in Table 7.

Table 5: Estimate of forest area (10^6 ha) for five Congo Basin

Country	1990	2000	2010
Cameroon	20.32	20.21	19.88
RoC	23.88	23.66	23.43
DRC	153.23	152.2	147.93
Equatorial Guinea	2.59	2.56	2.54
Gabon	23.38	22.92	22.99

Source: adapted from Kim et al. (2015).

Table 6: Forest area changes (1000 ha/yr) from Landsat based estimates versus FRA report for 1990-2000 and 2000-2010 for five Congo Basin countries

	Kim et al. (2015)		FRA (FAO, 2010)	
Country	1990-2000	2000-2010	1990-2000	2000-2010
Cameroon	-11	-33.5	-220	-220
RoC	-22	-22.5	-17	-14.5
DRC	-104	-426.5	-311	-311
Equatorial Guinea	-3	-2	-12	-12
Gabon	-46	-7	0	0

Table 7: Forest loss and gain (1000 ha/year) for five Congo Basin countries for the period: 1990-2000, 2000-2005 and 2005-2010.

Country	1990-2000	1990-2000	2000-2005	2000-2005	2005-2010	2005-2010
	Loss	Gain	Loss	Gain	Loss	Gain
Cameroon	20.66	9.80	37.91	4.09	48.02	15.42
RoC	26.10	3.71	41.34	20.41	39.88	16.09

Country	1990-2000	1990-2000	2000-2005	2000-2005	2005-2010	2005-2010
	Loss	Gain	Loss	Gain	Loss	Gain
DRC	227.97	124.40	388.50	47.21	600.46	88.3
Eq. Guinea	3.10	0.45	2.29	2.30	5.37	1.11
Gabon	49.53	3.39	39.88	29.73	13.07	36.86

Source: adapted from Kim et al. (2015)

Estimates of forest cover change in the CB conducted by different studies have so far yielded different results. Arguably, the observed discrepancies in forest cover change estimates could likely be a result of authors employing different methods in arriving at the estimates (See Table 8). This argument concords with the opinion of Kim et al. (2015) that differences in the estimate of forest cover change by different authors for the same time period is accounted for by differences in the definition of forest and methodology employed in deriving the estimates. The authors highlighted the need for a consistent definition of forest and method to track changes in forest cover.

Table 8: Methods employed by different authors in estimating forest cover change in the Congo Basin

Authors	Methodology employed in estimating forest cover change
Kim et al. (2015)	5440 landsat scenes were employed in detecting changes in forest cover using probability thresholds
Ernst et al. (2013)	Object-based automatic method combined with validation of national experts
Duveiller et al. (2008)	Combination of a systemic regional sampling scheme based on high spatial resolution imagery with object based unsupervised classification techniques
Zhang et al. (2005)	Employed pairs of co-registered Landsat TM imagery from the 1980s to the 1990s

4.1.2 Drivers of deforestation and forest degradation in the Congo Basin

4.1.2.1. Current drivers of deforestation and forest degradation

While the direct drivers of tropical deforestation refer to human activities that directly drives forest cover loss, indirect or underlying drivers constitutes the basis for the direct causes of forest loss (Geist and Lambin, 2002). Based on the production of regional and national statistics on forest cover change in the CB forest, Ernst et al. (2013) identified the direct causes and drivers of deforestation as agricultural expansion, infrastructural development, timber extraction and fuelwood extraction as the direct drivers that influence forest cover changes while demographic pressure, political instability, governance practices and economic context all emerged as the indirect factors that drives deforestation and forest degradation.

According to Duveiller et al. (2008), the expansion of agricultural land, development of plantations, commercial logging, industrialization, mining, urbanization and road construction are factors that cause deforestation in tropical regions. A more recent study by Tegegne et al. (2016) on the drivers of forest loss in the CB identified subsistence agriculture predominantly slash and burn as a very important current driver of forest loss in Cameroon while cash crop farming and agro-industrial plantations were identified as deforestation drivers of medium and low importance in Cameroon and the RoC respectively. Hence, it is evident that the drivers of forest loss differ from one country to another depending on national circumstances.

For instance, the RoC is more of an annual food importer (Megevand et al., 2013) compared to Cameroon and this is likely why only 45% of the national experts interviewed in RoC by Tegegne et al. (2016) identified subsistence agriculture as an important driver of forest loss as opposed to 70% in Cameroon. Industrial and illegal logging were identified as very important current causes of forest degradation in the CB forests of Cameroon and RoC while 45% of national experts in both countries consider fuel wood extraction as an important driver of forest degradation. Infrastructural expansion and mining operations in forested areas in the CB forests of Cameroon and RoC were rated as drivers with low impact on deforestation and forest degradation. Enongene and Fobissie (2016) analysed REDD+ documents including Readiness Preparation Proposal (RPP), Emission Reduction Programme Idea Notes (ER-PINs) and REDD+ progress report of the CB countries so as to identify developmental sectors in these countries that drives forest cover change. Their findings revealed that agriculture, energy (fuel wood extraction), logging, mining and infrastructure/construction carried out by different actors: the state, smallholders, local populations and the private sector drives forest cover change as presented in Table 9.

Table 9: Drivers of forest cover change in Congo Basin countries

Forest loss drivers	Country	Impact on forest	Key Actor
Agriculture	Cameroon	-Deforestation	-Private sector -Small holder
	CAR	-Deforestation -Forest degradation	-Private sector -Small holder
	DRC	-Deforestation	-Private sector -Small holder
	RoC	-Deforestation	-Private sector -Small holder
Energy (fuel wood extraction)	Cameroon	-Forest degradation	-Local population
	CAR	-Deforestation -Forest degradation	-Local population
	DRC	-Forest degradation	-Local population
	RoC	-Forest degradation	-Local population
Logging	Cameroon	-Forest degradation	-Private sector -Small holder
	CAR	-Forest degradation	-Private sector -Small holder
	DRC	-Forest degradation	-Private sector -Small holder
	RoC	-Forest degradation	-Private sector -Small holder
Mining	Cameroon	-Deforestation -Forest degradation	-Private sector -Small holder
	CAR	-Deforestation -Forest degradation	-Private sector -Small holder
	DRC	-Deforestation -Forest degradation	-Private sector -Small holder
	RoC	-Deforestation	-Private sector

Forest loss drivers	Country	Impact on forest	Key Actor
		-Forest degradation	-Small holder
Infrastructure / construction	Cameroon	-Deforestation	-The state -Private sector
	CAR	-Deforestation	-The state -Private sector
	DRC	/	/
	RoC	-Deforestation	-The state -Private sector

Source: Enongene and Fobissie (2016)

4.1.2.2. Future drivers of deforestation and forest degradation in the Congo Basin

The expansion of mining operations and agro-industrial expansion in the CB forest region poses a future threat to the forest cover as it could culminate in drastic deforestation impacts in the years to come (Tegegne et al., 2016). The identification of agricultural expansion as a potential future driver of forest loss in the CB forest is not unexpected owing to the current and prospective potentials of the agricultural sector in promoting economic growth in the respective CB countries. For this reason, the governments of the respective CB countries are keen to develop their agricultural sector. According to the Rainforest Foundation (2013), there are plans underway to expand oil palm and biofuel plantations in RoC and Cameroon by an estimated area of 640,000 ha and 1,060,000 ha respectively. Hence, the likely future impact of agricultural expansion on deforestation in the CB is high.

Pertaining to mining, the CB forests host diverse mineral resources and based on the claims of Cohen (2014) on the rising demand and prices of minerals in the world market, it is expected that mineral exploitation will be intensified in forested areas in the coming years and this constitutes a future threat to forest cover. Infrastructural construction is also speculated to impact on the forest cover of the CB in the future. Other important future drivers to forest cover change include subsistence agriculture and logging. According to Tegegne et al. (2016), subsistence agriculture is likely to expand in Cameroon and RoC due to the interactive effect of: population growth and poverty; lack of access to agricultural inputs, absence of a national land use plan; and decline in oil revenue and potential rise of food prices. Also, national experts in Cameroon and RoC are of the opinion that population growth and lack of alternative energy sources is likely to result in increased demand of fuel wood in the future which will pose threat on the cover of the CB forests (Tegegne et al., 2016).

According to the Government of DRC (2014), agriculture aimed at augmenting food production, mining and infrastructural development are factors with potential of driving forest cover change in the future. Continued development of extensive livestock farming, increased slash and burn agriculture, increased unsustainable logging practices, mining, infrastructural development, investment in large scale plantations, underemployment and population growth are all potential future drivers of forest cover change in CAR (Government of Central Africa Republic, 2013).

4.2. IMPACTS OF EXTRACTIVE INDUSTRIES ON THE 3FS AND CLIMATE CHANGE

Activities of extractive industries have the likelihood to impact on food on a local scale and beyond. Some extractive industries use substances which could culminate in food security issues. Studies conducted by Hansen et al. (2016) in Greenland revealed that the local population obtained their meat from marine mammals, deer, birds and fish and the locals were concerned about the potential contamination of these wild animals as a result of the activities of extractive industries. Anecdotal evidence from a local in Cameroon attested that if they cannot feed on domestic food as a result of contamination, they will have to resort to imported food of poorer quality which could result in bad nutrition with health implications.

The locals highlighted health and diet as important issues to be taken into consideration when activities of extractive industries are implemented. Extractive activities like those of mining companies often lead to the contamination of water bodies from which local populations fish from. Under such a scenario, the fish obtained from water bodies would likely be unsafe for consumption and this would affect the nutrition of the concerned population. In the CB, over 75 million people from 150 ethnic groups rely on the forest to meet their health and nutritional needs (Megevand et al., 2013). As opined by Nasi et al. (2011), the annual consumption of bush meat in the CB was estimated at five million tonnes. This is supported by the claim of Abernethy et al. (2013) and Milner-Gulland and Bennett (2003) that the hunting of wild animals serves as an important source of food and income for many rural population in tropical forests worldwide. Hence, the contamination of these wildlife resources as a result of activities of extractive industries will affect the nutrition of the forest dependent communities of the CB forests.

Forest food supports household nutrition in many communities by complementing agricultural crops especially during periods of low or poor production, in times of climate induced vulnerability and when other cyclical events results in gaps in the availability of food (Nasi et al., 2011). The implementation of extractive activities in the CB forest have potential to alter the forest cover which will in turn reduce the capacity of the forest to provide food to forest dwellers since the forest's capacity to supply food will be affected. It could also be argued that extractive industries have potential of yielding positive impact on food security.

According to Weng et al. (2013), the establishment of mines for iron ore, nickel, coal and copper among others are associated with infrastructural development like roads and railways for the transportation of the mined products and the established infrastructure gives rise to growth corridors. These corridors determine settlement patterns, land use and penetrate areas where agricultural constraint was associated to the lack of market roads. Improved access and the presence of well payed workers in new settlements will create an enabling condition necessary for the intensification of agriculture (Laurence and Balmford, 2013). Mining constitutes a major driver of economic growth in Africa (Scott, 2009) and this growth supports the development of secondary industries in cities and results in new opportunities in manufacturing and services. The resulting urban population with better purchasing power will demand more and diverse agricultural products which would constitute a solution to the absence of domestic markets, a major constraint that plagues agriculture in Africa (Collier & Venables, 2007).

Extractive industries can present both a window of opportunity and an obstacle to the production of biofuel. Investment in high-volume minerals such as coal and iron often require good infrastructure and a well settled workforce (Weng et al., 2013). The lack of adequate infrastructure which is a determinant of accessibility is a major setback to agricultural production (Jayne et al., 2010). Hence, the presence of infrastructure and a readily available workforce will create an enabling condition for the large-scale cultivation of crops for biofuel production since the developed infrastructure by the extractive industry will also be used by the agro-industry.

Conversely, mining and other operations of extractive industries could compete with land for the growing of crops employed in biofuel production. Studies by Cuba et al. (2014) in Ghana and Peru revealed that high portions of land used for agriculture in both countries are located in areas where exploration activities are ongoing or permitted. It could be argued that under such a scenario, the extractive industry activities could reduce the surface area of potential land that could be employed in the cultivation of biofuel crops.

The extractive industry is a source of revenue to governments but is also a threat to the conservation of biodiversity. In the CB, mining for instance is known to be a driver of forest cover change as highlighted in the RPP of the Congo Basin REDD+ participating countries. According to Bele et al. (2015), the establishment and operation of mining companies is associated with the construction of roads, railways lines and power stations among others which often cut and fragment natural habitats. In Cameroon for instance, there has been an award of 28 mining and oil permits inside 12 protected areas over the last decade (Government of Cameroon, 2013). Industrial mining activities in DRC without adequate environmental and social safeguards puts the forests and biodiversity resources of this country in jeopardy as a result of the overlap of mineral resources and forests (USAID, 2011).

An oil drilling permit was attributed to the biologically diverse Virunga Park by the government of DRC (Coghlan, 2014) and this will likely negatively impact on the forest cover of the park.

Activities of extractive industries can be argued to contribute to global climate change. In the RPP of the participating REDD+ CB countries, logging carried out either by commercial agents or local population culminates in the degradation of the forest. Activities by mining companies in the CB often result in deforestation and forest degradation. Deforestation and forest degradation is known to account for up to 20% of global anthropogenic carbon dioxide emissions, more than the entire global transport sector (Van Paddenburg et al., 2012) and this contributes to climate change.

According to Weng et al. (2013), establishment of mining companies is associated with the construction of roads and railways. These roads and railway lines may not only cut across forested areas but may as well give rise to growth corridors which attracts the settlement of a viable work force. The developed infrastructure renders potential agricultural land which could not be cultivated due to lack of accessibility to be more available and coupled with a readily available workforce, a conducive condition is created for the establishment of large scale plantations and the practice of slash and burn agriculture by the locals which lead to the modification of the natural forest especially in Africa (Laurance et al., 2014) as depicted in Figure 6. Agriculture predominantly slash and burn is known as a major driver of deforestation in the CB countries. Hence, extractive industries could be said to drive deforestation indirectly since the infrastructural development associated with them makes accessible more areas for agriculture. According to Seyler et al. (2010), China had been negotiating deals with the government of DRC so as to have more access to DRC's copper and gold deposits. This expected expansion of mineral exploitation is likely to significantly affect DRC's forest cover which forms a major block of the CB forest and this could exacerbate global climate change (Samndong and Nhantumbo, 2015).

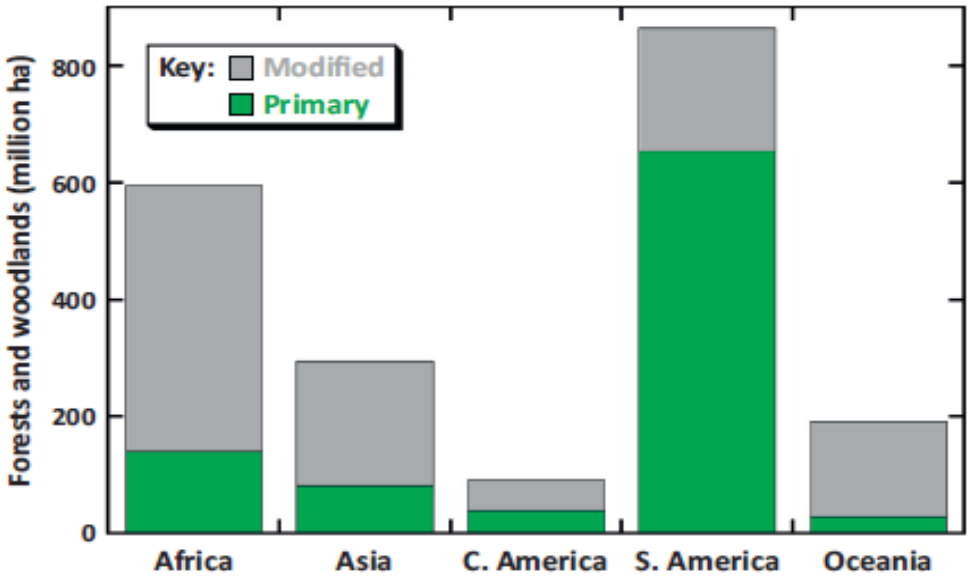

Figure 6: The decline (modification) of primary forest in different regions of the World. (Source: Laurance et al., 2014)

4.3. NEXUS OF FOOD, FUEL AND FIBRE

The finite nature of fossil fuels, concerns over energy security and the need for climate change mitigation has led to burgeoning interest in biofuel (Koh and Ghazoul, 2008). Biofuel represents fuels obtained from recently harvested biological materials (biomass). Biofuels can take the form of: wood and agricultural residues used for burning, alcohol obtained from plant materials (Gnansounou and Dauriat, 2005), methane derived from the process of anaerobic digestion (Gunaseelan, 1997), gasoline derived from the pyrolysis of biomass (Stevens and Wan, 1989), biodiesel derived from vegetable oils and animal fats (Ma and Hanna, 1999), diesel and other fuels obtained through the gasification of biomass followed by Fischer-Tropsch synthesis. Of the biofuels, alcohol derived from biomass especially ethanol, and biodiesel obtained from oil bearing crops receive most attention as liquid fuels employed in transportation (Granda et al., 2007).

The predominant biofuel crop in the CB is palm from which palm oil is obtained. According to the Rainforest Foundation (2013), confirmed and potential projects for the exploitation of palm oil in the CB (See Table 10) are over two-third (115 million ha) of the total surface area of the CB forest and possesses a climate and soil favourable for the cultivation of palm.

Table 10: Information of known projects on the expansion of palm oil production in the Congo Basin. (Source: Rainforest Foundation, 2013)

Country	Name of Company	Information	Total land area of historic and current commercial large scale oil palm plantation per country
Cameroon	Palm Co	100,000 ha of plantation envisaged	57,520
	Cameroon Development Cooperation	6,000 ha of plantation established in 2009	
	Smart Holdings	25,000 ha of plantation envisaged	
	Cargill	$390 million contract signed for an area of 50,000 ha	
	Good Hope	Envisage to obtain 6,000 ha	
	Biopalm Energy	Obtained 53,000 ha but envisaged to obtain at least 200,000 ha	
	Herakles Farm	Concession of 73,086 ha	
	Sime Derby	600,000 ha is envisaged	
Gabon	Olam	Ongoing 100,000 ha of plantation	7,300
	Société d'investissement pour l'agriculture Tropicale (SIAT)	Possess 6,000 ha in view of expansion of its exploitation	
RoC	Biocongo Global Trading	Concession of 60,000 ha of $150 million	4,000
	Fri-El Green	40,000 ha accorded for the production of biofuel	
	ENI	Memorandum of understanding signed for 70,000 ha	
	Atama Plantation	Concession of 470,000 ha	
	Aurantia	In 2007, the Spanish company Aurantia had the intention of establishing four plantations and a transformation factory for palm oil on millions of hectares geared	

Country	Name of Company	Information	Total land area of historic and current commercial large scale oil palm plantation per country
		at biofuel production	
CAR	Palmex	Concession of 8,701 ha	1,000
DRC	ZTE	Surface area of 100,000 ha	28,127

4.3.1. Biofuel versus food production

Biofuel is advocated by some as an environmentally friendly fuel with potential of reducing GHG emissions that drive global climate change. While this novel environmentally friendly fuel has potential of mitigating global climate change, concerns are raised over its potential impact on the production of other agricultural crops. The production of biofuel is argued to have a negative impact on food security (Ji and Long, 2016). The conversion of agricultural land and community forest into palm plantations cannot only have an enormous repercussion on the living conditions of local communities in the CB forest but as well destroys forest land rendering it incapable to furnish food, medicine and necessary construction materials to local populations (Rainforest Foundation, 2013). When the land left for subsistence agriculture becomes small due to expansion of biofuel crop plantations like palm, the food produced thereof will be insufficient to meet the needs of the local and indigenous communities. While biofuel production could actually increase the production of crops, the quantity of the produced crop directly consumed as food may not meet demand. This is particularly true for first generation biofuel crops which also serve as food to humans. Using the United States as an example, approximately 23% of the corn crop produced in the US was employed in the production of ethanol while only 10% was consumed directly as food or used as ingredients in processed food (Muller et al., 2011).

4.3.2. Biofuel versus land security

The cultivation of biofuel crops is often carried out by foreign companies who normally require large expanse of land. The legislation of most tropical countries does not recognize customary land rights of indigenous and local communities (Rainforest Foundation, 2013) and landed property without a land title is officially considered as state property. The procedure for obtaining a land title is complex, financially entailing and further exacerbated by bad governance and corruption which plagues Central African countries as well as other African states. Indigenous and local communities are unlikely to be financially viable to procure land title procedures and are left with no option than to hold on to their customary rights over land.

Under such a scenario, the state can easily attribute ancestral land as concessions to palm oil companies without seeking free, prior and informed consent (FPIC) of the concerned indigenous and/or local communities. In most cases, land allocated for palm plantations are customary lands over which communities had in the past enjoyed their customary land rights. The deprivation of communities of their customary rights as a result of the attribution of their customary and ancestral land as concessions for palm plantation culminates in conflict between the concerned communities and the palm oil producers. Where the law of the state demands for FPIC of communities prior to use of their customary lands, this law is often violated by the government and palm oil companies (Rainforest Foundation, 2013). In some cases, where the FPIC of the concerned community is sought, false information is made available to the community accompanied with fake promises so as to obtain their consent (Friends of the Earth, LifeMosaic and Sawit Watch**,** 2008).

Experience from Indonesia revealed that the rapid expansion of palm plantations culminated in different land conflicts characterized by manifestations, arrest of some members of the population, displacement of communities, torture and death (Rainforest Foundation, 2013). Indigenous and local forest communities in the CB rely on the forest for their livelihood and enjoy customary rights over their land. Hence, the expansion of palm plantations without appropriate social safeguards will likely place these communities in the same position like their Indonesian counterparts.

4.3.3. Biofuel versus biodiversity habitat

The establishment of large scale plantations for the cultivation of biofuel crops often occurs at the expense of the natural forests. According to Eisner et al. (2016), global loss in biodiversity is principally caused by the expansion of agriculture. The link between the establishment of palm plantations and deforestation is evident in Malaysia and Indonesia (Clay, 2004). The establishment of palm plantations in Malaysia and Indonesia from 1900 to 2005 resulted to the destruction of 1.1 million and 1.7 million ha of forests respectively. In the course of this 15-year period, 50 to 60% of the expansion of palm plantations led to the destruction of the natural forest (Koh and Wilcove, 2008) of which most of the destruction was illegal. This destruction of the natural forests results in the loss of biodiversity resources and the extinction of species in cases where their habitats are lost or modified.

In Indonesia for instance, the production of palm oil resulted to the destruction of the habitat of two species: Orangutan and Tiger which both are at the verge of extinction. When producers of palm oil target an area of primary forest, they have the intention of getting access to the precious timber therein and after this is exploited, the land is abandoned without the planting of palm trees (Rainforest Foundation, 2013). In cases where palm trees are planted on degraded or non-forested land, it is likely to have indirect damage on neighbouring forests. This is true for palm plantations established on land used for

subsistence agriculture by local populations. The local populations will likely clear down forests in their environs in order to replace their agricultural land lost to the palm oil producers (Rainforest Foundation, 2013). Also, the establishment of palm plantations is accompanied by an influx of a work force to work in the plantations. This work force can also augment small scale illegal exploitation of wood, hunting of wildlife and the expansion of agricultural fields all of which will negatively impact on the forest and the biodiversity resources therein.

The majority of the expansion of palm plantations in the CB occurred in or around forest land. The Atama Plantation in the RoC signed a concession contract which entails 470,000 ha of land majority of which is composed of forest land in the north of Congo. In Cameroon, the concession attributed to HERAKLES Farm is in close proximity to several important wildlife sanctuaries and protected zones (Rainforest Foundation, 2013). It is therefore likely that these plantations will impact on the rich biodiversity and forest cover in close proximity to them. Constraints to oil supply in the future is likely to result in the intensification of agriculture with varying impacts on biodiversity (Eisner et al., 2016). The impact of biofuel on biodiversity includes effects on ecosystem diversity, species diversity and genetic diversity (Ji and Long, 2016) and the impact of biofuel on the biodiversity of an area differs at multiple scales (Liu et al., 2014).

4.3.4. Major drivers of biofuel crop (palm oil) expansion in the Congo basin

The global demand for palm oil has significantly increased over the past few years and has gained significant proportion of the market as compared to other vegetable oils. This expansion is due to increase in consumption in the countries (China, India and other emerging Asian countries) where palm oil is used extensively as a cooking oil. Presently, global demand surpasses supply, a trend that is likely to continue into the foreseeable future making it particularly attractive for investors. Furthermore, increasing regulations, preventing the clearing of forests, land scarcity, and the hopes raised by the emerging REDD+ mechanism in major producing countries of Malaysia and Indonesia is encouraging Asian companies to diversify their production areas targeting the CB (Hoyle and Levang 2012). At the regional level, the CB is targeted for the following reasons:

- Good physical conditions;
- Availability of cheap land;
- Increasing importance of the agriculture sector to the economic development of the countries of the region; and
- Closeness of the region to the EU and North America market where palm oil is used principally for manufacturing goods.

4.4. INSTITUTIONAL ARRANGEMENTS FOR DEVELOPMENT OF BIOFUELS

4.4.1 Policy and institutional context

In the countries of the CB, biofuel production and commercialization appears to be an emerging issue. There is no coherent policy or national strategy on biofuel production and consumption. Information from documents and expert interviews revealed that many CB countries are still at the level of making deliberations on developing policies related to biofuel production and consumption. There is no clear policy vision on the scale of biofuel production, domestic consumption and export ratio, process of transformation and blending. At the moment there is growing expansion of biofuel crops in the CB region, especially palm oil. However, it is still not clear whether the expansion is for domestic consumption as cooking oil, or for biofuel production. Furthermore, there is limited information available on the investments related to biofuel crops and biofuel production in general. In the different countries visited, some experts expressed the feeling that they are not being involved in the preliminary discussions on biofuel policy development. These experts argue that biofuel is a multi-sectoral and multi-actors issue which requires a broad participation of all relevant actors e.g. actors from relevant ministries, international multilateral and bilateral organisations, international and local NGOs.

The three countries visited have different ministries leading the biofuel policy development process, depending on the general government policy framework, which at times are ambiguous. For example, in the DRC, the process is steered by the Ministry of Hydrocarbons, RoC by the Ministry of Agriculture and Livestock, and in Cameroon by the Ministry of Energy and Water. Most of the experts interviewed agreed that countries of the region have inadequate technical and financial capacity to elaborate and implement a comprehensive biofuel policy. It was stressed that technical support is imperative for the countries in the region. Discussions and actions which are still at an early stage should consider taking into account policy components that fully capture the environmental, social and economic, institutional aspects of biofuel production. Box 1 presents policy components which can guide the different countries in the CB region when developing and implementing an explicit national biofuel policy and strategy.

Box 1: Important elements when crafting a comprehensive biofuel development policy

1. Policies and strategies to address environmental issues: Policies should be formulated to ensure that the production and consumption of biofuels adhere to the environmental best practices.

2. Policies to protect the rights of communities with informal land rights: To avoid land conflicts between large scale land investors and communities, land laws need to protect local communities with insecure land rights based on customary tenure. The land allocation process for biofuel crops should be transparent, involve all stakeholders, provide just and adequate compensation.

3. Policies to ensure food security and rural development: An approach is to address food security concerns directly through targeted safety nets, investment in infrastructure, crop-breeding research and other opportunities that increase the efficiency of food production and lower costs.

4. Government support and incentives: Government support is important to make the agriculture sector competitive; which is critical to the cost of producing biofuel crops and the industry in general. Policy support may include investments in research and extension, maintenance of an enabling macroeconomic environment and a favourable fiscal policy and business climate for the private sector.

5. Policies should consider and support smallholder involvements.

6. Multisector institutional arrangement and policy coherence: To develop a policy that will respond to institutional complexity, it is important to identify and appoint lead institutions and mandate them with the power to coordinate different government agencies and formulate the national policy. A committee or a team is also required to guide the work of various ministries and agencies. Other stakeholders such as the private sector, NGOs should be consulted and represented in the team.

7. Mobilisation of external partners and support for capacity building, financial support and technology transfer.

Source: (Mitchell, 2011)

3.4.2 Expert stances on biofuel crop production in the policy process

3.4.2.1 Biofuels – agriculture sector and food security

There are serious concerns that biofuel crop production will threaten food security. However, many experts from the CB strongly agree that the agriculture sector of the countries in the CB has potential to provide for biofuel production and food (Figure 7). However, there are no clear strategies that provide guidelines in ensuring this balance between biofuel crop production and food security. It was noted that adjustments need to be made with care. For example, placing too much limitation on biofuel crop production is a solution; however this solution has serious equity concerns because they might limit employment opportunities, wages and income of farmers in rural poor areas.

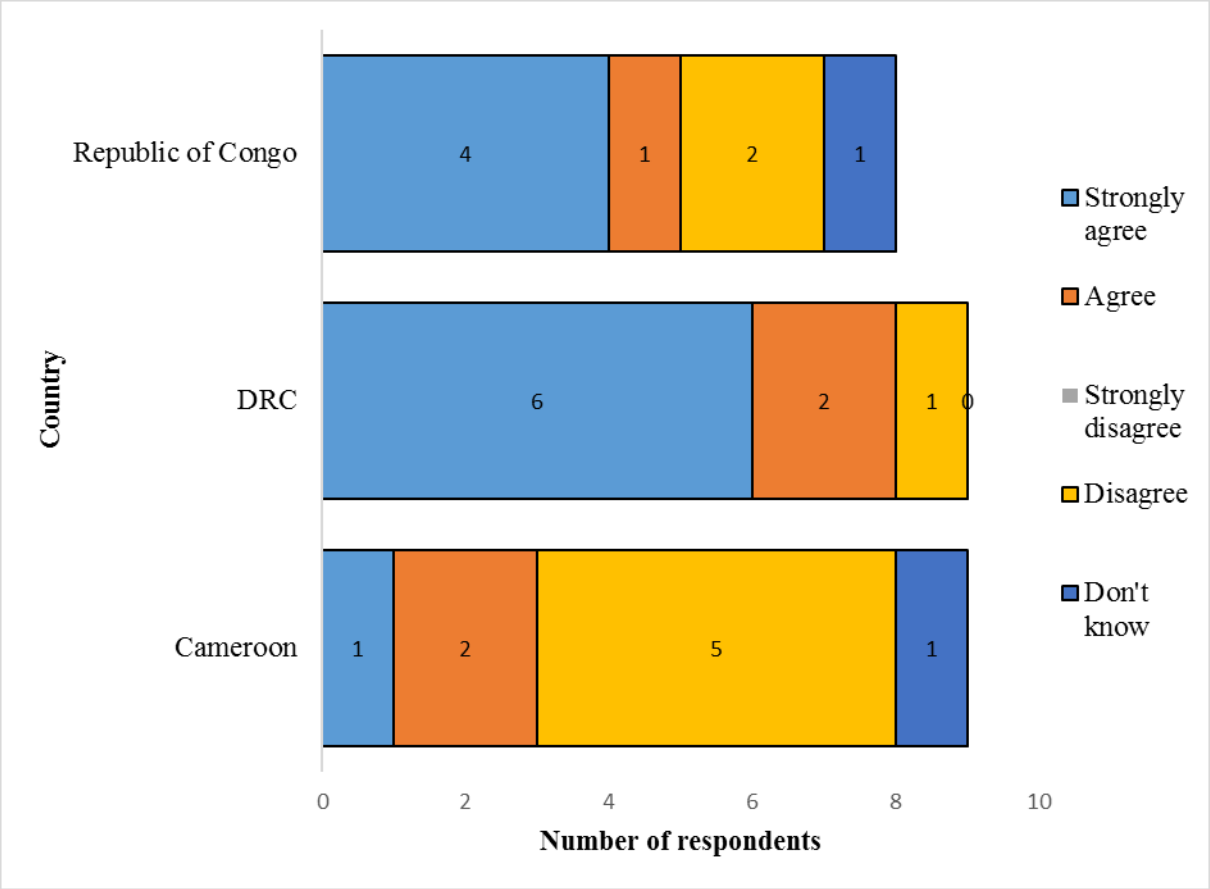

Figure 7: Perception of respondents on agriculture meeting biofuel demand without compromising food security

4.4.2.2 Biofuels and land security and conflicts

Respondents strongly agreed that biofuel crop production will drive land use conflicts between companies and local communities and indigenous peoples, who depend on customary land rights (Figure 8). However, respondents stressed that conflicts can be avoided. Experience in the different countries indicates that land tenure arrangements are unclear, and the land allocation processes are frequently not transparent. This creates opportunities for companies to manipulate and marginalised local communities.

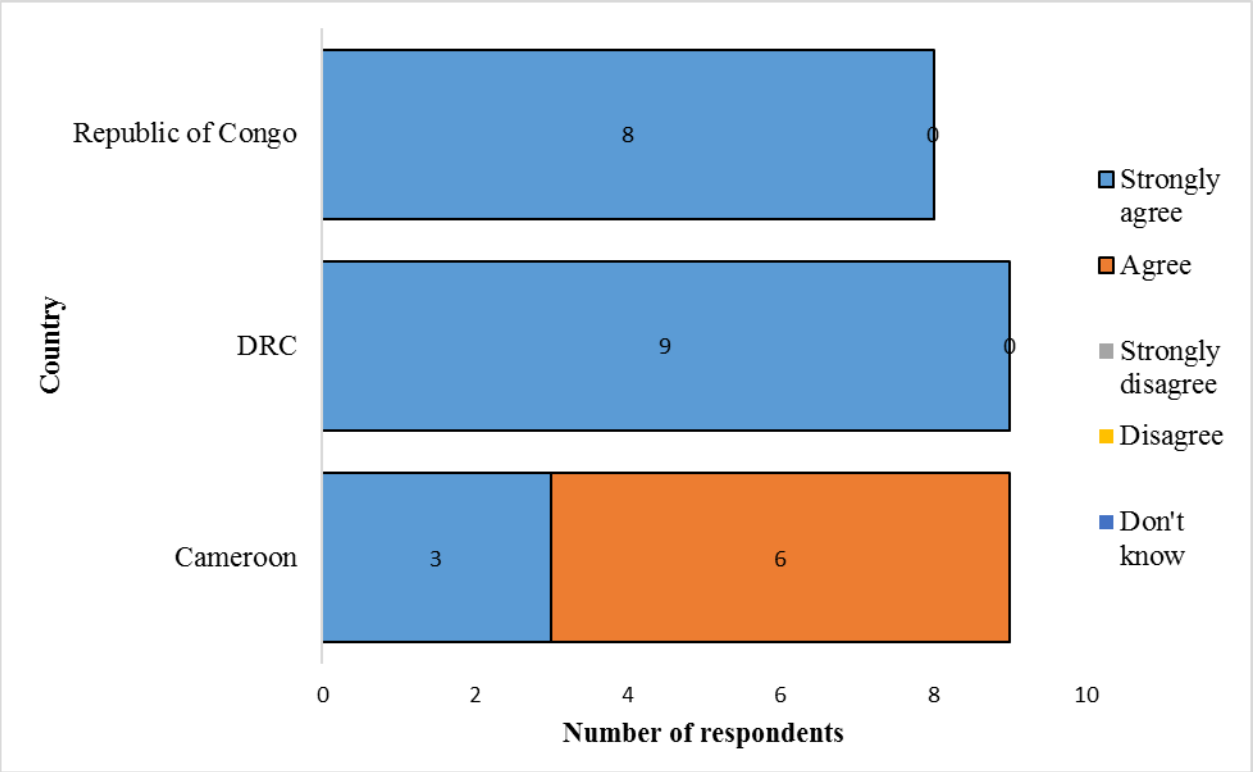

Figure 8: Respondents perception on the likelihood of increase biofuel crop demand resulting in land use conflicts and marginalization of communities with informal land rights

4.4.2.3. Environmental impacts of biofuels

Despite the growing concerns about the impacts of biofuel crop production on the environment, there is consensus that biofuel crops can be produced with limited impacts on the environment, biodiversity and ecosystem services for example. Respondents agreed that biofuel crop production in central Africa is a big threat to forest cover (Figure 9). It was noted that impacts on forests ecosystems can be avoided by practising integrated land use

planning methods. Others argued that theoretically integrated land use management is plausible, but appears very challenging in practice especially on a large scale.

Ongoing oil palm expansion initiatives in Cameroon, the RoC and the DRC are being carried out amidst strong criticisms on their environmental integrity. This situation has been attributed to the weakness of existing environmental protection policies. These countries have national strategies to guide companies to reduce environmental impacts. These strategies are implemented with mixed results. Many actors are not satisfied with the procedures and the implementation of these environmental policies (Figure 10). The implementation process is characterised by weak governance - corruption, inadequate accountability and transparency, weak enforcement, and lack of technical and financial capacity. For example in the RoC, it was mentioned that due to some unclear reasons e.g. cost, technical capacity and time, government related projects are not subjected to strict environmental scrutiny in terms of carrying out environmental impact assessments.

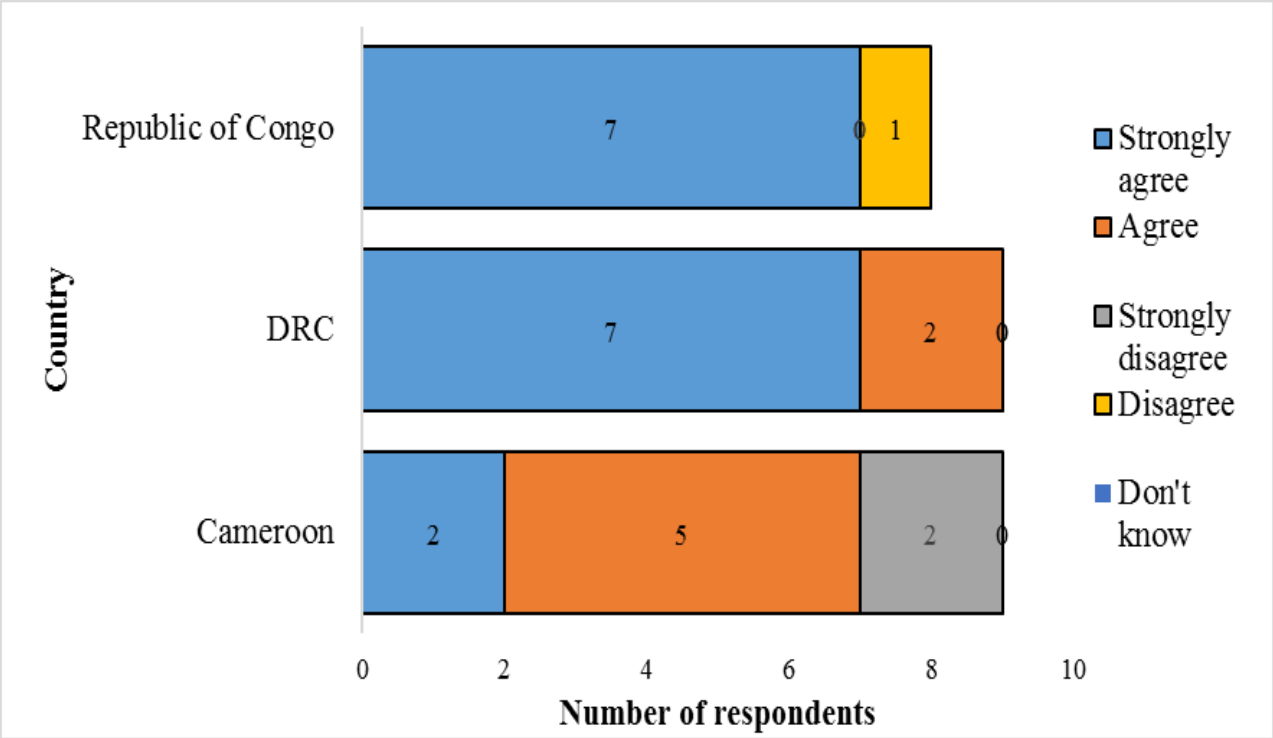

Figure 9: Respondents perception on the likelihood of large scale agriculture expansion for food or biofuel culminating in impacts on forest cover and biodiversity

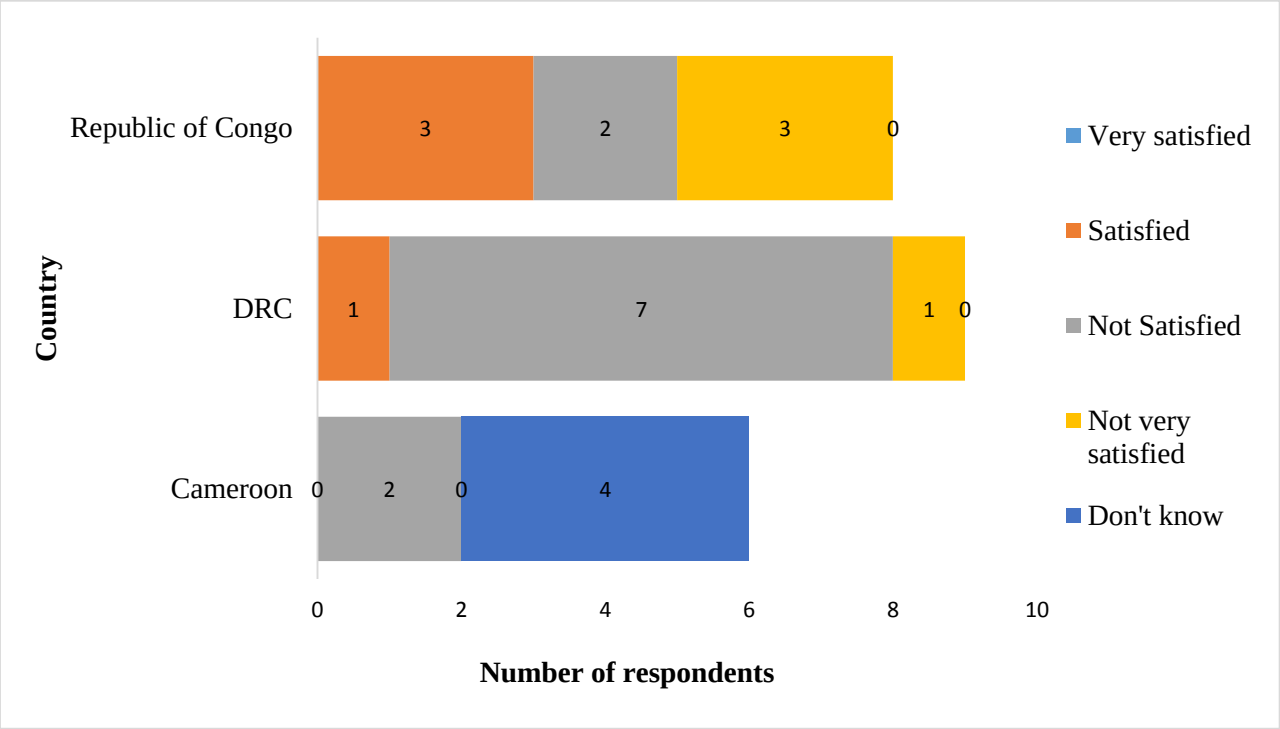

Figure 10: Respondents satisfaction pertaining to the implementation of a national policy for the management of environmental impacts associated with agricultural expansion for food or biofuel

Most of the respondents agreed that it is possible to reconcile biofuel crop production with forest and biodiversity conservation for climate change mitigation (Figure 11). In the DRC for example, it was mentioned that old abandoned plantations can be revived in order to avoid expansion of plantations into forest areas. Furthermore, it was stressed that degraded lands can be well exploited for the establishment of new plantations. At the moment, none of the countries have a strategy that encourages agriculture investments in degraded lands. It was stressed that agriculture investments in degraded lands may be expensive financially and technologically.

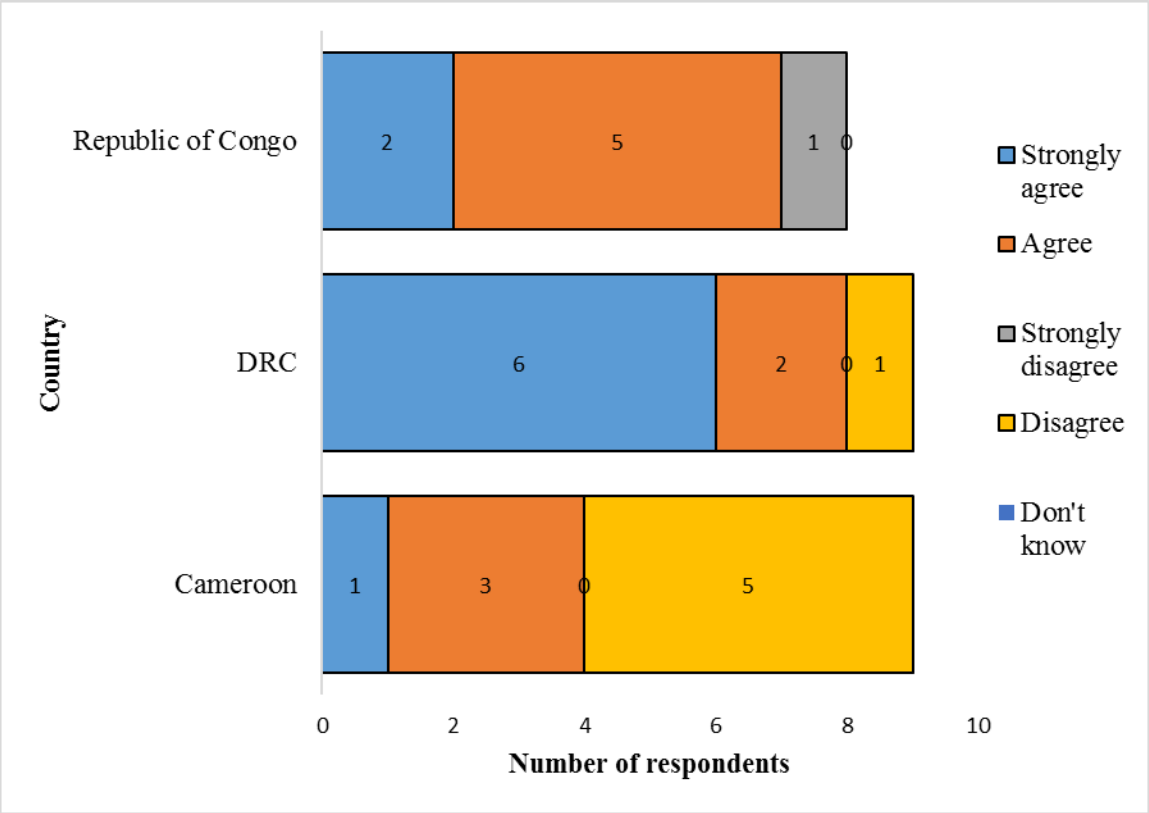

Figure 11: Respondents perception on the possibility of reconciling biofuel crop production with forest and biodiversity conservation for climate change mitigation

4.4.3. Making biofuel crop production sustainable in the Congo basin region

According to experts on the ground, if carefully planned, the development of biofuel crops can contribute to economic development and poverty reduction in the region. Otherwise, plantation expansion for biofuel may lead to loss in high conservation value areas and negative impacts on the livelihoods of local communities and indigenous peoples. There should be efforts to reduce the negative impacts of the expansion and to increase the positive impacts. In this context, actors argue that all relevant stakeholders e.g. government ministries, international and local NGOs, companies and local communities need to organise and develop a national strategy that can lead the rapid growth of the biofuel crop plantations and can ensure that expanded production contributes to the sustainable development agenda of the region.

The region can borrow positive experiences from leading producing countries. Proposals for a strategy include:

- Revitalize abandoned/existing plantations to increase productivity and yields. For example, provide inputs and improved harvesting techniques;
- Expansion of biofuel crop production in degraded lands in order to reduce impacts on biodiversity and carbon emissions;
- Provide incentives and motivation to companies to encourage investments in degraded lands e.g. fiscal policy, research etc;
- Expansion of future plantations should be obliged to adopt and implement guidelines of existing standards such as Roundtable on Sustainable Palm Oil (RSPO);
- Sufficient attention should be made on reviewing the existing tenure arrangements in order to protect and secure local land rights; and
- The rights and responsibilities of local and indigenous communities should be respected.

4.5 STRATEGIES FOR DEVELOPMENT OF VIABLE WOOD ENERGY SECTOR

4.5.1. Social and economic importance of wood energy in the Congo Basin

Woodfuel consumption constitutes the major source of household energy in developing countries (Rahut et al., 2016). In Sub-Saharan Africa, an estimated 81% of households rely on woodfuel daily for cooking (Africa Renewable Energy Access Programme, 2011). Fuelwood is the main form of fuel used in rural areas while charcoal is widely used by urban households as a smokeless fuel with high heat content. There exists a variation in the quantity of fuelwood produced and consumed in the different CB countries. In 2009, the production of fuelwood in the CB ranged from 190,000 m^3 (Equatorial Guinea) to 75,446,000 m^3 (DRC) (Schure et al., 2010) as presented in Figure 12.

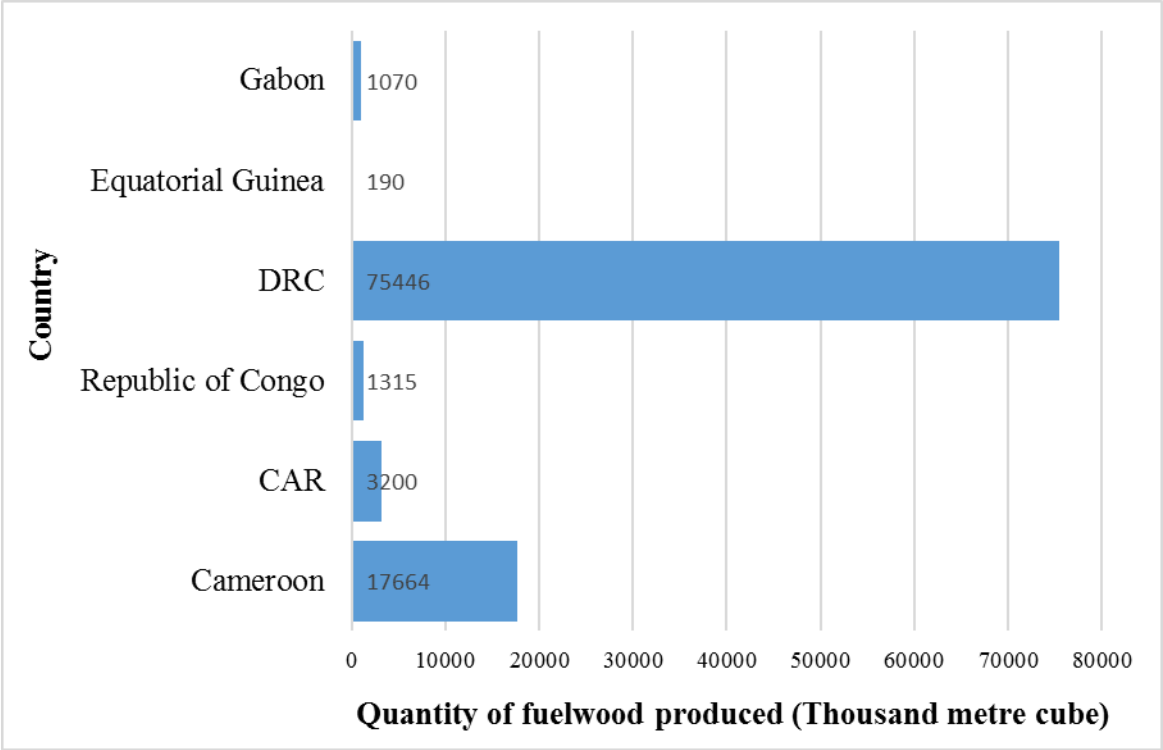

Figure 12: Woodfuel production in the Congo Basin countries (Source: Schure et al., 2010)

Charcoal and fuelwood are often among first forest products mentioned that provide revenue to the poor. Studies conducted by Schure (2012) on the economic importance of the wood fuel sector to the livelihood of producers in the vicinity of Kinshasa, DRC revealed that fuel wood and charcoal profit stands at United States Dollar (USD) 288/year and USD 405/year respectively both of which represents a considerable part (47% and 75% respectively) of the income of average households. The poorest households are known to produce less than half the amount of charcoal produced by the richest income group household, but no significant difference exists between household income groups for fuelwood. This could likely be due to the fact that both household groups have the same capacity to exploit fuel wood from the forest, but the poor income household group may lack sufficient financial capacity to transform the wood to charcoal. Revenue obtained from wood fuel plays an important role in: the mitigation of poverty since the obtained revenue is used for accessing basic needs including but not limited to healthcare, food and education; and the reduction of poverty through the provision of capital that could be invested in other economic activities (Schure et al., 2014) and consequently, ensure livelihood diversification for 91% of charcoal producers and 72% of fuelwood producers. However, overexploitation of fuel wood impacts negatively on the forest and this puts the livelihood of many individuals at risk. This livelihood activity is particularly threatened since the cost of charcoal does not take into account the associated environmental costs (Chidumayo & Gumbo, 2013).

The charcoal value chain is more complex and economic gains differ among the actors along the value chain. The value chain of charcoal prescribed by Schure et al. (2013) is presented in Figure 13. The actors involved in the value chain includes: producers, traders, transporters and vendors. Ribot (1993) studied the charcoal sector of Senegal and argued that the sector's problems and solutions are in most cases focused on urban woodfuel supply and commercialization since the threat posed to rural households is recognized to be minimal. These urban oriented policies tend to favour urban traders and wholesalers who end up making substantial profits meanwhile producers and villagers gain only a small proportion of the end price (Ribot, 1998).

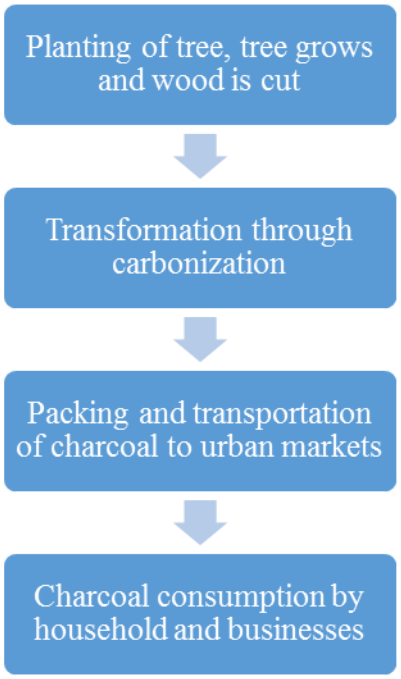

Figure 13: Value chain of charcoal (Source: Schure et al., 2013)

The role of the fuelwood sector in providing employment is often not reflected in national statistics since the production and trade mostly occur in the informal sector. However, over 350,000 people in Central Africa are estimated to be involved along the fuelwood and charcoal chains (Schure et al., 2013). In the 1970s, an estimated 800 to 1200 people mainly women in Brazaville were retailers and profits earned by these women after paying for transport, labour and wood cost was small meanwhile the few individuals involved in wholesale and transport made considerable higher profits. Studies conducted by Atyi et al. (2016) revealed that the fuelwood and charcoal sector of Cameroon provides an estimated 90,000 full-time jobs and contributes to food security since over 80% of households in the country rely on charcoal and wood fuel for cooking. Unequal distribution of benefits in the sector occurs among rural households as a result of varying distances to the market and uneven investment capital and cost associated to the access of the resources. In DRC, the large demand of charcoal in Kinshasa provides important income opportunities for 290,000,

900 and 21,000 people involved in the production, transportation and sales of charcoal respectively (Schure et al., 2013). The largest number of people that benefit from cash generating opportunities in the wood fuel sector are found at the level of production since over 80% of producers are able to sell their charcoal themselves at the urban market and end up achieving 60 to 70% of the final market price.

4.5.2. Woodfuel governance in the Congo Basin

In the wood energy sector, governance makes reference to the policy, regulatory, legal and institutional framework that governs the value chain and it concerns the processes through which decisions in the sector are shaped and implemented. The concept of good governance is associated with stakeholder participation, accountability of decision-makers and actors, transparency in decision making and the rule of law and predictability (Mundhenk, 2015). Governance is as well considered to be satisfactory when it ensures the sustainable management of human, financial and natural resources and a fair and impartial distribution of resources and benefits.

4.5.2.1 Forest tenure and management rights

In the CB, activities in the forestry sector are often regulated by the forestry laws of the respective countries. In Cameroon for instance, forest tenure is governed by the 1994 Forestry Law which divides the nation's forests into: permanent forest estates which include state forest and council forest with the state forest further classified into protected zones and forest reserves; and non-permanent forest which may be allocated to uses other than forestry and comprises of state forests, community forests and privately-owned forests. Private forests are those planted by natural persons (individuals) or legal entities on their land property acquired in accordance with the law and regulations in force. Community forests are those handed over to one or more communities by the state and the community or communities take charge for the management of the transferred forest. However, only the state transfers only the forest and not the land itself. State forests represent all unallocated non-permanent forest and the resources therein belong to the state. In DRC, the Forestry Code divides forests into: classified forest estate, protected forest estate and permanent production forests. The classified forest estate is further classified into natural reserves, national parks and other protected areas.

Pertaining to access, any natural or legal person with intentions of exploiting forest products of any kind in Cameroon for profit making must obtain a production permit (Okenye and Nguenang, 2012). Customary right or the right of use is however granted to forest dependent communities and these rights permit them to harvest all forest products for their personal use except protected species. Such communities have the right to harvest firewood for their personal use but in reality, an informal and illegal trade of fuelwood and

charcoal is being carried out by these communities (Okenye and Nguenang, 2012). DRC's Forest Code grants access to forest resources to: customary use right holders, concessions contractors, local communities that make an application for concession, persons with obtained permits for clearing the forest for a particular activity like agriculture, and to communities and persons that carry out agriculture (Lilakako and Duchochois, 2015). A summary of policies and rules related to the woodfuel sector of the three Congo Basin countries is presented in Table 11.

Table 11: Policies and rules applicable to the woodfuel sector of three Congo Basin countries

Country	Policies and rules applicable to woodfuel sector
Cameroon	-1994 Forestry Law. Non-commercial use of wood fuel falls under users right (Schure et al., 2013) while commercial use is controlled by the 1995 Decree on modalities for forest regime implementation including two permit types: 1) for special forestry product exploitation including charcoal; and 2) exploitation of fuelwood. -Role of wood fuel hardly discussed in the national energy strategy.
RoC	-Wood fuel permit system applied for transport and retailing. -National reforestation plan promotes wood fuel plantations development. -Lack of strategy for wood fuel substitutes (Schure et al., 2012).
DRC	-Regulations for the management of fuelwood exploitation exists in the forest and land codes. Legal strategies for the management of fuelwood production includes; public plantations, private plantations, permits for felling and carbonization, reforesting agricultural lands and community forestry (Schure et al., 2013). -Woodfuel plays no role in the national energy policy.

In Cameroon, a permit is required for commercial exploitation of all forest products including wood energy. The application for a permit is normally received by an inter-ministerial committee and following a favourable decision by this committee, the permit is signed by the Prime Minister's office with prior approval by the Presidency of the Republic (Okenye and Nguenang, 2012). An annual permit can be obtained and for firewood, it is issued by the Minister of Forest. Exploitation of all forest resources is subjected to two taxes: regular taxes applicable to all economic operators and taxes specific to special products. Any legal or natural person (individual) in Cameroon can commercially harvest wood energy but prior to this, a forest exploitation authorization and production permit for special product must be obtained. The production permit specifies the exploitable species, production area and authorized quotas. In DRC, forest exploitation permits embody firewood logging and carbonization permits issued by the administration of the territory within the jurisdiction of the forest and this annual permit gives all Congolese who are members of a local

community in rural areas the right to extract firewood in the local community forests or to carbonise the wood for commercial purpose (Lilakako and Duchochois, 2015). There exist commercial and local taxes related to the wood energy sector of DRC as well.

4.5.2.2 Actors involved in the wood energy value chain

Diverse actors are involved in the management and control of the value chain of wood energy and in its exploitation, conversion and marketing. Table 12 presents the actors involved in the wood energy sector of Cameroon and DRC.

Table 12: Actors involved in the wood energy value chain in Cameroon and DRC

Country	Actors involved	
	Management and control of value chain	**Exploitation, conversion and marketing of wood energy**
Cameroon	-Ministry of Forestry and Wildlife -Ministry of Environment, Protection of Nature and Sustainable Development -Ministry of Water and Energy -Ministry of Finance -Decentralised authorities -Traditional authorities -NGOs and other development partners -Strategic support units -Regional level dialogue platforms	-Producers (loggers) -Charcoal producers -Collectors -Wholesale traders -Transporters -Retail traders
DRC	-Ministry of Environment, Nature Conservation and Tourism and its Directorate of Forest Management -Ministry of Energy and its Directorate of new and renewable energy -Provincial governments relevant administrative services -Customary authorities -NGOs -Research and training institutes	-Producers -Transporters -Merchants -Consumers

Source: Mundhenk, 2015

4.5.2.3 Offences and sanctions related to illegal exploitation of wood energy

The Forest Code of DRC prescribes the sanctions imposed on offenders who have committed offences related to wood harvesting. The quantity of fuelwood generated is over 10 times greater than the quantity for which permits were allocated (Lilakako and Duchochois, 2015) implying that a lot of illegal activities exists in the wood fuel sector of DRC. The country's regulation pertaining to forestry control and seizure of illegal products are poorly enforced and outdated. In Cameroon, offences related to the exploitation of wood energy include:

- exploitation without a permit;
- logging of protected tree species;
- transportation of products without waybill;
- exploitation outside defined harvesting area;
- exploitation beyond granted quota;
- non-payment of taxes; and
- logging of green wood in the Sahelian part of the country (Okenye and Nguenang, 2012).

Sworn officials are charged with the responsibility of detecting, establishing and prosecuting forest related offences in Cameroon. In case of illegal exploitation, the forest products are confiscated by the forestry officer in charge of control and auctioned. The proceeds from the auction are deposited into the state treasury.

4.5.3. Challenges of the woodfuel sector

Wood fuel generates revenue for both urban and rural households but the lack of internalizing the environmental costs of charcoal production leads to resource depletion which puts at risk the livelihood of many individuals. A key challenge in the management of activities in the fuelwood/charcoal sector lies in understanding the activities of the sector considering that production occurs in the informal sector (Schure et al., 2013). The informal system is associated with many vested interests along the chain and low motivation or limited incentives for change (Schure et al., 2013) and formalization occurs only when the pressure on the resource is acute enough that government intervention is required.

Informal operations in the wood fuel sector are associated with bribes (Ingram et al., 2012) and under circumstances of high commercial pressure, customary laws may become less effective in the mitigation of negative environmental impacts or social equity (Laird et al., 2010). In this case, formal institutions can play an important role in ensuring desirable outcomes. However, this sector is further posed with the challenge in that the formalization

of the sector's activities can culminate in detrimental and undesirable outcomes when newly formulated regulations criminalise extraction practices, foster corruption, marginalize harvesters and disregard customary law (Laird et al., 2010). For instance, Ribot (1995) presented a scenario of an undesirable outcome in Senegal where forest policies did facilitate the access to resources by powerful traders which resulted to an unequal distribution of benefits between urban charcoal traders and rural charcoal producers. The use of a charcoal permit system as well has its own drawbacks for wood fuel management (Schure et al., 2013). Such permits needs to be accessed by rural producers who are in most cases located long distances from urban areas and this distance problem together with the involved procedures and costs all emerge as obstacles for the functioning of such systems. The lack of transparency and large discrepancies between receipts of revenues from permits and taxes represents another challenging issue faced by the wood fuel sector (Schure et al., 2013).

Clear tendencies exist in the Central African region to formalize institutions governing charcoal chains. Formal policies and rules applicable to the charcoal sector are mainly embedded in forest policies of different CB countries and hardly in any other sectorial policies. Formal policies and rules applicable to the wood fuel sector of CB countries are presented in Table 11. Albeit these existing legal options (Table 11) in the region, large gaps exists with respect to the implementation of wood fuel policies. These according to Laird et al. (2010), reflect general problems associated with the governance of forest products including; poorly coordinated laws, ineffective implementation and little consultation with the actors along the chain. The poor enforcement and implementation of rules in the sub region could be explained by the presence of weak institutions and low levels of human and financial resources (Schure et al., 2013).

4.5.4. Intervention to make charcoal and wood fuel extraction more sustainable

There is need for the formulation and implementation of effective strategies in the Central African sub region geared towards ensuring sustainability in the charcoal/fuelwood sector so as to guarantee the livelihood of actors involved within the sector's chain. The wood fuel sector in Central Africa is interlinked with agriculture and rural activities and as a consequence, strategies aimed at sustainable management of wood fuel should integrate different components and provide incentives for local populations (Schure et al., 2010). As opined by Schure (2012), strategies geared towards the management of charcoal can target the different aspects of the value chain such as plantations, agroforestry, trade control and improved energy efficiency at the level of both producers and consumers.

4.5.4.1 Promotion of agroforestry

Trees play a vital role in agricultural systems and the recognition of this role is important. Large expanse of land which were initially savannas or forested land that is currently

deforested is being used for large scale subsistence farming. This often culminates in increased soil erosion, acceleration of soil nutrient depletion and a decrease in productivity. The reintroduction of trees under such circumstances plays a pivotal role in ensuring long term improvement of the system (Schure et al., 2010). These trees will also serve as a source of wood fuel among other variety of goods and services.

The effective management of slash and burn agriculture and forest fallow ecosystems can support the sustainability of the wood fuel sector. The traditional slash and burn agriculture over a long time entailed crop rotation (for 2 to 3 years) and a long period (10 to 20 years) of forest fallow. Due to increase demand of food, wood fuel and an increase in population growth, fallow period has been shortened and this results to land and environmental degradation (Schure et al., 2010). The use of assisted natural regeneration techniques can promote the growth of existing forest tree species which subsequently will serve as a source of woodfuel.

4.5.4.2 Plantations

As a result of increasing demand of woodfuel, the surrounding zones of protected areas often emerge as sources of unrestrained charcoal production. A way to get around this would be to develop a woodfuel source in deforested or degraded zones (Schure et al., 2010). Such plantations could be composed of both timber and fruit in order to increase their value and consequently the effectiveness of their management. The establishment of energy plantations in the CB will guarantee the sustainable supply of wood fuel while also supporting REDD+ initiatives and a green economy transition (Enongene and Fobissie, 2016).

4.5.4.3 Improving effectiveness of production and consumption

The use of wood waste can go a long way to ensure sustainability in the wood fuel sector. In the course of trees being felled, a significant amount of biomass is left on the ground in natural forests (Schure et al., 2010). A significant amount of biomass also ends up on the forest floor in the course of creation of forest routes to ease accessibility and harvesting of timber. This abandoned biomass alongside saw mill residues could be transformed into wood fuel and sold.

The improvement in energy efficiency represents a strategic option as far as sustainability in the wood fuel sector is concerned. Viable alternatives to wood fuel are not readily available in the CB region and this makes improvement in energy efficiency within the near future absolutely necessary (Schure et al., 2010). This entails improving the conversion of timber to charcoal through:

- selection of timber species that yield high-energy returns;

- the provision of efficient technologies to consumers (improved stoves) and to producers of coal; and
- improvement of transport, storage and market capacities.

4.5.4.4 Formalisation of the woodfuel/charcoal sector

The establishment of formal institutions is often recognized as the path to be pursued for the sustainable management of charcoal production (Schure et al., 2013). The establishment of such formal institutions and policies should be accompanied with appropriate strategies to mitigate their undesirable outcomes of which an example could be the restriction of charcoal producers to access the wood resources and markets. Like other forest products, access and control over wood resources are often controlled by customary rules and practices. Hence for this formal institutions and policies to effectively address issues around the sustainability of fuelwood, it must take into consideration these customary rules and practices. Furthermore, the devolution of responsibilities of wood fuel management to local levels, the monitoring of wood fuel trade, the reinvestment of taxes emanating from fuelwood in social and environmental projects, and the provision of incentives for sustainably produced charcoal can provide an enabling condition for the formalization and creation of more sustainable value chains that has potentials of providing positive livelihood benefits to concerned individuals (Schure et al., 2013).

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1. CONCLUSION

The forest of the CB is highly rich in biodiversity and mineral resources of economic importance. In recent times, the forest has witnessed the expansion of extractive industries which impacts on food security both negatively and positively. On the negative side, the expansion of extractive industries often occurs at the expense of the natural forests and this tend to limit the forests' capacity to provide non-timber forest products (NTFPs) to forest dependent communities. Also, wildlife (bush meat) resources which serve as a source of protein to local and indigenous communities can be contaminated as a result of the activities of extractive industries and this will render these resources unsafe for human consumption.

Conversely, extractive industries can positively impact food security in that the mining of minerals is associated with the construction of roads and railway lines for the transportation of the mined products and these infrastructures give rise to growth corridors. These corridors render areas where agricultural activities were constrained by lack of market road to become accessible. Extractive industries present both a window of opportunity and an obstacle to the production of biofuel. Pertaining to the opportunities, the growth corridor resulting from the establishment of an extractive industry creates an enabling environment for the settlement of a good work force that can provide labour for the development of biofuel crop plantations. On the other hand, extractive industries may compete for land with biofuel crop plantations. Expansion of extractive industries often occurs at the expense of the natural forest resulting to the loss of biodiversity, deforestation and forest degradation which drive global climate change.

Biofuel is known for its climate change mitigation potential. However, its production negatively affects food production through the use of arable land for food crop production for growing biofuel crops. This culminates in biodiversity loss which occurs from the clearance of forest land to setup biofuel crop plantations and causes land expropriation from local and indigenous communities who hold customary rights to land. Biofuel appears an emerging issue in the CB and there is the absence of national policy strategy in each country that regulates the production and consumption of biofuels. However, CB countries are looking forward to developing such policies. The development of such policies should involve the participation of all relevant stakeholders since the biofuel sector is concerned with diverse stakeholders and actors. The development of a biofuel policy in Cameroon, DRC and RoC is led by different government ministries and there is the lack of technical and financial capacity for the elaboration and implementation of a comprehensive biofuel

policy. It is the opinion of experts that the agricultural sector of the CB countries has potentials to provide for both food and biofuel production and that the production of biofuel crops can occur simultaneously with the conservation of forest and biodiversity.

The use of fuelwood and charcoal results to social and economic benefits to the population of the CB. Income generated from the wood fuel sector makes a significant contribution towards poverty mitigation since the obtained revenue is employed in procuring basic needs including but not limited to healthcare, food and education. A key challenge in the management of the fuelwood/charcoal sector lies in the fact that its production occurs in the informal sector.

4.2. RECOMMENDATIONS

This study puts forth the following recommendations:

i. **Elaboration of biofuel policies through a participatory approach**

Biofuel is a multi-sector and multi-actor issue. As CB countries are currently reflecting towards the development of policies geared towards regulating the consumption and production of biofuels, it is important for these policies to be developed in a participatory manner that takes into consideration the views of the different stakeholders. In this way, the developed policies will be more holistic in regulating biofuel activities.

ii. Appropriate inter-ministerial coordination

Increase institutional coordination and collaboration between government ministries of CB countries with particular respect to those in charge of the issuance of agro-industry concessions, issuance of mining permits, management of forest resources, and the protection of the environment will reduce institutional conflicting goals which will go a long way to ensure that activities of agro-industries and mining companies occur with minimal harm on the forest and other components of the environment.

iii. Formalisation of the charcoal/fuelwood subsector

Formalisation of the fuelwood subsector through the setting up of appropriate institutions and policies that takes into consideration the customary rights of local and indigenous communities over forests will enable the activities within the sector's value chain to be sustainable.

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