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Production and commercialization of timber in Angola (History, present state and perspectives)

MSc. Thesis

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Declaration

I declare truly that this thesis is my own work and quoted only according to the references listed within. Moreover, it supported with material of my bachelor thesis on forest resources in Angola. I also declare that contributions of others are involved, especially under the guidance of doc. Ing. Miroslav Hájek, Ph.D.

Prague, 2015.

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Vasco Valério Chassusso Chiteculo

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Abstract (English)

Historical information of what went well or wrong with forest sector in Angola has been less reviewed. The production and commercialization of timber in the country have high impact northern part of the country where it constitutes one of the major components for the international trade. Logging companies operating in Angola do not undertake any forest inventory before timber exploitation. By using a combination of literature review and questionnaire survey undertook with sawmills operating in Bié Province, this study intended to investigate the historical production of timber before and after independence of Angola as well as describing the actual situation to find out the way forward. The Logit regression model (**1**) in SPSS was applied to test the variable influencing the decision of sawmills to sell timber. The outcome of this thesis was a comparative analysis of the production of timber before and post-independence of Angola. It also gives the overview of the actual situation of forest in the Province of Bié. The main commercial timber species accessed in Bié Province were *Brachystegia sp., Grossweilerodendron balsamiferum, Terminalia superb* and *Ceiba pentane.* The vast majority of timber harvested by private sawmills are sold as log and the price of timber is always based on speculation in the market.

Key words: Timber production, timber production in Angola, timber price, timber exploration, wood industry.

Czech

Historické informace o tom, jak fungovalo lesní hospodářství v Angole jsou méně přezkoumáné. Výroba a prodej dřeva v Angole, má vyznamený Impact na severní části země, kde tvoří jeden z hlavních komponent pro mezinárodní obchod. Dřevorubeckých společností Které působí v Angole neprovádějí žádné inventarizace lesů před těžbou. Pomocí kombinace literární rešerše a dotazníkového šetření provedeny s pil působící v provincii Bié, této studie byl určené prozkoumat historické produkce dřeva před a po nezávislosti Angoly, stejně jako popisuje aktuální situaci lesní hospodářství. Regresní model Logit (1) v SPSS byl použity pro testování proměnné ovlivňující rozhodnutí pil prodat dřeva. Výsledkem této práce byla srovnávací analýza produkce dřeva před a po nezávislosti Angoly. To také dává přehled o skutečné situaci lesa v provincii Bié. Hlavní tržní dřeviny v provincii Bié byly Brachystegia sp., Grossweilerodendron balsamiferum, Terminalia vynikající a Ceiba pentan. Drtivá většina dřeva sklizené soukromými pil jsou prodávány jako ''logs'' a ta cena dřeva je vždy založena na spekulacích trhu.

Klíčová slova: produkce dřeva, těžba dřeva v Angole, cena dřevo, dřevo průzkum, dřevozpracující průmysl.

Abbreviations

IDF- Intituto do Desenvolvimento Florestal

MINADER- Ministerio da Agricultura e Desenvolvimento Rural

DNRN – Direccao National dos Recursos humanos

GDP- Gross Domestic Product

HDI – Human Development Index

DRC- Democratic Republic of Congo

OECD- Organization for Economic Co-operation and Development

SPSS- Statistical Program in Social Science

CCPA- Companhia de cellulose e papel de Angola

NWFP- non wood forest products

RQ- Research question

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1.   CHAPTER ONE: INTRODUCTION

Timber production is being considered the most economic form of land use in tropical forest. Even with poor management practices they have a vital role to play in conservation strategies. Forest has been at the centre of the debate on environmental protection. The precise role of commercial exploitation of forest products is controversial (Peck, 2001) and the challenges today is to bridge the current gap between conservation requirements and commercial interests on timber, indicating the possibilities for integrated management of tropical forests (Johns, 1997).

Forests today have multifunction output, some of which are not sold in the market, like for example other plant products, grazing, beauty, open space and hunting (Klemperer, 1996). Forestry needs long production period and in the middle of everything it comes with a lot of uncertainties. This long time horizons and uncertainty occur with ventures like education, flood control or even certain speculative investments.

In Angola, data on forestry resources is almost inexistent and obsolete, constrained by the 27 years of civil war (FAO, 2008). However, there is a widely help perception in the country that forest has been destroyed, but information on what exactly is happening, on where and how fast it is happening is unknown. Historical information of what went well or wrong with forest sector has been less reviewed. The production and commercialization of timber in the country do not have high impact in southern part of the country while in the northern part it is one of the major components in the international trade.

The Institute for Forest Development is fully responsible for the data management and its capacity to run this component of data collection, analysis and dissemination is very low due to lack of specialized expertise and limited financial resources.

1.1 Problem statement

Production of timber in Angola had long tradition when the Portugal settlers were in the country. After the independence of the country in 1975 the all forest sector stopped, no production no commercialization. Today the exploitation of timber is being done by many Portuguese's and Chinese's companies in regime of licenses. However, very few producer have their own planted forest, they all rely on natural forest or on the plantations established before the independence of Angola.

Sustainable management of the forest resources in Angola needs update and reliable data on social, economic and environmental benefits of forests. The existing information is obsolete and does not reflect the reality on the ground. National forest inventory is about to be concluded its first phase and them the existing data will no longer be considered as simple speculation. The Institute of Forest Development is incapable to respond to the growing need of information in the country. The sector needs to be supported materially and financially in order to form a strong human capital to dill with the actual trend.

Another problem linked to the commercialization of timber is certification; the timber from Angola cannot be sold in international market due to certification (mainly in European countries) therefore, the way out is China who do not care much on certified timber. However, the all situation on timber production and commercialization is less researched and matter of thousand questions. Therefore, this thesis aims to investigate the historical production of timber before independence of Angola and describe the actual situation to find out the way forward. The problem of harvesting without any management plan still prevails in the country. The excessive consumption of fuelwood and charcoal in urban areas drive to forest degradation and even valuable commercial species like *Chlophora excelsi, Acacia welwitshii, Pterocarpus angolensis, Dalbergis sp.*, are being cut for firewood or transformed into charcoal (FAO, 2008).

1.2 Rationale of the study

The forest resources are considered a natural capital available at low-cost investment that can generate economic, social and environmental benefits to the state and people through its exploitation. The study intended to assess and valuate the main forest species with high economic value.

1.2.1 Weaknesses and threats

The knowledge of the state concerning historical forestry resources is not sufficient to provide better management plan on what, where and when to cut trees. Logging companies operating in the country do not undertake any forest inventory before timber exploitation. The weakness and threats are summarized under following points:

- The lack of proper information about what went wrong with forestry resources in past decades is costing not only money but also time. Historical information on forest are not been updated are old over 30 years. Old figures (maps, tables) are being used to describe the same situation over and over (forest cover reported as 53 million hectares and in other document reported as 23 million hectares);

- The purpose of this study is to review the historical production of timber in Angola, concentrating mainly on timber production and commercialization in central part of Angola (Bié Province). The data about forestry in Angola are almost inexistent (FAO 2008). For this reason, it has been difficult to realize studies in this area. Therefore, this work will contribute in enriching the information of forestry in Angola by bringing good ideas, like what and how to invert the precarious situation involving the governor to realize that spending money in the forestry sector is not a cost but rather an investment.

1.2.2 Strengths and Opportunities

The forest sector in Angola has a lot of opportunities which can be transformed into strengths. The commercialization of some valuable economic species is one of the most. The strengths and opportunities can be summarized into following:

- The extent of reconstruction in Angola has taken large proportion and timber is need therefore, IDF as responsible for the Forestry in Angola has been called to supply timber for reconstruction purposes of many projects within de country;

- Within the dynamic of the nation rebuilding, the forest sector is called to bring solutions to the numerous problems of the sector. Therefore, assistance from outside is highly needed especially in areas where the country lacks the capacity;

- The forest sector is acting to strengthen its capacity at national and provincial levels to promote sustainable production of timber and conservation of forests and wildlife resources;

- Timber pricing system has to be developed to promote good market competitiveness and avoid market speculation.

1.3 Limitation of study

This study is limited to one selected Provinces out of 18 Provinces. The availability and accessibility of information on forestry in Angola was a major obstacle to achieve to objectives, therefore, the results of this study cannot be generalized. The sample size of sawmills operating in the study area was not so much representative; therefore the analysis of the results was more suitable for qualitative analysis rather than quantitative.

2. OJBECTIVES AND KEY RESEARCH QUESTIONS

The main objective of this thesis is to describe the history of forestry and the actual situation of timber production in Angola specifically in Bié Province. Describing the types of management applied in order to produce enough timber to sustain the actual demand.

Specific objectives:

> ➢ Analyze the history of timber production in Angola and its import and export

> ➢ Describe the types of timber with higher economic value

> ➢ Formulate basic recommendation to improve the actual state of timber exploration

The research framed the fallowing questions to achieve the objectives above:

RQ1: What was the top production of timber before 1975 and what was the management plan applied to achieve high production?

RQ2: What is the pricing system for timber trade in Angola?

3. CHAPTER TWO - LITERATURE REVIEW

3.1 Theoretical background on timber commerce

Timber is the major market based forest product and a primary reason for managing forest (Sills and Abt, 2003). In modern society, economic actors enter into voluntary agreements. They not only govern the exchanges between them and their obligations (Brodrechtova, 2015), but must also be beneficial to both parties, this is called commerce. From an economic viewpoint the contract partner functions with explicit contracts (by law), or implicit contracts (without formal arrangement in case of Angola), because of benefit expectations (Harris and Veljanovski, 1986; Pejovich, 1990).

A timber sale or trade is the last phase of many years of forest management. For many woodland owners, it is the most significant opportunity for return of their forest investments. However, a successful timber sale demands lots of preparation. A forest owner need to invest the time, to research markets, ensure proper access to the harvest area, interview logging operators, seek buyers, promote his products and develop viable contracts (Bowers and Punches, 2007).

It is important to mention that the decision of forest owner to sell timber is linked to "purposeful behavior" which does not assume that they are immune from faulty logic which makes them perfect decision makers (McConnell, 2012). However, they sometimes make mistakes. Moreover, it does not mean that people's decisions are impervious by emotion or the decisions of others around them. "Purposeful behavior" simply means that people make decisions with some desired outcome in mind.

In order to maximize potential revenue from a timber sale, it necessary that forest owner perform the following steps:

➢ **Step1**. Clarify goal and objective: By ranking goals, forest owner can determine what is most important to him;

➢ **Stet 2**. Understand the market: this include general market conditions and trends, define it will sell timber or logs, market condition for selected species and market timing;

➢ **Step 3**. Knowing what you have: most small forest owners sell only domestic logs—and too often miss opportunities to sell potentially higher

valued logs simply because they did not realize they had trees that could be sold by higher prices;

> **Step 4**. Develop a marketing strategy: this means stumpage sales and logs sales;

> **Step 5**. Lay out the areas: determining timber sale boundaries, mark the timber;

> **Step 6**. Promote the product: identifying the product being sold and develop contact with potential buyers;

> **Step 7**: Pricing systems

3.1.1 Timber value

Finding of value of forests is vitally important, because forested proprieties are often valued not for current harvest but as investments to compute taxes on property values, or to determine collateral on loans.

Timber price and timber value have a direct relationship because the price of timber heavily depend on the value of timber vice-versa. Based on the same issues, the timber values are used for timber tax purposes when timber income is realized and when the property is eventually sold (Fountains America Company, 2014).

Timber valuation is a necessary when valuing a large forested property the so called forest land appraisal, as timber is usually the major price driver of the total value. A timber valuation is specifically critical if the timber is to be sold for a single fixed price. However, buyers and sellers of stumpage for instance need to agree on sale prices. The emphasis is on immediate cutting.

Buyer's maximum willingness to pay for stumpage= (end product price) – (cost of manufacturing and distribution) – (cost of logging and hauling logs)

Moreover, suggestions are made that the value of timber prices varies because of forest growth in different environment and with different characteristics. Therefore, it may indicate that the quality of timber today is not the quality of timber tomorrow and this can be one of the reasons of variability's on prices of timber.

According to Fountains (2014), to determine the value of timber requires not only the careful and scientifically conducted measurements of trees, but also the analysis of timber markets, and knowing how value will be recognized in the measured timber.

3.1.2 Timber pricing, and the economics of timber

Before defining the concepts of timber pricing of a certain country, it is important to consider and understand that price of timber heavily depend on biological productivity of the forest. It depends on economic environment and the considerable values that an individual in the society can offer (willingness to pay).

The availability of timber price reports has been limited. The limited availability of these reports has been a cause of uncertainty among nonindustrial private forest landowners by knowing whether they are receiving fair market value for their standing timber. What is really a fair price for timber (Catanzaro, 2001)? Is a far price an amount that a landowner that you would accept to sell the trees? Is a fair price simply a price that a landowner and buyer have negotiated? Or is it what the trees are worth in an open market? In reality, there is fair price; it is all in base of agreements.

One problem with timber price reports is that the units used may differ depending on the source of the data. Historically, most standing timber has been valued for purchase using dollars per thousand board feet (dollars per MBF). However, delivered logs to the mill are valued in dollars per ton. This can create confusion in translating standing timber prices to delivered log prices. Care should be taken to ensure that the proper units are being applied when valuing timber in order to perform the timber price indices (FC quality report, 2014).

3.1.2.1 Factors That Affect Timber Prices

The actual amount of money received from a sale may depend on many variables: weather, access and distance to a mill, individual tree characteristics and other factors. Weather can play a significant role in timber prices for a specific time period. For example, timberland capable of being harvested during wet periods will typically have higher values during wet seasons. Individual tree characteristics such as species, size and quality can have great impact on price (Cunningham and Barry, 1914).

Apart of that, there are other important factors to consider like as: biophysical, social, and economics. *Biophysical factors* are related with biotic and biotic components.

According to Williams (1994), the productivity capacity of the forest is determined by a number of operational and biophysical variables, these variables are named as Fraction of Absorbed Photo-synthetically Active Radiation (FAPAR), Leaf Area Index (LAI), Chlorophyll content (Chl), and Vegetation Phenology (VP). In another site, the *social factors; they ar*e based on how humans valuate the various resources that forest offers to them, how much of those resources human wish to consume, how versus that human must leave for future generations – this is called sustainability (Williams, 1994). The social factor of humans is based on forest policy or from public policy.

The factors related to *economic factors* are the one that affect the timber harvesting process through timber product prices. The considerable concepts above the line prevail, because the above factors are considering as the key issues to determine the price of timber. However, there are still many reasons influencing the price of timber thus as when a legal entity want to buy a timer, they have to know that the price of timber depend on regional market conditions, that heavily depend on the size and quality of the tree before and after growth (Fountains America, 2014).

3.2   Brief overview of Africa timber flows

The flow of timber in the Africa is largely one-sided from the eastern DRC to through East Africa. Although, formerly, the tropical timber belt stretched into Uganda from the Congo Basin, today there is very little tropical timber left in Uganda, situated mostly in reserves. Uganda is an importer and transit destination for wood from the DRC and South Sudan rather than an exporter. Considering the vast size of the DRC's forests, its contribution to the international trade in tropical timber is disproportionately small (Canby et al. 2008).

Africa is home to up to one-quarter of the world's remaining tropical forests. The continent produces 14% of the world's total non-coniferous tropical (NC-T) industrial round-wood. Although less than that of Asia–Pacific (60%) and Latin America (25%).

The largest producers of timber in Africa are Nigeria, Gabon and Cameroon. Despite being home to more than half of the Congo Basin forests – the second-largest block of tropical rainforests after the Amazon – the DRC's official production figures for NC-T industrial round wood are only about one-tenth of those of countries like Gabon and Cameroon. There could be a number of explanations for this, including differences in definitions of forest or measurements, or even challenges with data collection.

Most of the timber produced in Africa is shafted to china. In 2006, Africa exported 2.6 million m³of forest products to China, worth US$737 million. Volumes have been relatively variable over the past 9 years, with fluctuations and noticeable drops. The same timber that has been exported to China comes back to Africa in form of assortments imports. This is a concrete example of Angola where 4% of plywood is imported from China (Canby et al., 2008). Today timber trade in Africa is directly linked to Chinese's investments.

3.3 A Brief Description of Angola

Angola is located on the western coast of southern Africa with an equivalent area of 1.2 million square kilometres (FAO, 2008; IDF 2011) and population is estimated to be 19.6 million. Administratively Angola is composed of 18 Provinces, 164 municipalities and 547 communes. The main existent ethno-linguistic groups are: Ovimbundu representing 37% of the population, Kimbundu 25% and Bakongo with 13%. Other groups include Chokwe, Lunda, Ganguela, Nhareca-Humbe, Ambo, Herero, and Xindunga (Klima, 2008; Jover et al., 2012). The official language is Portuguese, and approximately only 40% of the population can speaks it.

The climate is tropical to sub-tropical, and is characterized by warm and humid summers and mild and dry winters. The dry season extends from mid-May to September and the rainy season from October to mid May. The climate of Angola varies considerably from the coast to the central plateau and divided into three big climate zones: Humid tropical climate covering the northern region, hot desert climate in south region, which goes from tropical desert of Namibe to tropical dry zone of Cunene (WFP 2005) and finally the dry tropical climate covering the plateau zone of Angola.

Angola has experienced a long period of war. First for the liberation of the country from the Portuguese colony from early 1960s to 1974 and civil war which broke immediately after the country gained independence. The civil war lasted about 27 years which had a mixed consequence on the forestry sector. Spatially, the forest resources were well conserved in some areas while in others, the degradation reached points of non-return (FAO, 2008).

Now, Angola is rebuilding itself after 27 years of civil war and the battle for the country reconstruction is now at all fronts affecting all the sectors. The forestry sector is called to bring benefits from the high level timber production accumulated to the

sustainable forest management based on clear policy orientations and strategies towards accomplishing the national objectives on forests.

The coastal zone of Angola is characterized by lack of vegetation cover even with the presence of indifferent broadleaves trees species (**Figure 2**) such as *Brachystegia, Julbernardia* and *Isoberlinia* usually found in the plateau (FAO, 2001).
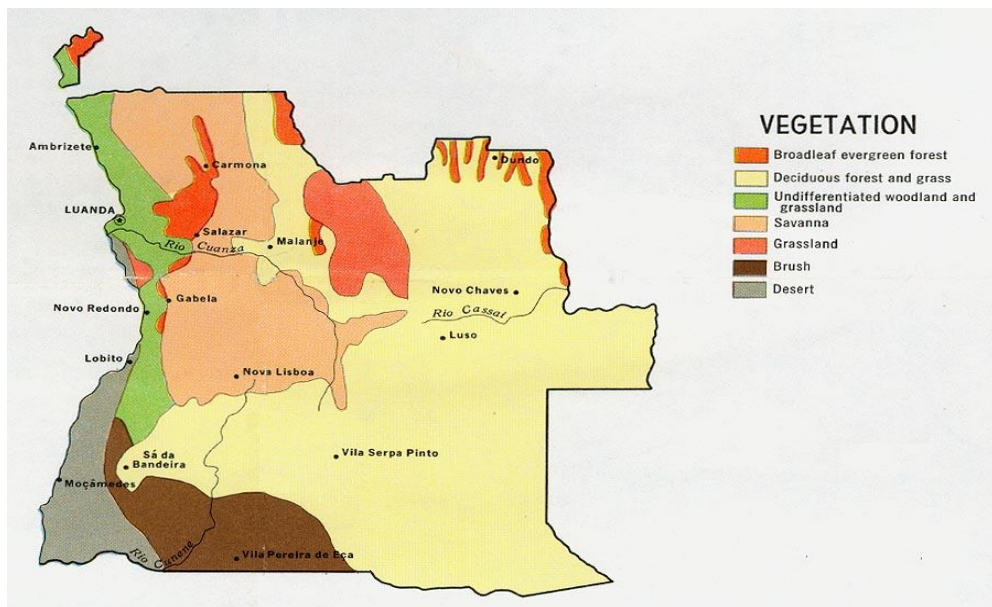

Figure 1-Geographic location of Angola

Source: http://www.transvalair.com/our-services/african-logistics/angola.php

Figure 2-Vegetation map of Angola

Source: (http://maps.nationmaster.com/country/ao/)

3.3.1 Forestry sector

Angola's forest resources are abundant, well distributed across the country and have high potential to supply sufficient quantities for internal consumption as well as export.

Forest and savannah are the dominant natural features. Nearly 43% of the territory is covered with natural forest and woodland (53 million hectares), mainly Miombo woodlands. The rest of the woodlands constitute savannah, steppes and a variety of wetlands (including mangrove forests). Plantation forests cover some 148,000 hectares, consisting mainly of eucalyptus along the Benguela railway line (IDF, 2011).

The tropical rain-forest extends over an estimated 2,000 km², which represents less than 2% of the national territory. This forest is located in North-East Cabinda Enclave (Government of Angola and UNDP, 2007).

In terms of protected areas, Angola has 7 Forest Reserves and Parks corresponding to 7.9 million ha (6.6 percent of the country) all under control of Ministry of Agricultural and Environment.

The forestry sector is administratively composed of a set of institutions namely "Instituto de Desenvolvimento Florestal (IDF)" and "Direcção Nacional de Agricultura, Pecúaria e Florestas (DNAPF)" both under the "Ministry of agriculture and rural development (MINADER)", the National direction of natural resources (DNRN)" under the Ministry of urban and environment (MINUA)" which is in charge of the protected areas. Theoretically, DNAPF is responsible for defining policies and IDF as executing agency of the policy. However, IDF decide on forest policy issues and in the development of such policy.

The executive structures of IDF consist of: (a) Office of Studies and Planning; (b) Forestry Department; (c) Wildlife Department; (d) Department of Law Enforcement (Fiscalização); (e) Department of Administration, Management and Budget; (f) Human Resources Sector. Nonetheless, at local level, the executive structures of IDF consist of: (a) Regional Centres; and (b) provincial directorates. This institute is severely under-resourced (FAO 2008). The existing staffs is comprised of 27 professional foresters with university education, 157 technicians with high school education and 941 that form administrative personal plus forest guards poorly trained and equipped. The current forestry legislation dates from colonial times. The forestry sector still makes use of the edict established by

Decree Law n°44531 of 21 June 1962, which remains to this day the sole legal instrument covering forestry, wildlife and fisheries (Amsallem, 2002).

3.3.2 Economic Background

Angola has achieved a prospering economy with one of the fastest GDP growth. However, from 2009 to mid-2011 GDP growth stagnated due to a decline in global oil prices and a slowdown in domestic oil production. Despite the advances in economy, the country still registers higher poverty rates (World Bank, 2012). Another important feature on the structure of the Angolan economy is the predominance of the "grey market", which is estimated at over 30 percent of GDP according to recent studies. Forest activity has a significant share in informal economic sector. However, the contribution of this sector into the GDP is about 4% (IDF, 2007).

In the early 1990s, Angola changed over from the centrally planned economic system introduced after independence to a free-market system. A trade liberalization of important economic domains, bring substantial changes in the development of the economic sector of the country. However, it causes some negative points in the forest industry for government (public fund), by politic of private businessman, based on international market Why? – Because:

➢ 70 - 80% profit for selling wood stay private,

➢ 10 – 20% spent in corrupted and 10% for government (sometime government doesn't receive anything).

Table 1-Angola social-economic indicators

Indicators	year					
	2004	2008	2009	2010	2011	2012
GNI per capita, PPP ($)	2480	4590	4990	5000	5040	5400
Population (millions)	16	18	19	20	20	21
GDP ($ billions)	20	84	75	82	104	114
GDP growth (%/year)	11	14	2	3	4	7
Life expectancy (years)	48	50	50	51	51	

Source: WB 2012.

3.4   Brief history of forestry in Angola

Forest regions in the world vary according to their level of plant, animal, insect, and fungal species diversity, their soil and topographic complexity as well as their developmental history. The fundamental practices for managing forests and natural resources can be applied anywhere on the globe, but differences in forest character may require modifications to these practices to best meet the needs and demands of each location. Understanding the developmental history of forests and natural resources of a country always help to understand the opportunities and challenges posed for foresters and natural resource managers in these areas (Grebner et al., 2013).

According to Jirků and Petrželková (2008), the history of African forests began 8 million years ago, when the climate became humid and started to develop flowering plants. However the actual climatic zones in Africa were formed 5 million years ago.

In Africa, with the exchange of the glacial epochs, the temperature and humidity decreased and this brought an enlargement of the dry regions and a reduction of the humid regions and as a consequence forests were damaged. Practically, during the glacial period the forests disappeared from the African continent and were replaced by savannah.

In Africa, the target of the firms specialized in logging have always been the higher-valueble woods especially red mahogany woods (*Khaya spp.*, *Entandrophragma spp.*, etc.), for that reason, the history of forest management of many African countries is always linked to European colonization. Large-scale commercial logging for export markets began in the colonial era, accelerating after the Second World War, particularly in the early post-independence years. The main thrust of post-colonial forestry has been commercial, with several economic processes emerging, including autonomous organizing efforts by peasant communities, the emergence of local enterprises in the early stages of industrialization, and profound institutional changes designed to lay the legal groundwork to guarantee contracts and favor ownership rights (Amsallem, 2002).

Angola in this point of view was always characterized with natural forests densely populated since antiquity. These forests had always served as a place to seek sustenance (subsistence) however, with the arrival of the Portuguese settler in Angola, an intensive exploitation of forest resources began. This was due to the high demand of timber at that time.

After many years, the Portuguese colonists started to introduce new species such as eucalyptus, cedar, pine, etc which were planted in very large areas (IDF 2009); this was because the timber from natural forest was not enough to satisfy the needs of those times (Britton and Zuidema, 2006). Moreover, prior to independence, timber extraction from natural forests was concentrated in Maiombe forest in the Cabinda exclave. The Maiombe forest in the north of the Cabinda exclave contains the most-valuable commercial species, notably white tola (*Balsamiferum harms*) and limba (*Terminalia superba*). There are also stands of commercial timber along the rivers of the southeast, especially mussibi (*Guibourtia coleosperma*). However, then there was a shortage of timber and the price boomed due to the demand of national timber? German settlers, who cultivated sisal in the area of Benguela, started also to plant eucalypts and pines, therefore, today a lot of plantation are see in those areas.

3.4.1 History of Eucalypts plantations in Angola

An estimated 789 000 hectares3 of forest plantations have been established in Central Africa since the end of World War II, with varying degrees of success.

In Angola the plantations species were introduced during the colonial period. The species introduced were Eucaliptus sp, Cupressos lusitanica, Calitriss calcarata, Pinus patula, Grevilha robusta and Cassuarina equisetifolia (FAO, 2000). Old documents with information about how and what happen with forestry sector during and after the 1975 are unknown.

The demand of timber motivated the settlers to grow more plantations in Angola. They planted more than 20,000 ha of trees mainly Eucalyptus, Pinus patula, Pinus elliotii and Cupressus lusitanica. What happens after that? No one knows. No studies have been done concerning these plantations. Eucalypts was the major genus planted for timber, fuel wood and pulp wood (Matas and Pukkala, 2011). Forest plantations were established especially during the 1960s and 1970s, mostly by the rail companies and paper-making firms. The wood from these plantations was used to produce firewood to fuel the locomotives as well as raw material for papermaking. (FAO, 2001; Amsallem, 2002).

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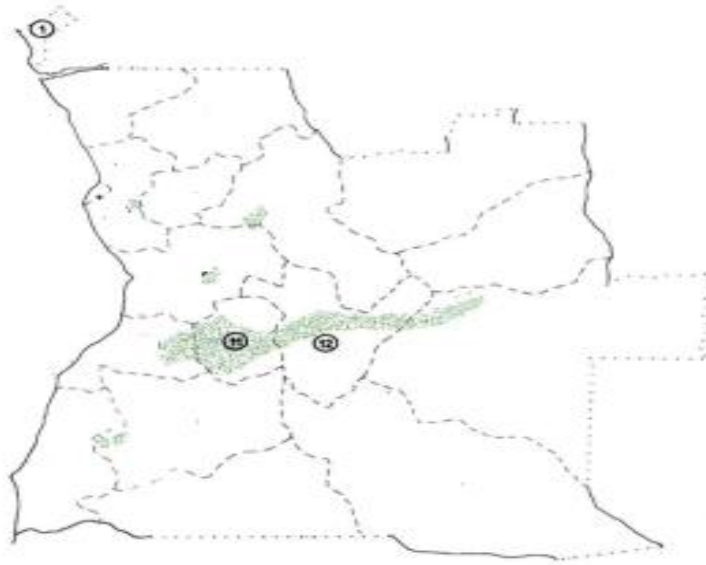
Figure 3-Central angolan highlands with Eucalyptus species

11. Huambo Province; 12. Bié Province; 1. Cabinda

It was distributed in highlands, central plateau concretely in Provinces of Benguela (Ganda, Babaiera, and Alto Catumbela), Huambo (Kuima, Sanguengue, Ukuma and Tchinjenje), Bié and Huila (Bunjei) as it is shown on (Figure 3).

The history of Angolan forests was linked with the presence of Portuguese settlers in the territory. The Angolan population knew very little about their forest resources so it was much easier for the settlers to dominate the resources. Today, a new history is in the making; the surface of the planted forest area after independence increased for about 650 hectares (IDF, 2011) furthermore, the Government is negotiating with FAO to revitalize the forest sector and potential of Angolan natural forests.

3.5 Timber production in Angola

The production and exploitation of forest resources in whole World is matter several questions because of the concept of sustainability. In Angola, the statistic data on timber production are 50 years old. The annual production capacity of Angolan natural forest is estimated to be 360, 000 m³ (Buza et al., 2006) with an annual increment of 0.3 m³/ha per year (Zola, 1998).

3.5.1   Timber exploitation in Angola

The concept of timber exploitation comes from cutting down the trees. According to World Bank (2003), timber exploitation has negative effects even in countries which have good management plan. It is associated with opening new roads that permit the expansion of illegal trade in bush and reduce the biodiversity and consequently create a big impact on the livelihoods.

Exploitation of timber in Angola is dived in to two periods: first, from 1950 -1975; this period was dominated by timber extraction for industry purpose (Buza et al., 2006). The second period was after the independence of Angola. This period was dominated by decentralized economy that allowed private companies to export timber to different part of the world.

Today in Angola, timber exploitation and other forest products are based on annual license systems which are ensured by Institute for Forest Development - IDF. According to the current regulation, the explorations of forest resources fall under two following regime:

- The exploration based on simple license; this license is valid during 12 mouths and it is renewed every year. It consists on exploitation of 500 m³ of timber only not more. It is exclusively for national companies and local community.

The requests for licenses must include the following; a descriptions of the technical and financial resources of the individual or company making the request, the company name, a description of the type of vegetation cover which should be verified by a IDF local authority, a map of the area to be licensed, including number and technical level of its employers (FAO, 1995). They have to indicate also the utilization of the finished or unfinished product.

Licenses to exploit timber
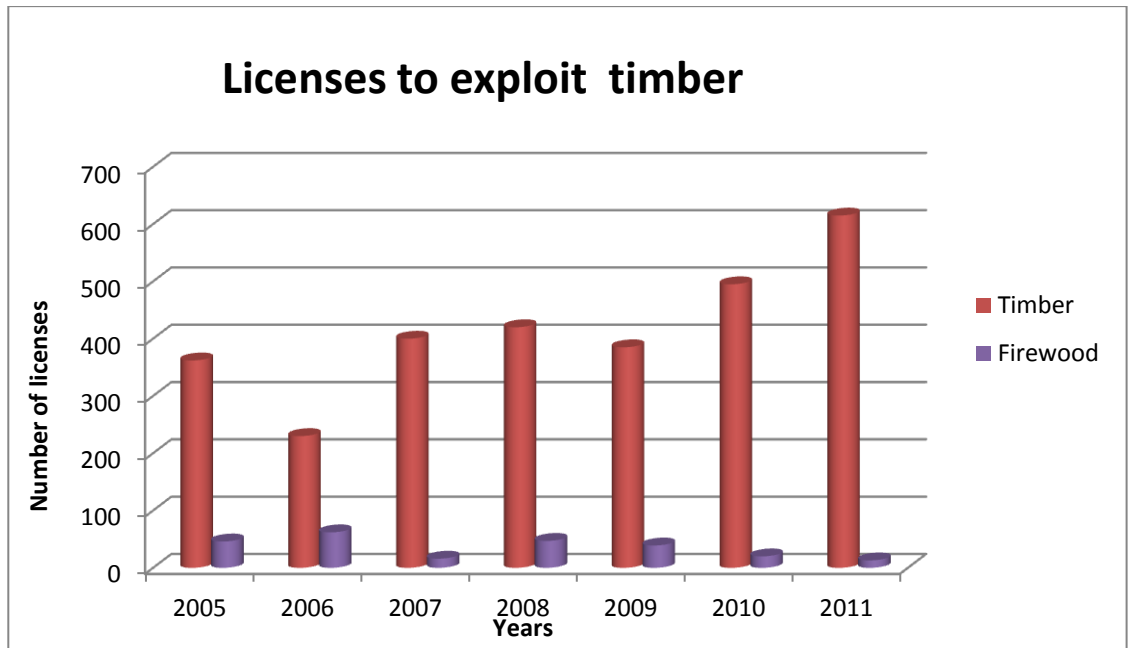
Figure 4 - Permit to exploit timber and firewood

Source: (IDF, 2011).

- The exploration based on contracts; consists on multiannual concepts. Unfortunately it's no longer used because the forest sector does not currently know the availability of forest resources and their localization (MINUA, 2006).

However, experiences from other countries (e.g. Ethiopia) have proven that the annual system of licenses for timber exploitation is not efficient and may stress the foresters and lead to an extinction of certain species (FAO, 2008), because companies are always targeting valuable species.

The real value of forest in ecologic and socio-economic point of view is unknown. The forest is seen only as source of timber. In the process of timber exploitation less attention is given to silvicultural treatments.

The centers of timber exploitation are located in the region of Maiombe (Cabinda Province) and Dembos (Bengo and Kuanza Norte Province), Uíge, Moxico, Kwanza sul, Lunda Sul and Lunda Norte (Figure 5).
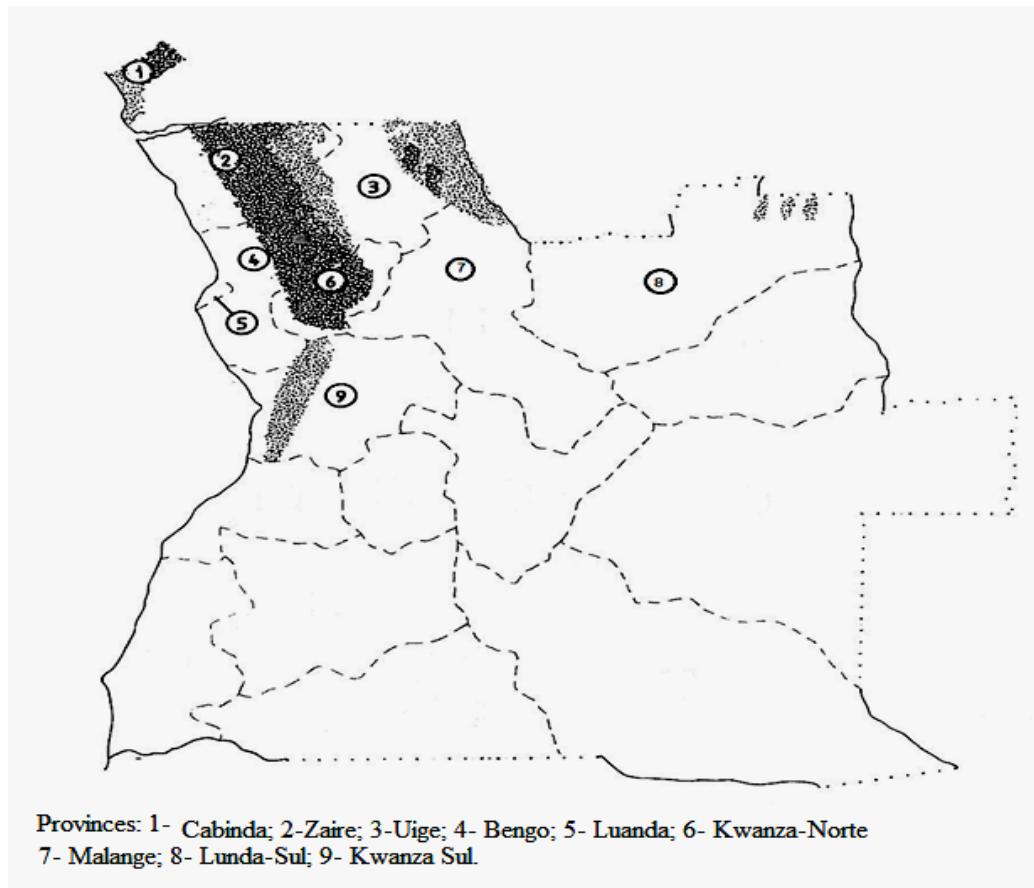
Figure 5-Zones for timber exploitation in Angola

Source: (Diniz, 1998)

The main commercial species of timber in Angola are; *Entangrophragma, Chorophora excelsa, Pterocarpus tinctorius, Combretodendrom africanum, Sarcocephalus diderichii, Millettia laurentii, Gossweilerodendron balsamiferum, Terminalia superba, Pterygopodium oxyphyllum, Albizia sp., Celtis, Melia dubia, Pterocarpus angolensis, Guibourtia coleosperma, Entandrophagma ekebergioides*, *Brachystegia spiciformis* locally called "onduko", *Brachystegia hockii* locally called "omanda", (Diniz, 1996).

3.5.2 Trade of illegal Timber in Angola

Universally there is no single definition of what is illegal timber. The European Union Action Plan for Forest Law Enforcement, define illegal logging when timber is harvested in violation of national laws (FSC, 2010; Alemagi and Kozak, 2010). However, the ITTO (2002) refer illegal logging as the removal of logs in a manner that is against the provision of relevant laws. The definition of what is really legal and illegal timber is controversial, the only sure rule known are the general requirements for legal timber; harvesting wood only where you have the rights to the timber, respecting quotas and

restrictions, paying royalties and taxes, certification and possessing the necessary authorization to transport and process logs.

The control of illegal activities in timber production and trade world-wide has received increasing attention over recent years (Brack, 2002).

Awareness of the extent of these violations of forest law, and their impacts on the global and local environment, on nations deprived of natural resources and revenue, on local communities and on the rule of law and good governance, has steadily grown (Greenpeace, 2014).

Most trade in industrial wood occurs in the northern hemisphere between industrial countries; OECD members account for roughly 80% of total exports and 90% of total imports. The three dominant industrial wood importing markets – Western Europe, Japan and North America – are all expected to more than double their net imports of wood products by 2020. Tropical products only represent a small share of exports of most forest products. For 1997 tropical industrial roundwood production was estimated to represent about 18 percent of world industrial roundwood production. Today the sale of timber in Africa for instance are much higher but also illegally sold. One concrete example is the common problems of timber commerce from developing Countries like Cameron, Ghana and DRC. As example, illegal shipments of logs from the Congolese firm Bakri Bois Corporation intended for two German operators (Greenpeace, 2014). In another hand, the Swiss-based wood company (BAM) is a major trader of high-risk wood from the Congo Basin. But it is not the only non-EU based company that supplies high-risk African timber to the EU market: the Swiss-based Interholco and Liechtenstein-based Norsudtimber Group (Neuholz) (Greenpeace, 2014).

Illegal logging is rampant in all Congo Basin countries and elsewhere in Africa. Although the DRC logging sector is much smaller than those of Cameroon, the Republic of Congo, or Gabon, it is in a state of organized chaos. As a result all timber from the country is to be considered as high risk.

In Angola the main risk is the timber coming from Cabinda Province which is neighbours with Democratic Republic of Congo. The tropical forests of the northern enclave of Cabinda are rich in plants and wildlife. However they also hold a valuable economic resource for the region - timber. Tropical woods such as white tola (*Gossweilerodendron balsamiferum*) and limba (*Terminalia superba*) fetch good prices on

the international market. A cross-border forest scheme – known as the Maiombe Forest Transboundary Initiative – has been set up to cover areas of the Maiombe forest in Angola, the DR Congo and Congo.

Over-logging and deforestation for farm land are a huge threat to the unique forest environments of Cabinda and other forest areas of northern Angola and the Congo basin. The main causes of illegal logging in developing Countries are: Systemic corruption, poverty, conflicts, licensing schemes, usurpation of property rights and inadequate institutional support (Alemagi and Kozak, 2010). The forest and forest industry of the Angola are constant violated by illegal emigrants, private businessman (national and international) and military (Governmental and rebel).

3.6 Forestry Industry in Angola

The forest industry is still in its infancy, composed by small and medium sized units (sawmills and carpentry) with an estimated capacity of 600 – 700 m³/day or 100,000 to 150,000m³/year. The capacity of forest industries to transform forest products into other forms is low. Majority of forestry industries which transformed raw timber into final products are closed and abandoned (FAO, 2001). They had played great importance in the economy of the country until 1974.

Angola had about 104 sawmills in the period before the independence, the control of the forestry industry was under the Ministry of agriculture and the rest were controlled by the government and private sectors. They had been operating from 1976 to 1986 (FAO, 2000) or up to 1992 according to IDF (2011).

Today, there exist only 20 sawmills including the new ones (IDF, 2011) in the country. The capacity of this sawmills is about 350-400 m³ per day. That is due to lack of wood and old equipments of exploration (Tomas, 2007). There are two (2) manufacturing units for plywood, one (1) manufacturing unit of matches, three (3) units of parquet production and one (1) paper industry which does not function. The production of Lumber decreased from 10,045 m³ to 5,372 m³ per year (FAO, 2001).

The industry which manufactured paper is abandoned. It had a production capacity of 15,000 tons of paper per year. The company of paper itself controlled about 82,500 hectares of forest plantation from which 78,000 ha were *Eucalyptus saligma* and 4,500 of *Pinus* sp (FAO, 2001; IDF, 2011).

In terms of exports, Angola has exported 10, 556 m³ of logs, 667.5 m³ and 112.3 m³ of laminates from 2004 to 2008. Today the average exports timber is about 12,000 m³. The main exporters are China, United States of America and about and Portugal (Manyoni, 2008). In other side, Angola imports also wood and forest products from Europe, China and other African neighbors' countries like Namibia and South Africa.

CHAPTER THREE: METHODOLOGY

3.1 Study area

3.1.1 Location and background

The study was conducted in Bié Province in centre (**Figure 6**) of the Angola between 10°34´´– 14°18´´South latitude and 15°42´´– 19°13´´ East longitudes. The area surface is estimated to be 70, 314 km² with 2 million of people approximately.

As the country becomes more centralized around its urban centers, pressures on land and natural resources especially on forestry resource increased in the rural areas closest to cities (Carranza and Treake, 2014).
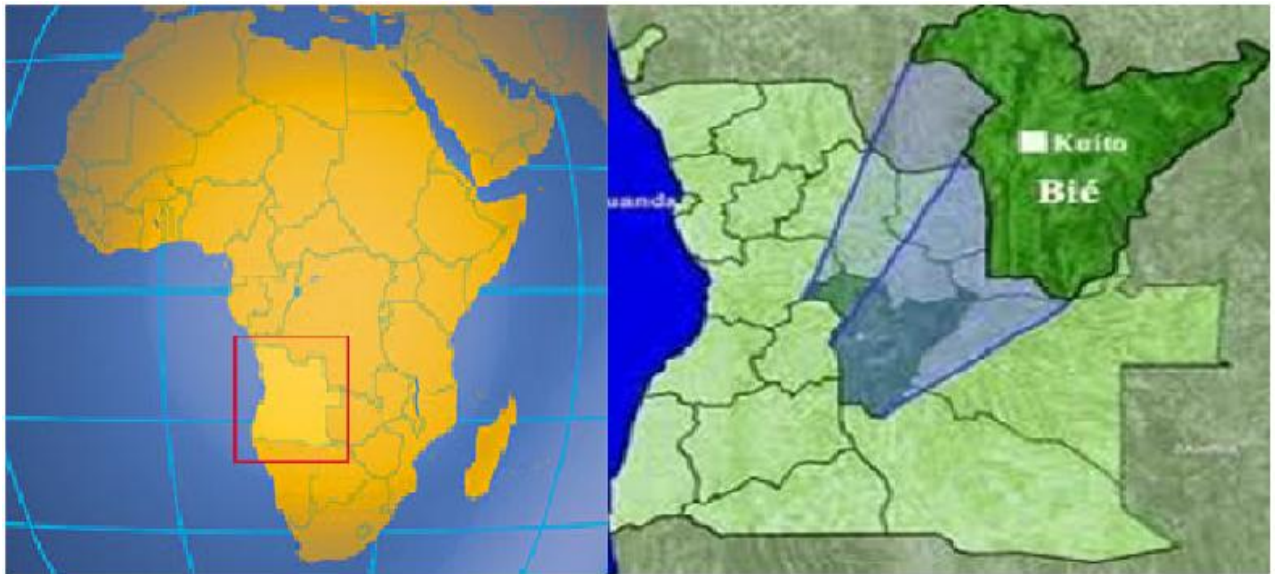
Figure 6-Location of the study area

Source: (Arte Angop, 2000).

3.1.2 Vegetation in Bié Province

The vegetation consists of four types, each with different features of plant species; highland forests, swampy grasslands, dry grasslands and woodlands. However, the general characteristic is open forest or also called miombo forest. The dense forests are found in the municipalities of Chitembo, Camacupa, Andulo and Cuemba. The structure of vegetation is heavily affected by frequent intense fires and clear cuts for charcoal production. The main species belong to the genera Brachystegia, Julbernardia, and Isoberlinia (FAO, 2001). Trees in these areas tend to have similar height, which is usually between 5 and 15 meters in different places. The trees come into leaf before the first rains, and the new leaves of some species are spectacular in their bright reddish, greenish or yellowish colors (Figure 7).

Figure 7-Representation of miombo forest in Angola

Source: Author design

3.1.3 Reasons for the study area selection

The reasons for selecting Bié Province as the target for this study were the following:

1. The huge plantation of eucalyptus and pines have been unexplored since 1975 in this Province;

2. Limited number of companies dealing with forestry issues;

3. The absence of research in this area;

4. High demand on timber market and insufficiency market supply

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3.2 Research design

Tellis (1997), in his article *Introduction to case study,* explained that case studies can always include qualitative and quantitative data. The research design was in base of triangulation (a combination of literature review, questionnaire survey and interview or observation). The study used a combination of both primary and secondary data (table1).

Table 2- Applied methods

Primary data collection method	Type of research method	Type of information collected
Semi-structured questionnaire directed to the sawmills	Quantitative	forest ownership, wood production and price of wood per cubic meters
Semi structured interview with managers of sawmills and government officers	Qualitative	Historical information on wood production, preferred species for wood production, government support to sawmills

3.3 Data collection

The data were collected from July to September 2014 via applying triangulation methodology (literature review, questionnaire survey and interviews) as perceived value was more constructive than an objective one. The questionnaire was not only based on theoretical framework but also based on data collected in previous year on the same topic (Chiteculo, 2013). Firstly a draft of the questionnaire was pre-tested with two forest officers in Angola and rectified according their comments. In order to increase the significance and effectiveness of the primary data, both qualitative and quantitative methods were used during the data collection and data analysis.

3.3.1 Primary data collection

One comprehensive questionnaire was formulated for the focus groups. The questionnaire was administered to sawmill personally, except those currently residing outside of the capital city (Kuito) who received it through e-mails. Phone calls were also made to clarify the questions. 3 phone interviews were performed only in the case of sawmills that operate far away from the city. Moreover, interview with the representative of the Institute for Forest Development was also done personally based on the questionnaires designed for the same purpose.

The semi-structured questionnaire was designed to not take more than 15 minutes. The questions were open and closed. The semi-structured questionnaire with 12 questions was written in English and translated into Portuguese language (see **Appendix 1 and 2**). The specific wording of the key inquiries of the questionnaire was: How do you define long-term timber license? How much would you willing to pay for long-term license? How do you characterize timber market? The survey included questions on forest ownership, types of forest species explored, price of timber and comparative analysis of wood production now and before the independence of Angola.

3.4.1.2 Qualitative data collection

Four semi- structured interviews were conducted. The rest of the interviews were instructed and the interview questions varied with regard to the position of the respondents and interviewed topics. The interviews were held in Portuguese language and noted in English. The stakeholders interviewed are summarized in table 4. The average duration of actors' interviews was approximately 10 - 15 minutes.

3.4.1.3 Sample size the research

The size sample the research was mainly dependent on the willingness of the respondents to cooperate and of course the time framework of the data collection. Primarily, for the purpose of the study we targeted 20 sawmills. However, the total sample size of the respondents collected was only 4. Others 3 were filled through phone calls.

Table 3- Summary of respondents interviewed

Place	Interviewed entity	Total number
Kuito	Government officer*	2
Kuito	Sawmill manager	2
Luanda	Government officer	1
Cabinda	Government officer	1

*Government officer were mainly interviewed for historical data.

3.4.2 Secondary data

The secondary data were collected from online databases sources. However, the data about the timber pricing system were obtain from quality report of 2013 of the Forestry Commission in UK and Timber price reports of USA.

The purpose of this study was to review the historical data of forestry in Angola, however, there were found very few essential documents that reviewed the history of forest in Angola. The main pillars data were collected from FAO web sites; FAO-Forest Resources Assessment 2000; FAO-Forest Resources Assessment 2010.

The supporting materials were annual reports from institute of forest development in Angola.

3.5 Data analysis

3.5.1 Quantitative data analysis

The collected data were transcribed and analyzed with qualitative content analysis, specifically the content structuring technique and the summarization technique (Mayring, 2002, 2003). For descriptive statistics was used IBM SPSS and excel spread shit. It was necessary to transcribe the qualitative data into electronic form. The qualitative comparative analysis (QCA) of Berg-Schlosseet al., (2000) was used to compare historical and present data. More specifically, this is done by means of using the excel software to generate a synthetic graphs and tables that shows, in a straightforward way, how some cases cluster together. In this way, the researcher was able to bring to light similarities between cases that may, at first sight, seem quite different. QCA is therefore an excellent tool for data exploration.

The Logit regression model **(1)** in SPSS was applied to test the variable influencing the decision of sawmills to sell timber. The dependent variable was: whether a sawmill sell or not timber (cods, 0 for yes and 1 for not). The independent variables were four: the forest area of sawmill, the year of operation, the received credit from the government and if the sawmill has license to exploit timber.

Logit: $p = \dfrac{1}{1+e^{XB}}$; **(1)**

Xi= predicted variable

βi= is a vector of regression coefficient

1+e^-X'β = predicted probability of the decision

Consequently preliminary exploratory analysis of qualitative data and connections to the research questions were made. Direct references to the interviewed respondents were applied throughout the text in order to bring better focus and grounded argumentation for conclusion and discussion. The all process of qualitative analysis was based on the perception of the respondents and on gathering information which enabled an explanation of the forestry history of many individual issues. Final findings were interpreted with support of different and sometimes conflicting perceptions by sawmills managers and government officers.

A SWOT analysis has been undertaken for each initiative in order to highlight the Strengths, Weaknesses, Opportunities and Threats of the strategies Figure11.

CHAPTER FOUR: RESULTS

This chapter presents the historical results of the production of timber compared to post-independence of Angola. It gives the overview of the actual situation of forest in the Province of Bié. The main commercial timber species were also accessed as well as the main centre of its exploration in our study area.

4.1 Forest ownership in Angola

After independence, the country's constitution stated that all land and forest in Angola belonged to the state except the plantations which are under private companies (table 5). The natural forest is estimated to be 53 million hectares and the management of this forest stand is under the Ministry of Agriculture (MINADR) and Environment (MINAMB).

Table 4 -Forest plantations ownership

Species	Owner	Surface (ha)
Eucalyptus sp.	CCPAA	60,000
	CFC	38,000
	State	10,000
	Other private companies	20,000
Pinus patula	CCPA	8,000
	State	4,500
	Other private companies	3,500
Cupressus sp.	CCPA	2,000
	State	1,500
	Other private companies	4,000

Keys: CCB- Benguela Railway Company; CCPA- Cellulose and Paper Angolan Company.

Due to the long period of civil war these plantations were not exploited and stooped to exercise the function of which they were planted. Today, the access to exploit timber is based on licenses which are ensured by IDF. To have access to those licenses, there are several parameters to fulfill: (i) a location sketches of the area; (ii) list of species a person or company want to extract; (iii) viability of the economic plan (mainly the equipment to be used); (iv) and declaration from local authorities attesting that there is land conflicts in the intended for exploitation. These licenses are renewable every year
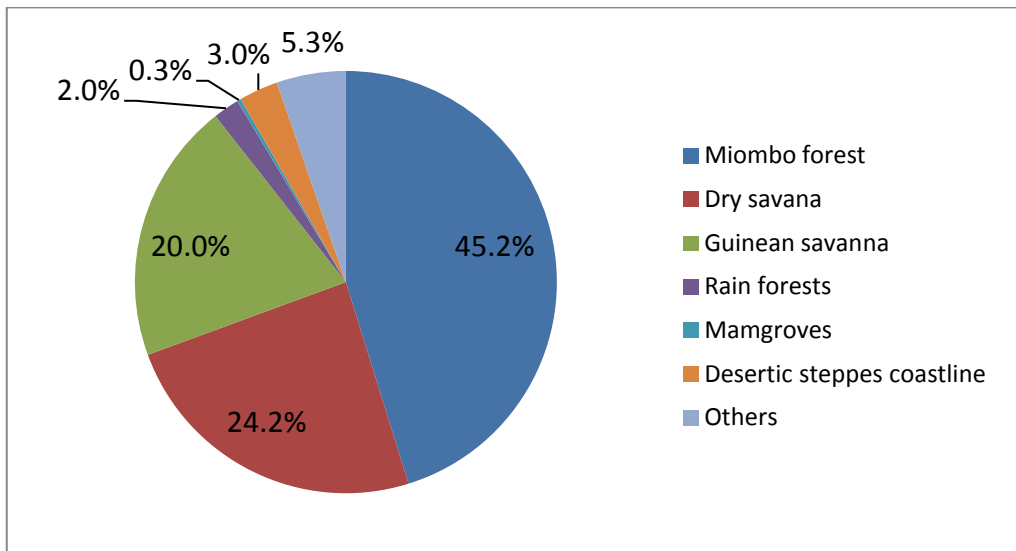
Figure 8- Classification of the Angolan natural forest

Source: IDF, 2011

4.2 Timber species and timber production history

Timber was one of major commodity produced and exported to Portugal before the independency of Angola, today the production has dropped drastically if compared with what was before 1975 (Figure 11).
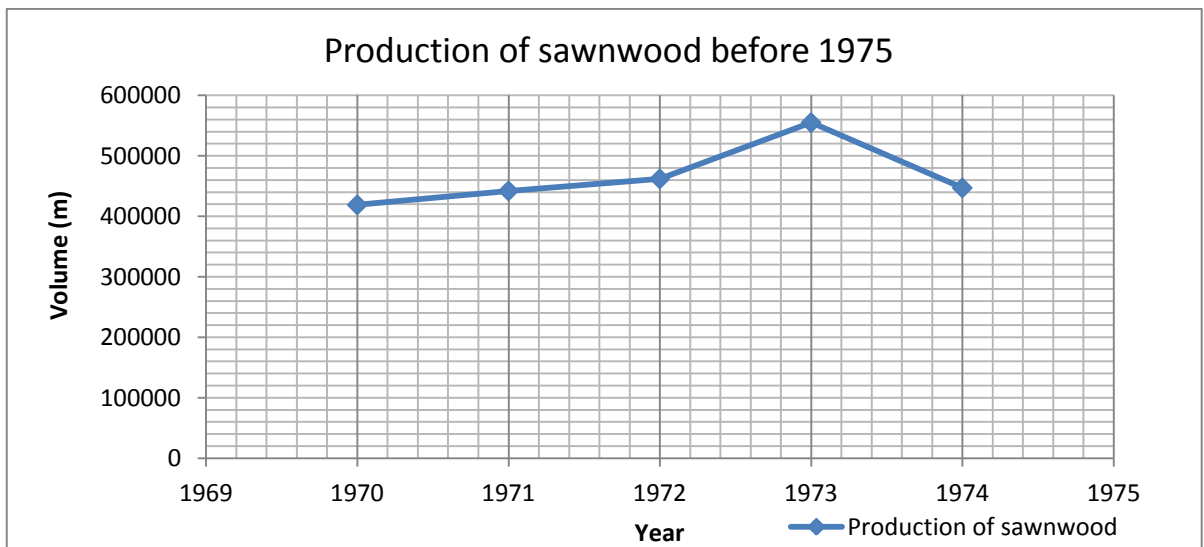
Figure 9-Production of sawn timber before the independence of Angola
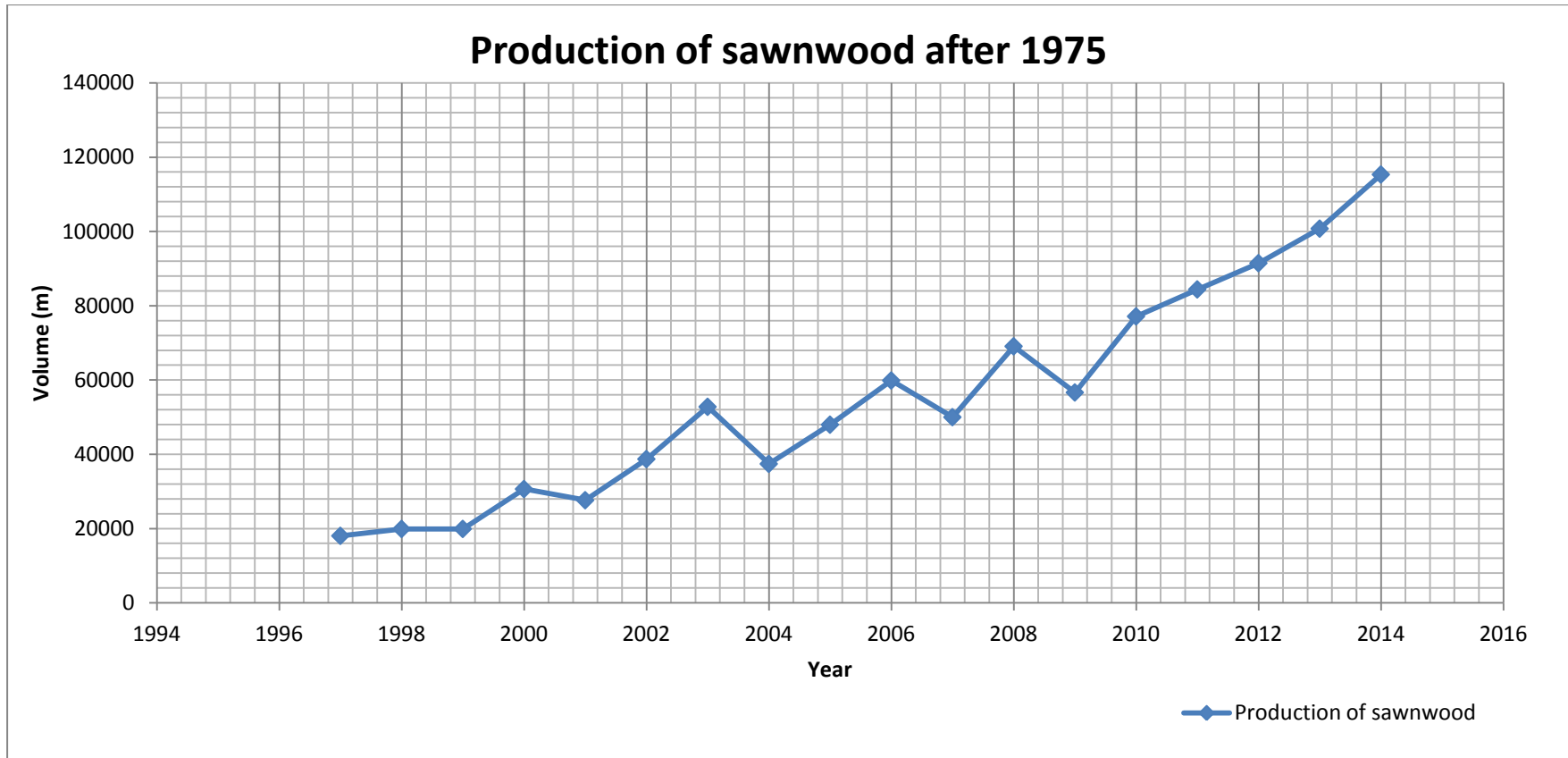
Figure 10 - Production of sawn timber after the independence of Angola

Source: IDF, 2011.

The capacity of IDF to control the forest resources is low; the institution lacks human resources capable to undertake the management of the forests (table 5). Data regarding sawn wood is scarce to obtain, the few sawmills operating in the region are resistant to supply data.

Table 5 -Technical personnel with their respective qualification in IDF of Bie-2014

Technical personnel	Area of expertise
University education	-*
5 High school	2 foresters, 3 administrative
2 Nurseries'	Technicians
5 Tractor drivers	Technicians
6 Forest rangers	non qualified workers

*there is forest Engineers in the province

4.3 Wood Species extracted for commercial purposes

From the data collected in the locality there was found four main commercial species: *Brachystegia sp., Grossweilerodendron balsamiferum, Terminalia superb* and *Ceiba pentane.* The utilization of this timber is consumed locally. However, the local production is not able to supply the market demand on timber therefore; part of timber consumed in Bié province comes from neighbor provinces.

Based on the way how timber is being exploited, two groups are distinguished there: (i) community which lives close to forest and harvest timber for house construction, firewood and charcoaling; (ii) loggers who are divided into two subsequent groups: those that extract wood for their carpentry and those extract wood for transformation in sawmills. According to government, producers are classified according to equipment used for timber producer: complete and uncompleted. Complete when a entity has all the four basic equipment required for timber production; one (1) skidder, one (1) harvester, one truck and one tractor.

Table 6 –Capacity production of the sawmill in Bié

Sawmill	Capacity (m³/day	Annual production (m³)
Lumenye Sawmill	95	27,500
Chissindo sawmill	40	1,100
Lopes sawmill	35	9,240
Camacupa sawmill	75	21,130
Total	245	58,970

Bié Province does not have potential areas for an intensive wood exploitation, Therefore, in sustainable manner the Province is able to produce *3, 000 m³*of timber per year only what means approximately 1, 800 hectares.

However, not all sawmills are legal. Legally there is only one sawmill (Carpentaria Lumenye) authorized in timber exploration, others are illegal. According to IDF/Bié (2008), the main problem constitutes the illegal's ones, there is not known concretely the wood species they exploit.

Two sawmill which were operated illegally mentioned to continuing doing unless the IDF changes the short-term regime of license to long-term license of at least 5 years.

Interviewed sawmills in selected area indicated that they walk long distances to access timber which results in lower income due to transportation costs.

4.4 Sale of timber in Angola- Bié province

Timber in the study area is sourced from local villages and produced largely by sawyers. The timber is marketed in border towns at Chissindo market. The wood is not sold in m³ but in planks or bundles (Appendix 1). The local market for indigenous timber includes individual retailers, institution, traders and consumers such as Carpenters, households and Churches.

The price of timber is always based on speculation in the market; there is no pricing system in the country to follow. Therefore, sawmills and carpentries interviewed are not selling timber in m³ however, they sell it per bundles (or pricing it per plank). The vast majority of timber harvested by private sawmills are sold as log and the most preferred species for wood market are plantations of pines and eucalypts.

Legally the average price of selling timber is being about USD 90 per m³ ranged according to the species. In particular case of Cabinda Province, the prices become higher due to high port fees paid for transportation. It is reported by the MINUA (2006) that 1 m³ is being sold at 130, USD plus 70, USD of port fees making a total of 200, USD.

The transport of logs is done with old trucks which have a lord capacity to carry 6 to 7 logs that is approximately 14 to 16 m³ of timber.

In the full sample, one variable was significant in the decision to sell timber: receiving credit incentive from the government. The forest area, the year of operation of sawmill and acquisition of license to exploit timber are just more likely to influence the decision to sell timber **(see table 7).** Receiving credit is a good proxy for individuals who have more information and access to markets, having gone through a documentation process with IDF, or are members of community associations.

Table 7- Logistic regression analysis of the variable influencing the decision to sell timber

Variable in the equation	B. (Logit coef.)	p.value
Extension of forest (ha)	1.16	0.3
Year of operation of sawmill (years)	1.87	0.2
Credit from government	7	0.008*
License to exploit timber	2.1	0.15

*Indicate a significant at 5% level of confidence

4.5   Exports and Imports of round wood in Angola

Species like *Rodendrom calsamiferum*, *Terminalia superba* and mahogany were intensively explored for export due to their wood quality and market demand. Today these species are no longer being exported.

Now days, Angola exports timber, log wood, wood veneer (Figure 13) and plywood to various countries such as: Portugal, Italy, France, USA, China, Bahamas, Slovenia, German, India, Namibia, Hong-Kong, Turkey, Netherland, Spain, Thailand, South Africa and Holland (IDF, 2007; IDF, 2010). The annual average of exported timber is about 25,000 m³. From this a quarter is shipped to China, half to United State of America and about 20% to European Union (Manyoni, 2008).

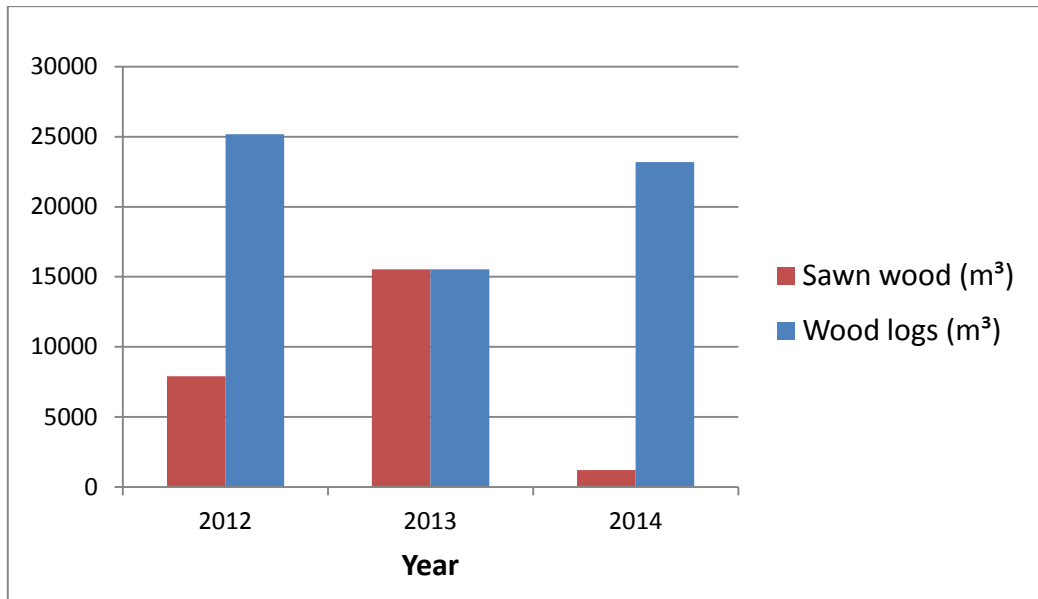Figure 11 - Trend of timber exports in Angola

Source: IDF

In other hand Angola imports wood from Europe, China and other African neighbors' countries like Namibia and South Africa (Table 14). Portugal was leading the trade import in Angola, however in the last period it seems like China is taking over the control of all imports (Manyoni, 2008).
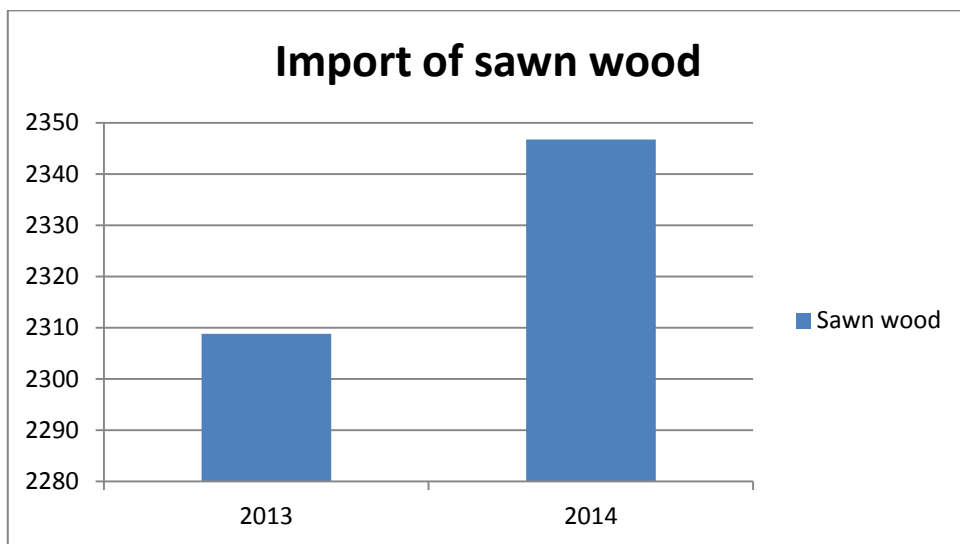
Figure 12 -Trend of the import of sawn wood in Angola

Source: IDF

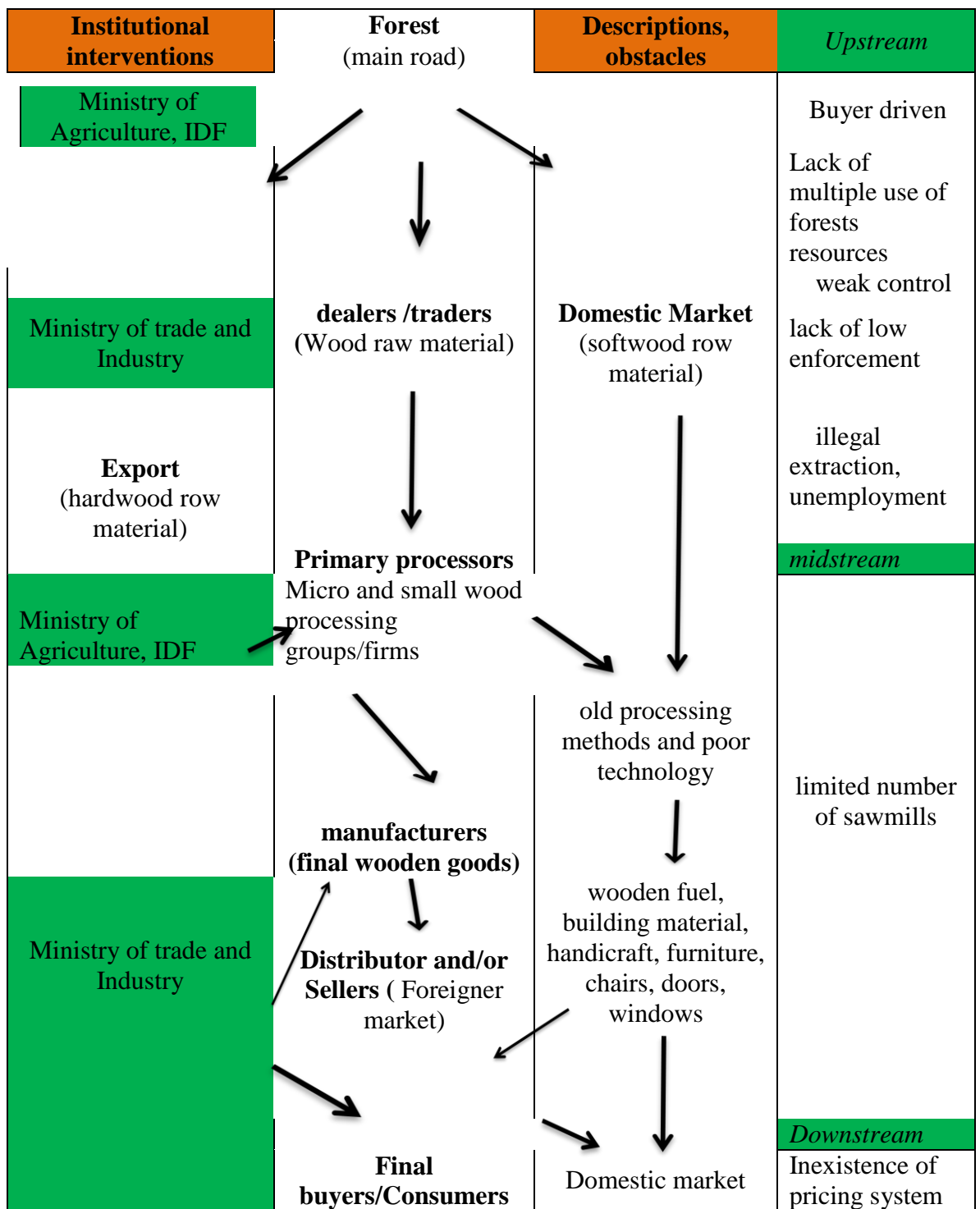| Institutional interventions	Forest (main road)	Descriptions, obstacles	*Upstream*
Ministry of Agriculture, IDF			Buyer driven
			Lack of multiple use of forests resources weak control
Ministry of trade and Industry	**dealers /traders** (Wood raw material)	**Domestic Market** (softwood row material)	lack of low enforcement
Export (hardwood row material)			illegal extraction, unemployment
	Primary processors Micro and small wood processing groups/firms		*midstream*
Ministry of Agriculture, IDF			
		old processing methods and poor technology	limited number of sawmills
	manufacturers (final wooden goods)		
Ministry of trade and Industry	**Distributor and/or Sellers (** Foreigner market)	wooden fuel, building material, handicraft, furniture, chairs, doors, windows	
			Downstream
	Final buyers/Consumers	Domestic market	Inexistence of pricing system

Figure 13- Map of the timber commercialisation chain in Bié and intervention by government.

Source: Author

4.6 SWOT analysis

Even thus socio-economic environment in the Bié Province, do not guaranty high private investment, there are a lot of advantages by doing business with timber in these areas. The demand for timber is high but the capacity of the existent sawmills to exploit is low. However, the development of the business itself has long-term horizon.

The areas of significance arose from the survey done is illustrated in SWOT based on understanding of the issues found (Figure 12). The SWOT analysis provides information to determine whether it worth to do business with wood in this province. It is used in ascertaining the priority areas.

Strengths	Weaknesses
• Presence of highvaluable timber species • Timber plantation has not been exploited for long time • Director involvement of local government on forestry sector	• Lack of information about forestry resources • Weak policy on commercialisation of timber
Opportunities	**Threats**
• Development of forestry industry • Possibility to start timber business with help of government credit	•Historical forestry data not allow comparison with present once • Over finantial dependence of forest sector on government budget

Figure 14 - SWOT analysis

Source: Author

CHAPTER FIVE: DISCUSSION AND RECOMMENDATIONS

In contest of African countries, Angola is the fourth largest country and is probably the only country in Africa where forest law is still weak. The production of timber is mainly done based on the old structure and concept of colonial era.

Ccomparisons of how timber was exploited in period post-independence of Angola, showed interesting perception. In the period before the independence of Angola, the production of timber was an extremely lucrative business and the highest pick production was about 500,000 m³ (Figure 11) and it was mainly exported to Portugal and other countries. Actually, the amount of timber produced in Angola is about 115,335 m³ (IDF, 2011) which makes a deficit of 384,665 m³ if compared with the period before independence.

Today data about exploitation of timber in Bie Province cannot be compared with the old data, because it is not known which species where exploited and it is quantities. It is claerly seen that after Portuguese settlers left Angola, all the production and exploitation stooped. No studies have been conducted in this regard. The few historic data found, when compared with the actual data do not illustrate a clear perception and does not show coherence at all; one image (Figure 2) or map has been used for over 30 years to illustrate different characteristics of Angolan vegetations.

The participation of the privite sector to the development of forestry sector is a big challange, it was expected that after Portuguese settlers left the country the local privite sector should take over to manege and exploit all those plantation in order to supply the local demand on wood however, it is just didnot came as expected.

The regime of timber extraction applied on the country is not the ideal. The companies operating there just focus on exploitation under the regime of licenses, therefore the companies only licenses theyself to exploit valuable timber as it comfirmed in Ithiopia (FAO, 2008). In this system of licenses, companies or sawmills do not manage the forest stand, fact which can lead to forest degration as the companies impruve their technologies.

From broud list of the main commercial timber species only few were highly commecialized *(Rodendrom calsamiferum and terminalia superbola)* international therefore, in order to increase the commercialisation of other important species, mejores shall be taken regarding the management of natural forest.

Timber market at national level is not also developed therefore, the pricing system is not been applieble in the country. There are no relevant studies regarding the wood demand and supply. If wood and its by-products are not fully accountable to the national economy due its complexity, it is evident that even Non wood forest products are forgotten when it comes to value or contribution to GDP. For example in Colombia, over the past 30 years, economists have made considerable progress in understanding factors influencing prices of timber. They found that sale's expected high revenues if the government will set rules on price of timber (Paarsch, 1997).

Regarding to the production of timber, it clearly seen from Figure 12 that, there is a tendency of growth every year even if fluctuation are observed in the trend. The lack of knowledge of the value of timber is what makes the production to be lower, because normal population are cutting valuable timber species and use it as firewood or charcoal. The point of concern should be if local population has to have their own forest and know the species within and apply the adequate management practice, and then sale the timber to sawmill.

There is no management applied on natural forest at all. In this regard, it is also important to state that natural forest without management will never supply a quality timber in term of quantity and preferred size. It is only possible to calculate the total amount of wood that has been produced per each Province every year however is not possible to estimate the current species composition of the forest stands, because of absence of forest inventory. The magnitude of most exploited species are not accessed and more the historical data of the felling of the tree species is not been accessed too.

There is also one important component that does not exist in the country which is the development of logging systems. Challenges and issues in logging are all related to new technologies, introduction of broadleaves species and pressure of society (pastime and environment). The development of a logging system in forest management allows the estimation of the number of harvesters of forwarders needs to exploit a certain amount of timber. The basic division of the assortments shall be sated according to species

(softwoods, hardwoods, and soft hardwoods). The actual division of roundwood according to the way of measuring is based on single pieces (planks) which are acceptable in the market.

The incentive from the government may guaranty not only higher supply but also good management practices from forest owners as it is done in Colombia; where the Minister of Forests sets aside a portion of each year's allowable cut to sell to eligible loggers and saw millers through a series of public auctions held under the Small Business Forest Enterprise Program (Paarsch, 19970). Several criteria for eligibility exist. For example, to be eligible a person must be an independent logger (in Category 1) or a mill owner (in Category 2) over 19 years of age with at least 2 years of experience. This kind of policies incentive the forest owner to manage the forest in order to improve the quality of timber produced. This was also accessed by Amcher et al., (2009), where strongly said the first step in this situation is to develop the wood sale decision for a representative smallholder from the perspectives of the decision to sell and the volume of trees sold at market prices.

The state own the forest but the capacity to manage these forests is precarious and even plans for future management at provincial level are not set. Local population is socialized that natural forests may grow itself without any management. There no schools at province level in which courses related to forestry are applied. In this situation it will be difficult develop a good management plan because there is no foresters to implement this plan. Moreover, the IDF itself is poorly staffed and lack professional cadres at all levels and also financial capacity to control all forest in the area. The situation concerning forest management should only be solved by schooling young generation on forest management practices.

In other hand, the few sawmills operated in the area are all functioning under the normal productivity. They all rely mainly on state forest and they do not carry out any inventory of the species within the area before they start exploit timber.

Our finding suggested that sawmill operating in the study area should be all registered under IDF and part of natural forest where they exploit timber shall be privatized and concede to the companies and sawmills the entire responsibility of managing the forest, while the IDF should have a responsibility on sending experts for training and controlling if the management approaches have been applied by this institutions. The

privatization of the forest will allow generate high timber production and the country will stoop to import furniture from abroad which do not lasts longer.

The development of the timber industry in Bié province does not depend on government but, it depends on private sector therefore, the private sector shall be given incentives to improve the productivity of timber. Over-logging and deforestation for farm land are a huge threat to the unique forest environments of Bié as well as other forest areas of northern Angola therefore, the engagement of private sector is important also to combat deforestation.

Recommendations

Based on the findings of this thesis, only two recommendations can be set:

- Develop the links of co-operation between academic institutions involved to the management of forest and administration of forest/natural resources, by the side of government and private sector in the Province (Figure 15).

Figure 15-Integrated model for forest development (IMFD)
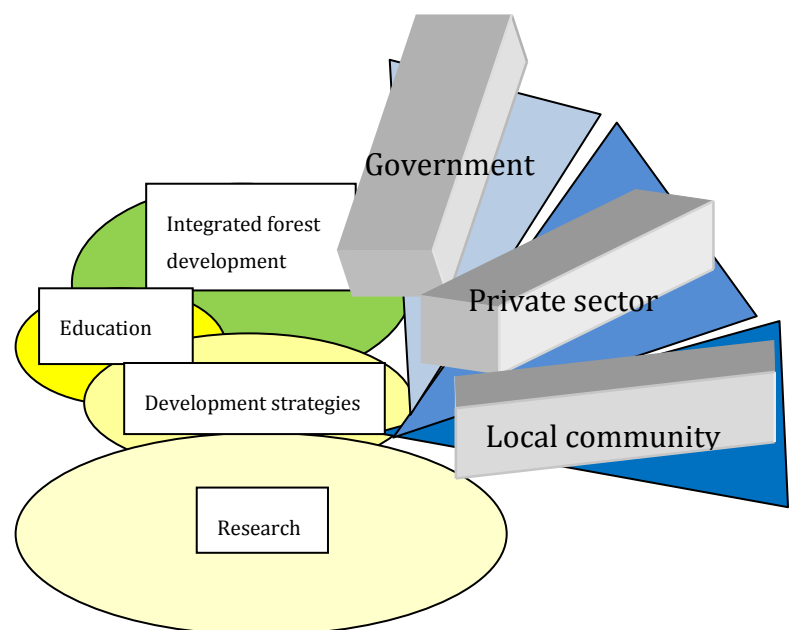
INFD describes a system of innovation, with emphasis on the links and interactions between the components on forestry sector, the institutional infrastructure with its incentives and the budget mechanisms from the government.

- Establishment of system that will attract funds that enable the sector to implement micro-projects and routine activities; and creating good

atmosphere in order to absorb local investments by developing mechanisms of incentives and ensure their application.

These recommendations can only work under the assumption that both government and private sector are willing to cooperate together.

CHAPTER SIX: CONCLUSION

The lack of linkage between forest sector and private institutions is one of the causes on discrepancy on data organization. It is important that the part of the natural forest should be owned by private sector for better management.

The system based on licenses to exploit timber is not efficient therefore, it is import to open space the contract system a guarantee the management of the forest where each sawmill is acting. Moreover, the pricing system of timber should be developed and published every year to the national journal.

The full history of forestry in Angola is still not fully accessed in this study, there are a lot of inscrutable gaps concerning timber production in Angola, therefore, the researchers suggest that detailed studies should be done in order to access even the zones of timber production and the types of management applied to this forest before 1975.

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8. APPENDIX

Questionnaire 2014

Questions related to commercial of timber (part1)

Production and Commercialisation of Timber in Angola (History, present state and perspectives)

1. Who is the owner of the forest from where you get timber?

Your own forest		State	
Family forest		Village	
Company		Others _____	

2. How big is this forest?

Under 50 ha		1001 – 5000 ha	
51 – 200 ha		5001 – 10 000 ha	
201 – 500 ha		10 001 – 20 000 ha	
501 – 1000 ha		More than mentioned ____	

3. Do you receive any credit or funding from bank or government?

☐ Yes

☐ Not

4. How do you sell your timber

_____

_____

5. How much do you sale the wood per m³?

_____

_____

_____

6. How far is your sawmill to the forest stand?

_____

_____

7. How is your experience with a commercialisation timber before the independence (**1975**)?

_____

_____

_____

_____

8. What are the more preferable species in the timber market?

_____

_____

_____

_____

9. From where you got the first incentive to introduce innovation? (you can select multiple answers)

Collaborator (s), Management	
From the owners/co-owners	
From universities or other scientific institutions	
From seminars, workshops and excursions	
From advisor if Regional Development	
Others……..	

10. Your personal opinion on the development of selected market and forestry in general.

_____

_____

_____

_____

11. How do you define long-term timber license? --
----

12. How much would you willing to pay for long-term

license?_____

_____

13. How do you characterize timber market? _____

14. What are your highest level of education and the education level of your closest co-workers?

	Your education level		Education level of your co-workers	
Elementary school				
Vocational school of forestry				
Secondary Forestry School				
High school graduation				
University of forestry or forestry focus				

15. How old are you and what is your gender

Age category				Gender	
Under 30 years old	31 – 40 years old	41 -50 years old	Above 60 years old	Male	Female

Thank you very much for your time