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Non-Detriment Findings Report on Pericopsis Elata (FABACEAE) IN CAMEROON

Report prepared for the National Forest Development Agency (ANAFOR)

by

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Ensuring international trade on *Pericopsis elata* (Fabaceae) is not detrimental to its conservation in the Congo basin

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Non Detriment Report on Pericopsis Elata (FABACEAE) IN CAMEROON

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ABREVIATIONS

ANAFOR:	National Agency for Support to Forest Development
API:	Pilot Integrated Management Project
ATIBT:	Association Technique des Bois Tropicaux (International Technical Tropical Timber Association)
ATFI:	Association of Timber and Forest Industries of Cameroon
CENADEFOR:	National Centre for Forestry Development
CIRAD:	Centre International des recherches agricoles pour le Développement
CITES:	Convention on the International Trade in Endangered Plants and Animal Species
CTFT:	Tropical Forests Technical Centre
COMCAM:	Database on trade wood
EEI:	Number of stems which will be logged (exploited) during the first rotation
EER:	Number of stems which will be logged (exploited) during the second rotation
EC:	European Commission
EU:	European Union
FAO:	International organisation for Food and agriculture
FLEGT:	Forest Law Enforcement, Governance and Trade
FSDF:	Special Fund for Forest Development
FMU:	Forest Management Unit
FSC:	Forest Steward Council
GDC:	General Division for Customs
GNT:	Groupe National de Travail
IFIA:	Interafrican Forest Industries Association
IRAD:	Institute for Agricultural Research and Development
ITTO:	International Tropical Timber Organization
IUCN:	World Alliance for Nature/International Union for Nature Conservation
MED:	Minimum Exploitable Diameter
MED/ADM:	Minimum Exploitable Diameter fixed by the forest administration

MED/AME:	Minimum Exploitable Diameter proposed by the manager (forest company)
MINEF:	Ministry of Environment and Forest
MINEFI:	Ministry of Economy and Finance
MINFOF:	Ministry of Forestry and Wildlife
MMD:	Minimum Managed Diameter
NTFP:	Non Timber Forest Products
NDF:	Non-Detriment Findings
PCI:	Principles, Criterion, and Indicators
PSFE:	Forest and Environment Sectorial Program
PSRF:	Forest Revenue Enhancement Program
Re:	Reconstitution rate
SIGIF:	Database on timber logging
TIAMA:	Computer treatment applied to forest management
UCC:	Central Unit for Control
VER:	Volume of stems which will be logged during the next (second) rotation
WRI:	World Resources Institute

EXECUTIVE SUMMARY

Pericopsis elata (Harms) van Meeuwen known under its trade/pilot names of Assamela or Afrormosia is classified by the World Alliance for Nature (IUCN) as endangered species, which led to its listing in the Appendix II of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). The annual quota of export volume for Cameroon is 15,200 m^3 while the girth limit or the administrative exploitable diameter was fixed by the Government at 100 cm.

The main objective of this report was to gather and analyse data for dressing a Non-Detriment Findings (NDF) Report on *Pericopsis elata* in Cameroon. The specific objectives are to summarize the basic information on this plant species, its management, utilization, control and trade, and to define suitable quotas for non-detriment findings. The report was dressed based on data recorded within the ongoing "ITTO – CITES Program for Implementing CITES Listings of Tropical Timber Species" in Cameroon. The program has received funding from the European Commission, United States of America, Japan, Norway and New Zealand.

In Cameroon, all the legal and technical instruments for the sustainable management of natural production forests are available and are of a good quality. The only problem of Cameroon is in the real implementation, or making people apply the official rules. The basis of restoration and alleviation measures is outlined in element 5, article 6 of the order No 0222 / MINEF / *of 25 May 2001*on the modalities of forest management plan and inventories: calculation of the forest possibility and determination of the managed minimum exploitable diameter.

The distribution area of *Pericopsis elata* is 5 339 023 ha, more large than the 4 855 738 ha outlined in the literature. This area is largely restricted to the East region of the country, the moist semi-deciduous forest with annual rainfall of 1 000 – 1 500 mm being its specific habitat. Density of Assamela is 0.53 stems/ha and the annual possibility is 34 183 m3 at minimum exploitable diameter (MED) 100 cm instead of 45 000 m3 as often used by Cameroon CITES management authority. Three diameters can be proposed to the discretion of the Cameroon government as MED: 80 cm, 90 cm, or 100 cm. The best diameter which conciliates both the ecological and economic concerns is diameter 90 cm. This MED takes in consideration, the precautionary principle of the CITES. If adopted by the Cameroon government, MED 90 cm will produce an exploitable volume of 1 791 646 m^3 and an annual possibility of 59 722 $m^{3.}$ of Assamela in production forests. The Assamela processing rate is 0.4242 instead of 0.33 as often used. This processing rate leads to an export quota of 14 400 m^3 at MED 100 cm instead of 15 200 m^3 and 25 334.07 m^3 at MED 90 cm. Since 2000, the national quota has never rich 8 000 m^3 (52.6% of the export quota). This is due to the fact that, timber companies do not get good quality wood for export. The individuals of Assamela at diameter ≥ 100 cm are wilting, and stems of many of them are rotten. Those individuals are therefore often abandoned in the forest, which lead to an economic loss for both the forest company and the Cameroon government. With the new MED (90 cm), we hope this problem will be mitigated and timber companies will exceed 70% of the export quota.

Cameroon signed the CITES Convention in June 1981 and ratified it in September of the same year. To guarantee the effective implementation of this Convention, and in pursuance of the relevant provisions of its Articles 8 and 9, Cameroon adopted a number of legislations composed of tree major measures: (1) Decree n° 2005/2869/PM of 29 July 2005 setting forth the enactment provisions of a number of provisions of the Convention on the International Trade in Endangered Species (CITES), (2) Ministerial Order N° 067/PM of 27 June 2006 providing the organisational set-up and operational procedure of the Inter-ministerial Coordination and Monitoring Committee for the implementation of the Convention on the

International Trade in Endangered Species (CITES), (3) Decision N° 0104/D/MINFOF/SG/DF/SDAFF/SN of 02 March 2006 providing the designation and definition of role of the CITES Scientific Authority in Cameroon. The adoption of these regulations bears witness, if need be, of the ownership process of the CITES Convention by Cameroon at national level. However, studies conducted reveal that the implementation of CITES and the European Commission regulations remains problematic in Cameroon. In fact, the study revealed that, the regulation related the implementation of CITES in Cameroon is incomplete because there is no lists/appendixes of CITES species; the modalities of issuance of certificates and the content of the documents are not clarified yet. It is therefore urgent to clarify such worst situation and to enact additional instruments.

Control of timber exploitation, trade and exportation is the main responsibility of the Ministry of Forestry and Wildlife. Many problems are observed on the chain of control of timber products from the forest up to the exit ports at Douala. Even at the ports, accessibility is difficult for the forest officers who encounter many problems with custom agents. There is little linkage between the main databases (SIGIF and COMCAM) that gather statistical data on forest products. Anyway, Cameroon is currently engaged in negotiations with the European Union to reach a Voluntary Partnership Agreement (APV/FLEGT) to improve the governance and transparency of the timber trade between the two partners. This will contribute to mitigate monitoring limits and combat the illegal logging

The main recommendations raised from different studies conducted within the ITTO/CITES project in Cameroon included:
(1) for what concerns monitoring and control: the re-organization of the control and monitoring system as outlined in the Forest and Environment Sector Programme (PSFE), development of a database encompassing logging, processing, transportation and trade statistics components, the provision of adequate materials and logistics for data collection and analysis and the training and sensitization of forest and custom officers at different levels;
(2) for problems related to CITES provisions, the first option which does not lead automatically abrogates of the 2005 Decree, consists by complementing the current CITES regulation in Cameroon. In fact, the study revealed that, the regulation related the implementation of CITES in Cameroon is incomplete because there is no lists/appendixes of CITES species; the modalities of issuance of certificates and the content of the documents are not clarified yet. It is therefore urgent to clarify such worst situation and to enact additional instruments. The second option should consist of the abolition of the Decree No 2005 / 2869 / PM of July 29th, 2005 and the order No 067 / PM of June 27th, 2006. The abolition of these two texts would be justified on the fact that the lists/ appendixes of species and modalities of issuance of documents are fundamental elements in the framework of the CITES Convention. The third recommendation should be the readjustment of the 1994 forestry law and the order No 0222 / MINEF / on the modalities of forest management plan and inventories. This would consist for example in setting specific management plans for assamela in the corresponding FMUs, and also by transforming the CITES management Authority into a special unit in charge of control of inventories, logging, processing, transport and trade to enhance coherent and timely information gathering and analysis.
(3) for what concerns the management of *P. elata:* increase knowledge of the stock of Assamela existing in protect areas, improve the knowledge on the wood quality of Assamela, adopt of a new Minimum Exploitable Diameter (90 cm), conduct inventories as to verify the credibility of the formula often used to calculate the reconstitution (recovery) rate, improve knowledge on the sylviculture of *P. elata,*
(4) for what concerns the management of the harvest of assamela, base the determination of assamela quotas on an individual basis (harvest quotas for individual FMUs, and next export

quotas for corresponding timber plants), using formulas and methodology developed in the course of the present NDF. This would help taking into account the fact that assamela is not uniformely distributed in its area and that its harvest should be banned in specific FMUs (where it is very scarce);
(5) for what concerns the CITES scientific authority (ANAFOR), enhance its capacities in terms of infrastructures, technical know how, and funds necessary for regularly making fair non-detriment findings for assamela and other CITES listed plant species.

0. INTRODUCTION

Pericopsis elata (Harms) van Meeuwen belongs to the Fabaceae family group of plants and is known under its trade/pilot name as Afrormosia or Assamela. It is a tree species of the close, Guinean-Congolese forest type. Its natural range is discontinued, with several isolated sub-stands in Ghana, Côte d'Ivoire, South-eastern Cameroon, Northern Congo, the North-eastern portion of the Democratic Republic of Congo, and the South-Western portion of the Central African Republic (CAR).

Pericopsis elata is classified by the World Alliance for Nature (IUCN) as endangered species, which led to its listing in the Appendix II of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). This decision had a significant impact on the revenues produced from this value timber species in the range countries.

As it is, the species is indeed endangered and has become all but locally extinct in some countries where the exploitation and international trade in this species had begun some 55 years ago. Significant stocks of the species still exist, however, in the Congo Basin, including Cameroon, CAR, Congo, and the Democratic Republic of the Congo.

The review of the significant trade (CITES 2003) proposed that Cameroon should be listed in the Category 'Species of possible concern'. This is a category of countries for which it is not clear whether or not the provisions of Article V, paragraphs 2 (a) or 3 of the CITES are being implemented.

In various African countries, policies have been established to ensure the sustainable management of forests having Afrormosia stands in them. However, enforcement issues and control problems do persist. The development of clear procedures to deliver non-detriment findings (NDFs) remains a priority for most producer countries (CITES 2003).

A key requirement of CITES is the non-detriment finding made by the Scientific Authority of the range State prior to export, certifying that export is not detrimental to the survival of the species. This requires information on the location, stocking, growth and condition of the species and on its ecology, regeneration and subsequent protection. Such information is often lacking, incomplete or imprecise making a proper evaluation of the sustainable levels of utilisation and conditions attached to be difficult. The Scientific Authorities also face obstacles due to inadequately trained and resourced staff.

Another key requirement is that the designated Management Authority must certify that exports have been obtained legally, yet they often lack adequately trained staff and resources to implement tracking and compliance systems.

As a response of some questions formulated by both CITES and the European Union (through its Scientific Review Group), the Cameroon government has produced two reports (MINEF 2002, 2004a) as to demonstrate that export volumes of Assamela have been obtained legally and are compatible with the initial stocking and conservation of that tree species in the country. The first report was addressed in 2002, while the second was sent in 2004. Those reports which were dressed by the CITES management authority, lacked accurate and scientific data.

The National Forest Development Agency (ANAFOR) was appointed to play the role of the CITES scientific authority for plants issues by Decision N° 0104/D/MINFOF/SG/DF/SDAFF/SN of 02 March 2006, providing the designation and definition of role of the CITES Scientific Authority in Cameroon.

This work aims to gather and analyse data for dressing a non-detriment findings report on *Pericopsis elata* in Cameroon. The main objectives are to summarize the basic information on this plant species, its management, utilization and trade, and to present a comprehensive description on the procedure followed to make the non-detriment findings for *P. elata*.

I. MATERIAL AND METHOD

This section presents the milieu and the logical steps and procedures followed to make the non detriment findings.

1.1. **Study area**

The Congo Basin is one of the two most extensive forest continue at global level, second only to the Amazon basin; it epitomizes the dialectics of conservation and forest use for sustainable development. Because forests provide both a source of income and a life-supporting environment to many peoples, forest use and exploitation and even forest conservation pose more complex challenges.

Cameroon belongs to the Congo basin, it is located at the centre of Africa near the Equator and covers about 475,000 km^2. It totals about 16.5 millions ha of dense rainforests. The flora component (higher plants) has 7,000 species of which 300 are woody plants, ranking Cameroon 4th in Africa after the Democratic Republic of Congo, Tanzania, and Madagascar (MINEF 1995). From South to North, there are various types of tropical rainforests, humid savannah, forest galleries, dry forests, dry savannah, steppes and yaeres. Apart from these natural ecosystems, there are also man-made agro-ecosystems (Letouzey, 1968; 1985). Figure 1 illustrates the main phytogeographical regions found in Cameroon including: the shrubbery steppe in the Far-north region, the wooded savannah in the North region, the forest savannah in the Adamaoua and West regions, the transition forests in the Adamoua and East regions, the semi-deciduous forests in the East and South regions, the mangrove and evergreen forests in the Littoral and South west regions (MINEF 1995).Cameroon's phytogeographical map can also be classified as follow: afromountain region, in South west, west and north west regions, the soudano-zambezian region in the North and Far north regions, the Guineo-congolease region found mainly in the Centre, South, south west and East regions, the Dja Congolese district found in the East and south regions, and the pery-forest savannah found in the Adamaoua region (Letouzey cit. Sonké 1998).

Cameroon is often considered as Africa in miniature due to its large variety of ecosystems and climates. The various ecosystems have always been inhabited by Cameroonians who have, some how, reshaped them through the years by harvesting this rich biodiversity for food, medication, construction of houses, etc…. The rate at which they are used varies from rural areas to towns.

According to the Cameroon's minister of forestry and wildlife, "the forest sector of Cameroon contributes to some 30% of total non-oil export revenues. Presently, the timber industry ranks first in terms of exported goods deadweight and accounts for 20% of the total value of exported goods. Its contribution to GDP rose from 4.3% in 1992 to 8% in 1999 and is currently exceeding 12%. It directly and indirectly employs 90,000 persons. This development potential can only become sustainable within a participatory management plan articulated both outside and inside the country" (Ngolle Ngolle 2008).

The utilization of resources is not always rational and sustainable thus constituting a threat to biodiversity. Systems of farming such as slash – and – burn agriculture constitute the major cause of the destruction of the tropical forest, recognised as a real reservoir of biological diversity. It is also important to note that poaching which used to check animal populations has now become a real bane of wildlife. Activities of forest logging are viewed as one of the main cause of intensive poaching and commercial hunting (Betti, 2004; MINEF, 1995).

Among the ten regions of Cameroon, six, namely the Centre (Yaoundé being the capital), East (Bertoua), Littoral (Douala), South (Ebolowa), Southwest (Buea) and West (Bafoussam) regions, are situated in the forest zone where logging and "wild sawing" are restricted. The

three Northern regions, namely the Adamaoua (Ngaoundéré), the North (Garoua) and the Far North (Maroua) regions, are situated in the savannah area, that is mostly concerned with sport hunting activities and, which are supplied with wood coming from Southern part of the country.

In Cameroon the distribution of *Pericopsis elata* is largely restricted to the East region.

The East region of Cameroon is largely covered by the semi-deciduous and the transition forests, and is referred as the main reserve of timber resources in the country. In fact, the region contributed for about 53.5 % of the total volume of timber produced in Cameroon (MINEFI, 2006). This region also contributes for about 3 billions of FCFA as the felling taxes per year (Mr Mbandji, the East Provincial Delegate of Forest and Wildlife in 2007, pers. Com.).

1.2. Method/procedures followed to make NDF

Data presented in this document are based on the previous reports dealing with non detriment findings on *Pericopsis elata* in Cameroon presented at the "International Expert Workshop on Non detriment findings" held in Cancùn/Mexico, 17-22 November 2008 (Betti 2008) and at the XIII th World Forest Congress held in Buenos Aires, Argentina, 18 – 23 October 2009 (Betti 2009a, b). Those data were updated according to the results obtained during the ongoing "ITTO – CITES Program for Implementing CITES Listings of Tropical Timber Species".

1.2.1. ITTO – CITES program in nutshell

The overall objective of the ITTO – CITES Program (ITTO – CITES 2006) is to ensure that continuing international trade in CITES-listed timber species is consistent with their sustainable management and conservation. The specific objective is to assist national authorities to meet the scientific, administrative and legal requirements for managing and regulating trade in *Pericopsis elata* (Afrormosia) – found in Central Africa, *Swietenia macrophylla* (Bigleaf mahogany) – found in Latin America, and *Gonystylus* spp. (Ramin) – found in South East Asia and, in particular, to develop guidance to ensure that utilisation is not detrimental to the survival of CITES-listed timber species.

The program has received funding from the European Commission, United States of America, Japan, Norway and New Zealand. The European Commission provided a grant worth 2.4 million euros for program implementation, with over US$ 800,000 dollars provided from the other donors in aggregate. The EC grant duration is until mid-2010 and ITTO will seek additional funds from donors so this popular program can continue into 2011. The USA has indicated an on-going interest in continuing to provide funds to this program. ITTO will encourage other donors to do so as well since requests for support under the program now exceed available resources.

This action responds to calls made in both the ITTO Council and CITES Conference of the Parties for support to range states for implementation of CITES listings, and in particular will support a work programme element of the ITTO. The listing of commercial timber species is a relatively recent phenomenon in CITES, which brings new challenges of both a technical and institutional nature for organisations involved in forest management and the timber trade

1.2.2. Regional CITES training workshop

The first activity launched within the ITTO/CITES regional programme in Africa *"Ensuring international trade on Pericopsis elata is not detrimental to its conservation in the Congo basin",* was the Kribi workshop. In fact, ITTO and the CITES secretariat convened a regional workshop in Kribi, Cameroon on 2-4 April 2008, to develop a participatory action plan to

ensure that international trade in *Pericopsis elata* (Assamela/Afrormosia) is consistent with its sustainable management and conservation in Africa. The workshop involved over 30 participants from all the main range states in Central and West Africa as well as importing countries. Representatives of NGOs, timber trade interests and international organizations also participated.

During that workshop, several questions from both timber companies and forest administration parties, raised regarding the sustainable management of *P. elata* in Africa. Pertaining to Cameroon, following questions raised: What is the real distribution area of *P. elata* in Cameroon? What is the real density of *P. elata* in Cameroon? At what minimum exploitable diameter (MED) *P. elata*, should be logged as to maximise both the conservation and the economic interests? (Timber companies solicited to reduce that MED as to maximise the economic interest). What is the national possibility? What is the average processing rate *P. elata*? What can be the national quota? Which difficulties Cameroon government faces to really implement the both CITES provisions and the European Union regulations in the country? What is the state of the art in terms of timber production, processing, trade, monitoring and statistics on *P. elata*?

1.2.3. Cameroon activities

Recognizing the shortcomings in scientific information related to those questions, the government of Cameroon has submitted to the International Tropical Timber Organization (ITTO) for funding two activities including (1) management of *P. elata* in forest concessions and (2) management of *P. elata* in forest plantations.

The Steering Committee (or National Technical Committee) of the project held its first meeting on 6 February 2009, once the Cameroon Government received the first instalment of funding from ITTO (100 000 US $). Two main recommendations were formulated by the members of the Committee: (1) ANAFOR, the Scientific authority and the implementing Agency of the project, should profit of this ITTO/CITES initiative to draft by the beginning of the second semester 2009, a NDF report on *P. elata*, and (2) ANAFOR should profit of this project to constitutes a framework were scientists from different institutions will assist its officers in gathering scientific data and dressing NDF reports, not only for *P. elata*, but also for other important timber or non timber plant species. Pertaining to the first recommendation, it is interesting remind that, since October 2008, the Ministry of Forests and Wildlife, acting as the CITES management organ, was urging ANAFOR to send its NDF report as to allow Cameroon to export products from *P. elata*. In fact, important volume of *P. elata* was stocked in the Douala port, waiting for the CITES Scientific report before exportation. ANAFOR was hesitating to send such a report, without getting a real situation on the management measures and forest possibility regarding *P. elata* in Cameroon. This situation created confusions and misunderstandings between the two CITES bodies (Betti 2009c).

Following the recommendations of the Steering Committee, the Regional Coordinator assisted ANAFOR to go fast in the implementation of the specific activities identified in the project. This consisted of drafting Terms of References (ToR) of specific activities, identifying national experts, dressing contracts. A total of 08 terms of references (ToR) and 08 Contracts directly related to the implementation of specific activities have been dressed and signed by ANAFOR on 25 February 2009 including: (1) study on the processing rate of *P. elata* in Cameroon, (2) study on the state-of-the-art on the logging, transport, processing, domestic trade and exportation of *P. elata, (3)* inventory (or stock) of *P. elata* in forest concessions, (4) research on biological and ecological aspects of *P. elata* in natural forest and forest concessions, (5) study of the policy framework for the implementation of the CITES and the European Commission regulations, (6) study of the soils and litter properties related to *P.*

elata in natural forests and plantations as important tool for sylviculture, (7) state of the art and elaboration of the simple management plans and business plan for *P. elata* plantations or plots in Cameroon, (8) research on biology, ecology and sylviculture of *P. elata* in forest plantations. The ToRs N° 1 - 5 concern the activity on forest concessions, and the ToR N° 7 and 8 were restricted to the activity on forest plantations. The 6th ToR (or expert) was identified to cover the two activities (concessions and plantations). In addition to those ToRs, nine MSc students from universities of Douala (03) and Dschang (06) were selected to conduct their thesis on specific items related to the two activities.

Early in the beginning of March 2009, the first experts sent in the field encountered many problems with some timber companies. These companies were reluctant to the implementation of the project, since they were not informed of the ITTO/CITES project. This problem was due to the lack of communication between the Association of Timber and Forest Industries (ATFI) of Cameroon, partner of the project, and its members. Also, many of those companies are not memebers of this Association. As a response to this problem, the MINFOF sent a circular letter to all timber companies, inviting them to welcome the project and to collaborate with the experts committed to conduct studies within this project. This letter was not enough to convince timber companies, who though that the project aims to control their activities and to ban the logging of Assamela. Face to this situation, the implementing agency, ANAFOR, together with the Regional Coordinator (RC) and the CITES management authority (CMA) organized several trips in the field to sensitize timber companies, local forest officers, and local communities (for what concerns the forest plantations) on the aims of the ITTO/CITES project in Cameroon. The first team went to Douala to sensitize the General Directors of the timber companies, the second team went to Kribi to sensitize local communities settled around the *P. elata* forest plantation, and the third team went to the east region to discuss with forest officers and timber companies representatives.

The trip in the east region was finalized on 20 March 2009, with a big meeting of understanding between ANAFOR and other stake holders of the project at Bertoua, the capital of the east region. The Bertoua meeting aimed once more to sensitize timber companies on the commencement of the project in their forest management units. As a result of the meeting, timber companies agreed to welcome the experts of the project in their concessions, and to give some supports to experts while they are in their forests. This support can consist of fuel for the vehicle or the prospectors for data collection.

One month later (April 2009), the RC went to discuss with some timber companies and local communities in the Kadei and Boumba & Ngoko divisions, east region. He gave further clarifications on the ITTO/CITES initiative and gathered opinions of forest companies on the state of the trade and logging on *Pericopsis elata*. He also prepared foresters to welcome the trip of MSc. students from the University of Dschang (7 students), scheduled by the beginning of May 2009, and the second trip of MSc students from the University of Douala (3 students) scheduled by the middle of July 2009.

The relative reluctance of timber companies mentioned above created a little delay and the NDF report could not be available by the beginning of the second semester 2009 as requested. However, the two activities funded for Cameroon are still on schedule according to the Work Plan (Betti opcit.).

II. BIOLOGICAL DATA

2.1. Distribution of *Pericopsis elata* in Africa

Pericopsis elata belongs to the Fabaceae family group of species, known under its trade/pilot name as Afrormosia or Assamela. It is a tree species of the close, Guinean-Congolese forest type. Its natural range is discontinued, with several isolated sub-stands in four different areas (Vivien et Faure 1985) including: (1) East of Côte d'Ivoire – west of Ghana, (2) the west of Nigeria and Cameroon, (3) the Sangha – Ngoko basin, and (4) central basin of the Democratic Republic of Congo (DRC).

2.2. Scientific and common names

Different vernacular names are used to design *Pericopsis elata* within the range areas where the plant occurs: Obang by the Bangantou ethnic group and Nguep by the Mvong-mvong ethnic group, in the Boumba Ngoko division in the East region, Nom eyen by the Mbulu ethnic group in the south region, and Mobay by the Baka pygmies settled in the south and south east of the country (Vivien et Faure 1985).

2.3. Distribution of *Pericopsis elata* in Cameroon

In Cameroon the distribution of *Pericopsis elata* is largely restricted to the East region of the country in the Dja, Boumba, Ngoko, and Sangha river basins (see figure 2). This main area of distribution was previously estimated approximately to 4 071 857 ha (MINEF 2004a, CENADEFOR-CTFT 1983, 1985, Vivien et Faure 1985) and represented about 19% of the national forest domain. There are also some small and isolated stains in the south (Dja et Lobo, Ntem, and Ocean divisions), Centre (Ndom division) and South west (Manfé) regions (CENADEFOR-CTFT 1983, Vivien et Faure 1985).

In the east region, *P. elata* is largely found in three divisions including, the Boumba & Ngoko, Haut-Nyong, and Kadei. This area is largely composed of three main forest types including: the semi-deciduous forests of Sterculiaceae and Ulmaceae, mix forests (sempervirent or evergreen and deciduous) with a predominance of elements of the semi-deciduous forest, and mix forest (evergreen and semi-deciduous) with predominance of the Dja forests. Aside of these tree forest types, there are also many other forest types, which are disseminated all over the area of *Pericopsis elata*. They include: the swamp forests, the mono dominant forests of *Gilbertiodendron dewevrei*, secondary forests on former logging sites and dominated by light demand plant species such as *Alstonia boonei*, *Macaranga spp*, *Musanga cecropioides*, *Terminalia superba*, forests on rocks or inselbergs dominated with *Croton mayumbensis*, *Oncoba crepiniaina*, drained forets along rivers as sangha, Boumba, Lobéké inhabited with *Uapaca heudelotii* and *Guibourtia demeusei*, ripicol forest of *Irvingia smithii*, *Trichilia retusa* and *Cathormion altissimum*, and swamp forest of *Raphia laurentii* and *Phoenix reclinata* (MINEF 2004b, MINFOF 2007a).

Data collected from different documents (management plans) tend to show that, the area of distribution of *Pericopsis elata* is more important than what was previously said by Vivien et Faure (1985). This area also covers an important part of the Kadey division, including the Bimba village in the north of Mbang (Betti 2008, Belinga 2009).

But we are not in position to tell if or not, the distribution area of Assamela has increased. May be, Vivien and Faure who first drew the distribution map of *Pericopsis elata* in Cameroon did not covered those zones during their botanical expeditions.

2.4. Biological characteristics

2.4.1. Life history

Pericopsis elata is a semi-gregarious species with a limited but widely dispersed distribution. It is locally abundant in parts of its main range. *P. elata* is a high tree, up to 20 m that can rich 1.3 m of diameter at breast high. The trunk is tortuous and irregular. Trees with high diameter are often hollow or rotten in their heart (Vivien et Faure 1985, Bourland 2008). The bark is more characteristic (0.5-1 cm), greyish and smooth. The trunk has brown to reddish stains. The slice of the trunk is yellow to orange, with an external green ring. The sapwood is well differentiated, yellow (1-2 cm). The wood is brown yellowish. Leaves are light, on horizontal branches. Leaves are deciduous, composed of 7-11 small leaves (follioles in French). Fruits consist of linear indehiscent pods, with brown and smooth surface (Vivien et Faure 1985).

The lack of natural regeneration for this species has been widely noted by many authors. Forni (1997) and Bourland (2008) reported low recruitment and regeneration levels under closed canopy conditions in unexploited forest in East region of Cameroon. The natural regeneration depends on the light conditions. This regeneration is high in areas where forest logging and forest roads have been realized (Kabala et al. 2008). In natural regeneration experiments, it has been observed that the seedlings of *P. elata* are scarce no matter the overhead canopy is light, medium or dense. It has been suggested that, insect damage to the seeds may be the cause of the scarcity of regeneration. But it is not thought that this species is more liable to insect damage than others especially as its germination period is short. Growth is slow in early youth, but increases when overhead light is available (Dei-Amoah & Cardoso 2008). It is said that a noticeable amount of natural regeneration for *P. elata* depends on some conditions such as: sufficient number of mother trees, ripe and abundant fruits, and sufficient quantity of seed, a soil well drained, and an optimal light of more than 40% (Peters 1994 cit. Kabala et al. 2008). However, natural seedlings are remarkably rare. *P. elata* produces flowers every year or every two years at the minor rainy season (March – May). Ripe and indehiscent pods, are wind-dispersed in strong winds and are produced from January to April (Bourland 2008). Each pod contains (Vivien et Faure op cit.) between 1-4 flat seeds (with diameter 1-1.5 cm). Seedlings are reported to be drought tolerant. In early youth it is tolerant of overhead shade but would appear to be a light demander later (Dei-Amoah & Cardoso 2008).

2.4.2. Habitat type

Pericopsis elata is a light demand plant species. The species occurs in 9 different forest stratums in the East and South regions of Cameroon (see table 1). In the South region, *Pericopsis* is only found in the humid dense forests on soil. In the East region, *Pericopsis* is found in humid dense forests and others forest habitats. The moist semi-deciduous forests with annual rainfall of 1000 – 1500 mm seem to be the specific habitat type where occurs *P. elata* in Cameroon (CENADEFOR-CTFT 1983, 1985). *Pericopsis elata* is semi gregarious to gregarious tree and uses to grow on flat ground, valleys and slopes. It is found in high density along rivers (Vivien et Faure 1985). *P. elata* is a true pioneer species, stimulated to germinate by gaps in the canopy (Forni 1997, MINEF 2004a, Dei-Amoah & Cardoso 2008, Dimanche & Regner 2008, Kabala et al. 2008). This plant species accepts soils of "Reddish-yellow latosols", with an annual temperature of 23 – 26°C (Kabala et al. 2008).

Table 1: Distribution of *Pericopsis elata* in different forest stratums and habitat types in East and South regions in Cameroon, data extracted from the Forest Resources National Inventory (CENADEFOR –CTFT 1983 & 1985).

REGION	STRATUM	SPECIFIC HABITAT TYPE	DIAMETER 20 – 40 CM (stem ha^{-1})	DIAMETER SUP. 40 CM (stem ha^{-1})	OBSERVATION threatened if density < 0.05stems/ha according to API project
SOUTH	The Dja forests	Humid dense forest on soil	0.00	0.01	threatened
	Mix forests with the Dja and semi-deciduous forests	Humid dense forest on soil	0.00	0.01	threatened
	Power Atlantic forest	Humid dense forest on soil	0.00	0.01	threatened
	Mix forest with dominant semi-deciduous species	Humid dense forest on soil	0.00	0.01	threatened
	Typical Caesalpiniaceae forest (Cristal mount)	Humid dense forest on soil	0.00	0.01	threatened
EAST	Evergreen forest of Irvingiaceae	Humid dense forest on soil and other forest habitats	0.02	0.23	not threatened
	Evergreen forest of *Gilbertiodendron dewevrei*	Humid dense forest on soil	0.00	0.01	threatened
	Transition forest	Humid dense forest on soil and other forest habitats	0.03	0.18	
	Semi-deciduous forest	Humid dense forest on soil and other forest habitats	0.06	0.61	

2.5. Population

2.5.1. Global population size

According to Pilot Integrated Management project (API project) which have been working in the East region of Cameroon for a long time, a plant species is said to be threatened if its medium density is less than 0.05 stem/ha (Forni 1997). This argument has often been used by the forest administration to claim that *Pericopsis elata* is not threatened in Cameroon (MINEF 2002, 2004). If we consider this assumption, we can said that *Pericopsis elata* is threatened in the South region of Cameroon, where it occurs with densities less than 0.02 stem/ha in all forests stratums and habitat types, and for diameter classes ≥ 20 cm (CENADEFOR-CTFT 1983). This is not the case for the East region (CENADEFOR-CTFT 1985). In fact, except for the Evergreen forest of *Gilbertiodendron dewevrei* where the density is less than 0.02 stem/ha, *P. elata* is well represented in the East region of Cameroon, particularly in the semi-

deciduous forests where it occurs with densities of 0.66 stem/ha for diameter classes ≥ 20 cm. For this reason, permits for exploitation of *Pericopsis elata* have never been attributed for the south region.

The recent national forest resources assessment conducted by FAO from 2003 to 2004 gives the density of 0.03 stem/ha for *Pericopsis elata* in the whole country, which tends to show that this plant species is vulnerable in Cameroon (MINEF - FAO 2005). This low density may be due to the fact that, the 2003 inventory covered many ecological zones of Cameroon, including those where *P. elata* does not occur. Also, this density includes trees with diameter less than 20 cm.

2.5.2. Current global population and population trends at both subnational (regional) and local scales.

2.5.2.1. Problem

Cameroon government encounters many problems in estimating the real density of Assamela in Cameroon. The CENADEFOR – CTFT's inventory is too old (1983, 1985), and the recent national inventory conducted by FAO (MINEF – FAO 2005) only gives result at the national scale. Detail results at the regional and local (FMU) scales remain problematic. To bring answers to some questions asked by the CITES Secretariat, Cameroon government uses to compile data obtained from different documents of the management plans as to get an idea on the abundance and stocks of *P. elata* in Cameroon. The problem is that, those data are produced by timber companies themselves, and one cannot guarantee for their confidence (Betti 2007).

Following what precedes, we focus the analysis in the East region (region) of Cameroon, considered as the main reserve of *Pericopsis elata* timber in the country. Population trends will be examined based on the CENADEFOR – CTFT (1983, 1985) and data obtained within the current ITTO/CITES activity in the forest concessions.

2.5.2.2. The CENADEFOR – CTFT's inventory.

During the second phase of the Forest Resources National Inventory (CENADEFOR – CTFT 1985, 1986), the National Centre for Forestry Development (CENADEFOR) delimited the East region in 6 forest blocs, with numbers from 6 to 11. The delimitation was not only based on ecological or floristic conditions, but also on physic and other considerations. A total of 23 Forest Management Units (FMU) are currently logged by timber companies in the main surface area of Assamela identified by the Forest Resources National Inventory (CENADEFOR – CTFT opcit.) in the East region of Cameroon. Those FMU are distributed as follow in different blocs: bloc 7 (2 FMU), bloc 8 (7), bloc 9 (1), bloc 10 (8), bloc 11 (5), and bloc 6 (0). Table 2 shows estimated densities of *P. elata* trees with diameter high than 40 cm in the six forest blocs.

The following Forest Management Units 10 026 (ALPICAM), 10 038 (CAMBOIS), 10 039 (PALLISCO), 10 054 (SFID) and 10 056 (SFID), which also contain important stocks of *Pericopsis elata* in the East region of Cameroon, are not included in this analysis. These FMU were covered with the fourth phase of the national inventory. They are found in the Kadei division. The analysis does not also include Assamela found in the sales of standing volume (Ventes de coupe in French) n° 10 01 153, 10 03 115, and 10 01 116.

Table 2. Distribution of Assamela density in different blocs in the East region of Cameroon

BLOC N°	DENOMINATION	SURFACE AREA (ha)	FMU	Density for stems of diameter ≥ 40 cm (stem ha^{-1})	OBSERVATIONS
6	Haut-Nyong South	528 750.00	-	0.00	
7	Haut-Nyong Centre	431 250.00	10 029, 10 037	0.045	Nki national park
8	Boumba–Ngoko and Haut-Nyong	731 250.00	10 018, 10 020, 10 021, 10 022, 10 023, 10 030, 10 031	0.45	
9	Boumba–Ngoko South-West	675 000.00	10 015	0.36	Boumba bek (321 076 ha) & Nki national parcs
10	Boumba–Ngoko North-East	601 250.00	10 001, 10 002, 10 003, 10 004, 10 005, 10 007, 10 008, 10 009	0.22	
11	Boumba – Ngoko South-East	857 500.00	10 010, 10 011, 10 012, 10 063, 10 064	0.55	Lobéké national park (217 854 ha)
MEAN				0.27	

Figure 3 illustrates the population size map of *Pericopsis elata* in its main distribution area (Fauvet 2008). The map was drawn, based on the national resources inventory conducted in South Cameroon in 1983 and 1985 (CENADEFOR – CTFT 1983, 1985). For stems of diameter ≥ 40 cm, the density of Assamela ranges from 0.22 to 4.35 stems/ha. The high density being observed at the Yokadouma region, in the Boumba & Ngoko division.

2.5.2.3. The current ITTO/CITES activity results

One of the 08th experts selected by ANAFOR within the ITTO/CITES program in Cameroon was in charge of estimating the real density of Assamela in forest concessions. The expert was asked to verify the inventories conducted by timber companies based on the national standards ant take a clear position in term of the credibility and confidence on the Assamela density often presented in the document of the management plans. The expert was also asked to update the current distribution map of Assamela in Cameroon.

The results of that study are presented in the following sub-sections.

a. Density

The study reveals that, management inventories are conducted in the forest concessions in respect to the national standards. In fact, no significative differences were noted between the data of forest inventory obtained by timber companies and those obtained during this study (verification). This leads to the conclusion that, the results on the abundance of Assamela outlined in the documents of the management plans of logging companies can be considered

as credible and therefore be used to evaluate the stock (potential) of Assamela in the production forests of Cameroon (Belinga 2009).

Table 3 shows densities of Assamela in different FMU. This density is 0.53 stems/ha at subnational level (East region), and is not uniform within the distribution area of Assamela in Cameroon. Assamela is much more concentrated in some forests than in others. Indeed, it is almost rare in the FMU 10025 and 10041 (lower density of 0.01 stems / ha). In these FMU Assamela deserves to be banned from exploitation. It is abundant in FMU 10 038, 10 064, 10 021, 10 010, 10 030-10 031 and 10 001-2 - 3-4.

Table 3: Assamela's density per concession (FMU or communal forest) in the East region of Cameroon

FMU	Surface Area	Total number of stems with diameter ≥ 20 cm	Density for stems of diameter ≥ 20 cm (stem ha-1)
10001,2,3,4	198310	133682	0.67
10005	89320	41737	0.47
10007	113507	32277	0.28
10008	60053	23591	0.39
10009	88796	13156	0.15
10010	61760	44994	0.73
10011	60838	13252	0.22
10012	62597	22200	0.35
10015	50752	56351	0.36
10018	155421	18104	0.28
10020	65832	9 157	0.11
10021	82571	62957	0.88
10022	71533	10409	0.21
10023	48864	37978	0.65
10025	57996	90	0.00
10026	49595	87114	0.68

FMU	Surface Area	Total number of stems with diameter ≥ 20 cm	Density for stems of diameter ≥ 20 cm (stem ha-1)
10029	128449	8015	0.17
10030,31	46922	107946	0.89
10037	120959	5927	0.11
10038	51685	220003	1.51
10039	145585	6309	0.13
10041	47585	147	0.00
10063	64971	49414	0.72
10064	68933	97483	0.84
FC Moloundou	115900	6655	0.16
FC Yokadouma	42382	8965	0.40
Total	22204	1 117 914	0.53

b. Distribution area

Figure 4 illustrates the updated distribution map of Assamela in Cameroon. Assamela covers a total area of 5 339 023 ha, of which most are located in the Southeast region for an area of 4 856 738 ha, the rest in small isolated patches located in the southern regions around Djoum, the Center in the area between Ndom and Ngambe, south-west in Mamfe around Eyumedjock. This area is allocated as follows:

- 29 allocated FMUs covering 2 057 982 ha;
- 9 unallocated FMUs covering 895 492 ha;
- 3 community forests covering a total of 85 486 ha, of which 2 have their management plans implemented;
- 3 National Parks on 777 729 ha;
- 1 Integral Ecological Reserve of 51 797 ha;
- National Area covering 1 470 537 ha.

This area (5 339 023 ha) is more large than the 4 855 738 ha outlined in the literature and often used by the CITES management organ.

2.5.2.4. Trends

As table 3 shows, the density per hectare of Assamela in its range in Cameroon is about 0.53 stem/hectare. This density was calculated taking into account the range of Assamela and demonstrates that this species is well represented in Cameroon unlike estimations done by Vivien et Faure (1985) (0.00 to 0.01 stem / ha south-west and from 0.01 to 0.03 stems / ha in the area of Yokadouma) or FAO (2004) (0.05 stems / ha) considered this species as a rare tree species and thus to be prohibited from harvest.

We are not in position to say if or not, the density of Assamela has increased or reduced between 1983 (CENADEFOR – CTFT) or 1985 (Vivien et Faure opcit.) and now (current ITTO/CITES activity). The methods used were different and for specific purposes. For example, CENADEFOR report does not give detail information on densities in different classes of diameter. This would be appreciated if we got the raw data. These data are not available now. Also, the CENADEFOR – CTFT inventory only shows densities for stems with diameter high than 40 cm, while the current ITTO/CITES activity shows density for stems with diameter high than 20 cm. The 1983 - 1985 data do not represent the environment of the whole bloc, to authorize statistical analyses (CENADEFOR-CTFT 1985). Detail inventory data obtained from the CENADEFOR - CTFT's work as far as the national inventory conducted with the help of FAO in 2006 should be used and analysed, to get an idea on the current global population trends.

2.6. Conservation status

2.6.1. Global conservation status

Pericopsis elata is classified by the World Alliance for Nature (IUCN) as endangered species *(EN*), and listed in the appendix 2 of the Convention on the international trade in endangered species of wild fauna and flora (CITES) still called the Washington Convention.

2.6.2. National conservation status for Cameroon

A few general provisions for the management of Assamela have been taken by the forest administration. They include the minimum girth limit: 100 cm which is more than the limit fixed in other countries of the Central African sub-region (60 cm in the two Congo and 80 cm in Central African Republic), the marking of seed-trees (with a record of GPS coordinates for each one of them), adequate spatial distribution and artificial regeneration work undertaken in some management units. Cameroon government has considered *Pericopsis elata'*s as an 'exceptional' species.

2.6.3. Main threats within the case study country

Two main threats can be observed for *Pericopsis elata* in Cameroon: habitat loss/degradation through agriculture and mining, and illegal logging.

Habitat loss through agricultural activities is considered as one of the main threat on forest biodiversity in Cameroon. Large-scale agriculture and other human activities in the area are leading to the degradation of primary forests (UICN 1989; Betti 2002), thus causing "vulnerability" of the wild plants. According to IUCN (1989), the rate of deforestation in Cameroon is the most high in the Congo basin, with an annual rate of 0.5%.

Illegal logging, composed mainly of "wild sawing" is considered as one of the main threat on the forests of the Eastern region of Cameroon (Betti & Bobo 2007). However, it has been reported that, *P. elata* timber is almost absent in the "wild sawing" (Dickson et al. 2005, Tieguhong 2009).

There are some mining industries that are being developed in the distribution area of P. elata in the East region of Cameroon.

III. MANAGEMENT MEASURES

3.1. Management history

Cameroon is considered as the most advanced in terms of forest sector policy in the Congo basin (Carret 2000, Karsenty 2006). This means that Cameroon is the first country to have produced and implemented a good and coherent forest code in the sub-region, after the summit of the world (Rio de Janeiro in 1992). The important point to make is that all the legal and technical architectures for the sustainable management of Cameroon natural tropical forests has been designed:

- A modern forest code, putting in place natural forests sustainable management is in force since 1994;
- Technical Norms for forest operations are in force, for all private concessionaires are obliged to apply them;
- National Guidelines for forest management are available (and the arête 0222 put them into forcein the forest sector);
- Cameroon has designed its own principles, criteria and Indicators of sustainable management of natural tropical production forests (as an adaptation of ATO/ITTO PCI);
- From its national PCI, Cameroon has designed a monitoring and Evaluation manual for the sustainable management of production forests;
- Cameroon is executing a Forest Sector Programme, as a tool to fund the necessary activities related to support the execution of its forest policy and action plan;
- Cameroon has signed many agreements with multilateral partners related to a sound-based management of its forest sector (Voluntary partnership agreement with European Union, etc.);

As it can be observed, all the legal and technical instruments for the sustainable management of natural production forests are available and are of a good quality. The only problem of Cameroon is EXECUTING; making people apply the official rules.

Cameroon government through its forest administration acted in different logical steps to ensure the conservation of forest resources: the knowledge of the resource, the zoning of the country and affectation of different land uses, the enhancement of the forest and wildlife control, monitoring and revenues.

More than 25 years ago, Cameroon Government decided with the help of the international Community, to tackle the general problematic of sustainable forest development. The Government therefore first focused its efforts on the knowledge of the timber resource of the meridional or forest zone of the country. A national forest inventory has therefore been established, comprising 7 phases (figure 6). Four out of these phases have yet been finalised by the years 80, for a total forest bloc of 14 000 000 hectares, with the north limit situated at about 4th parallel. In fact, the basis work undertook within the national inventory conducted during the years 1980 (CENADEFOR – CTFT 1983, 1985) led to the elaboration of principal norms and technical tools for the management of the forest domain. These tools include: (1) the zoning plan of the meridional area (phases 1-4 of national inventory) which led to division of the forest zone in two main domain types, namely the permanent domain and the non-permanent domain, and (2) all norms related to the interventions in the forest milieu (production forests to be précised).

The non-permanent domain comprises the community forests, sales of standing volume (small forest concessions of not more than 2,500 ha), and mining zones. It is also composed of lands

affected for agricultural and other agroforestry activities (République du Cameroun 1994, 1995).

The permanent domain (République du Cameroun 1994, 1995) is divided into the domanial or state forests which belong to the State, and communal forests which belong to the private domain of the council. The states forests are themselves divided into production forests, protected areas, and forest reserves. Production forests are the most important in terms of surface area, 64% of the permanent domain, and 40% of the meridional zone. They are the type of forest affectation which interests us in this text. Production forests are mainly composed of big forest concessions. Each forest concession is composed of one or many forest of more than 5,000 ha, called the forest management units (FMU). The process of establishment (classification) of a FMU includes three main steps: (1) data collection and local consultations, (2) confection of the file and signature of the decree of establishment (décret de classement in french), and (3) boundary stone (bornage).

The forest logging is conducted in the country through the logging convention (convention d'exploitation in french) for what concerns the permanent domain, and through the management convention (convention de gestion) for what is done in the non-permanent domain. The attribution of these different conventions is subordinated by the validation of the management plan (forest concessions) or the simple management plans (community forests) by an Inter ministerial Committee presided by the forest administration.

Forest Management Units (FMU) are assigned to the sustainable production of the wood and other resources (non timber forest resources for example) in respect to the conditions that allow the preservation of ecological functions of the forest. More than 83 forest management units have been attributed for a total area of 1,835,367 ha in Cameroon.

When allocating the FMU to a given company, a preliminary three years convention is signed between the Forest administration and the forest company. The terms of this preliminary convention precise that the forest company has to produce within the three-years of the convention and before the definitive convention has been signed, three types of documents in respect to the norms and rules indicated in the forest law, and including: a management plan for the whole concession (FMU), a five-years management plan (for the forest logging unit), and the operation plan of the first year of activity. At the end of the preliminary convention, a definitive convention is then signed between the forest Company and the Cameroon government for a renewable period of 15 years. At any step of the elaboration of the management plan, the forest administration verifies what has been realised in the previous step before giving his quitus (ok) for the next step.

The forest law seeks to promote a sustainable exploitation of the timber (by the increase of the harvesting volume per hectare) and the non timber forest products, and also diversify and ensure high processing of forest resources. This does not only imply the settlement of appropriated and perform processing units (sawmills), but also requires the adequacy between the capacities of sawmills and the availability of the resources.

The measures undertook within the application of the new forest law have had a significant impact in the development of the forest sector. These measures and rules included: the ban of the exportation of logs for many plant species, the instauration of additional tax for the exportation of logs of the remaining plant species, the obligation for forest companies to settle a fair sawmill. Following these measures, the number of forest industries increased in the country, but the harvest volume per hectare did not increase more.

To ensure the contribution of the forest sector in the national economy, Cameroon government took two important measures: the allocation of FMU through a competitive

bidding process namely adjudication, and the creation of the Forest Revenues Enhancement Program (FREP). The competitive allocation of FMU ensures high revenues, while the creation of the FREP in 1999 aimed to secure those revenues and to combat taxes frauds. Such measures are known as main conditions, required to improve forest or environment taxes (Scholl 2005).

3.2. State of the management plans

The implementation of the management plan implies two main constraints for the company: the respect of specific part of the forest that has to be exploited (5 years blocs and annual plot) and the respect of the minimum exploitable diameter (MED).

Of the 29 forests assigned for timber production (27 FMU and 2 communal forests) in the distribution area of Assamela in the east region of Cameroon, 27 have finalised their management plans and have signed definitive management conventions with the forest administration (see table 4).

Table 4: List of concessions (FMU and communal forests) with a definitive management convention in 2007 and with *Pericopsis elata* (Belinga 2009, Betti 2008).

N° FMU	COMPANY	SURFACE AREA (ha)	CCONSULTANT FIRM WHICH ELABORATED THE DOCUMENT OF THE MANAGEMENT PLAN	ACCEPTATION DATE OF THE MANAGEMENT PLAN	OBSERVATIONS
10001, 2, 3,4	CFC	198310	LFIS	2003	Paired FMUs,
10005	STBK	89320	ETS MESS	2004	
10007	SEBEC	113507	ONADEF	2003	
10008	SEFAC	60053	Sté Barak	2005	
10009	SEFAC	88796	Sté Barak	2004	
10010	SEFAC	61760	Sté Barak	2006	
10011	SAB	60838	ONADEF	2003	
10012	SEFAC	62597	Sté Barak	2004	
10013	ALPICAM	50752	MEDINOF	being reviewed for approbation	
10015	CIBC	155421	ONADEF	2005	
10018	SIBAF	65832	ONADEF	2004	Transferred to STBK
10020	Ingénierie Forestière	82571	CCB	2004	
10021	Green Valley	71533	L FM	2004	Certified by FSC (Forest and wildlife Delegate of Haut-Nyong forest, pers. com.)
10022	SCIFO	48864	CIEFE	2004	
10023	SFCS	57996	LFP	2003	
10025	SFIL	49595	LFM	being reviewed for approbation	
10026	ALPICAM	128449	MEDINOF	2004	
10029	SFDB	46922	LFP	2004	
10030 et 31	R. PALLISCO	120959	En propre	2008	Paired FMUs
10037	KIEFFER	51685	LFP	2004	Abandoned
10038	CAMBOIS	145585	LFIS	2005	
10039	ASSENE NKOU	47585	En propre	2004	

N° FMU	COMPANY	SURFACE AREA (ha)	CCONSULTANT FIRM WHICH ELABORATED THE DOCUMENT OF THE MANAGEMENT PLAN	ACCEPTATION DATE OF THE MANAGEMENT PLAN	OBSERVATIONS
10041	AVEICO	64971	LVEKO	2004	Transferred to R. PALLISCO
10063	SIBAF	68933	LVEKO	2004	
10064	Filière Bois	115900	Sté Barak	2006	
Communal forest of Moloundou	Moloundou 's council	42382	ETS MESS	2005	ALPICAM as Private partner
Communal forest of Yokadouma	Yokadouma's council	22204	ETS MESS	2005	STBK as Private partner

It is only to concessions which have signed their definitive management convention, that the forest administration attributes quotas for Assamela's timber.

3.3. Forest certification

Forest certification plays an important role in forest management in Cameroon. Some big companies are moving towards certification, a great step for sustainable exploitation. Timber companies, grouped in the Interafrican Forest Industries Association (IFIA), have initiated in partnership with WWF, GFW, WRI and the GNT FSC Cameroon, their adhesion to the FSC system. Table 5 shows the list of timber companies which are moving to certification on FSC scheme. A total of 4 timber companies has been already certified for a surface area of 878 896 ha. Two out of those certified companies (SEFAC and PALLISCO) are working in the surface area of *P. elata* in the east region of Cameroon.

Table 5. State of the art on the certification process in Cameroon (WWF cit. ITTO 2009)

Company	**Total surface area of FMU**	**Surface area in the certification process**	**Surface area already certified**
WIJMA	242 020	144 977	97 043
TRC	297 523	202 606	125 490
DECOLVENAERE/SFIL	187 033	187 033	0
SEFAC	406 942	92 287	314 655
PALLISCO	341 708	0	341 708
SFID	550 921	550 921	0
Total	**2 026 147**	**1 177 824**	**878 896**

3.4. Purpose of the management plan in place

The management plan of a FMU aims to exploit the timber resource in a sustainable manner. For Assamela, the management plan aims to ensure that the international trade in that plant species is non detrimental to its conservation in Cameroon.

3.5. General elements of the management plan

Elements of the management plan are précised in the arête *n° 0222/A/MINEF/ 25 may 2001*. This Arête sets the procedures of the elaboration and approbation of management plans, and the procedures for monitoring and control of the implementation of the management plans for the production forests, in the permanent domain.

The article 2, alinéa 2 of the arête *n° 0222/A/MINEF/ 25 may 2001* clarifies again the conditions for signing a definitive convention to a given company. As mentioned in section 3.1., when allocating the FMU to a given company, a preliminary three years convention is signed between the Forest administration and the forest company. The terms of this preliminary convention precise that the company has to produce within the three-years of the convention, three types of documents in respect to the norms and rules indicated in the forest law, and including: a management plan for the whole concession (FMU), a five-years management plan (for the forest logging unit), and the operation plan of the first year of activity. At the end of the preliminary convention, a definitive convention is then signed between the forest Company and the Cameroon government for a renewable period of 15 years.

The article 5 of the arête stipules that, the management plan is a document which aims to fix the forest logging activity in the permanent forests, through a fair planning of harvests in space and time, and by enhancing sylvicultural interventions, as to ensure a sustainable and equilibrium logging activity. This document is composed of five main sections including: (1) description of the natural milieu of the forest concession, (2) mapping, (3) management inventory, (4) affectation of soils and use rights, (5) Calculation of the forest possibility (stock).

The above sections contain following information.

1) Description of the natural milieu of the forest concession: it describes the biophysical characteristics of the forest, the socio-economic environment, and the history of the forest, based on appropriated studies.
2) Mapping:
    a. stratification of the forest territory at the 1/50 000 scale
    b. the produced map may contain following information: the final stratification realized beyond the management inventory, affectation of soils or delimitation in series, and the delimitation of five-year blocs (logging management units) in annual logging units.
3) Management forest inventory
    a. the list of tree species to assess obligatory are contained in the technical files (sheets) published by the forest administration. For those timber species, the inventory counts, measures and identifies all stems with diameter at Breast High of over 20 cm. Stems are classed in 10 cm diameter classes (20-30, 30-40, 40-50, …).
    b. data analysis is done with a special computer package, validated by the forest administration. The package currently used by the Cameroonian forest

administration is the TIAMA package (Computer treatment applied to forest management).

c. the sample rate for the management inventory should not be less than 1% for a forest concession less than 50,000 ha, and not less than 0.5% for a concession more than 50,000 ha (not less than 50,000 ha).

4) Affectation of soils and use rights: this consists of identifying and mapping the soil uses within the forest concession.

5) Calculation of the forest possibility: this item will be discussed in section 3.4.2.

3.6. Restoration and alleviation measures.

3.6.1. General provisions of the law

Law No. 94/01 of January 20, 1994 on the regime of forests, wildlife and fisheries provides in Article 45 that the management of production forests (FMUs and community forests) is subject to a management plan approved by the forestry administration. The management plan is developed on the basis of a management inventory. Article 41 stipulates that the inventory planning must be conducted according to standards approved by the forestry administration.
In 1991, the ONADEF edited the document "Standards for asset management and pre-investment" that the forest administration has approved. These standards describe the methodology used to perform an inventory of development or pre-investment. This methodology is hereinafter briefly described.

3.6.1.1. Sampling device

According to the standards above, the sampling is systematic and stratified to 1 degree when the statistical unit is the plot. The samples (plots) are distributed systematically throughout the entire population and not by stratum (Forest type). The stratification is done definitively after the sampling. The systematic disposal of plots allows to assume that the intensity of sampling for each stratum is proportional to its area in the forest. Results of the inventory and their accuracy are calculated for each stratum.

In practice, sampling is carried along straight and continuous axes called "layons" or lines or transects. These "layons" are oriented along a predetermined magnetic direction but are systematically arranged in such a way that they are mostly parallel, equidistant and perpendicular to the general direction of drainage.

In principle, the FMU can be divided in several compilation units (CU). A CU is a basic territorial unit for which the compilation and validity of the results are applicable. A CU is a part of the forest which is homogeneous mostly in term of topography: rocks, valleys, mountains. For example, if the FMU contains a mountain, each side of the mountain can be considered as compilation unit.

Each "layon" crosses all the CU from one limit to another. As it is, "layons" have therefore variable lengts, depending of the length of the CU.

Plots arranged along a "layon" are contiguous (without alley or corridor of separation) and measure 250 m in the direction of the "layon" (length) and 20 m in the direction perpendicular to the "layon" (width). This gives a surface area of 0.5 ha for each plot.

The formula which allows to calculate the distance or interval between two "layons" in a given CU, what ever be its form, is as follows:

$$\text{interval} = \frac{\text{Net Area to probe or to survey (ha)} \times 20\ \text{m}}{\text{Area actually probed (ha)}}$$

3.6.1.2. Sampling intensity

The sampling intensity is the ratio between the area surveyed and the total area of the CU. It must provide for the parameters studied, values which are representative of the general population and this, according to precisions criteria set in advance. But this precision of the results obtained with a given sampling intensity depends on the variability of the parameter measured in this population. Fixing in advance the desired precision, one must have some idea of this variability as to calculate the number of samples which will be collected (choosen). The surveys conducted so far in dense forest and using the technique presented here have estimated the number of sample plots required to achieve the required accuracy. This accuracy is 10% probability threshold of 95% for major species, the number of plots selected at the conclusion of this study is 500 sample plots representing 0.5% or 250 ha. Given the surface areas of CU used respectively for inventory management, the proportion actually inventoried ranges from 0.5% to 1%. However, these rates may vary depending on the size of the forest to be inventoried.

3.6.1.3. Prospection

The survey consists of two stages : “layons” or line opening/transect cutting and counting.

a) Line opening/transect cutting

This step consists of opening or cutting according to a defined magnetic direction, corridors or alleys of 1.5 m wide. These corridors are clearly cleaned by cutting shrubs, vines and branches that obstruct the passage. They are then identified by marks. “Layons” constitute the reference system which will be used by the subsequent counting team. It is during the “layons” opening that details on topography, habitat types, rivers and the corrected horizontal distance of the “layon” (after reading the slopes) are given. It is also during this stage that the sample plots are identified and numbered. The data collected are recorded on specific file.

b) Counting

The counting step includes all operations relating to dendrological and dendrometric records. All species encountered are prone to be inventoried. A list of tropical tree species identified in previous inventories has been published by the forest administration.

Stems with diameter at breast height (dbh = 1.50 m) below 10 cm are measured only in sub plots of 0.01 ha located within the first 5 meters of each plot. This inventory aims to appreciate the natural regeneration. The stems whose DBH is 20 cm or more are counted and measures on the entire surface of the plot (0.5 ha).

3.6.1.4. Data processing

Results of management inventory are given by stratum (habitat type), per hectare and for the entire surface area. Mapping is prior to the data processing. This map is done based on aerial photos. As said in section 3.3., data processing is made with the TIAMA package.
Volumes are obtained using the volume tables or “cubage tariffs “ or “tarifs de cubage in French”, established during the corresponding national inventory phase. For the specific case of *Pericopsis elata*/Assamela, here are tariffs by stage of national inventory carried out:

Phase 2: $V= a + bxD^2$ with a = - 0, 609 and b = 0,000967
Phase 3: $V= a \times D^b$ with a = 0,000519 and b = 2,161415
Phase 4: $V= a \times D^b$ with a = 0,000186 and b = 2, 388659

The different results often obtained are:

- The stand table or actual number of trees per hectare, by species;
- The table of stock or volume per hectare, by species ;
- The table of contents or areas of the strata;

- The list of species encountered;
- The species groups based on their value (main species groups 1, 2 and 3, promotion group species and secondary species).

A few general provisions for the management of Assamela have been taken by the forest administration. They include the minimum girth limit: 100 cm which is more than the limit fixed in other countries of the Central African sub-region (60 cm in the two Congo and 80 cm in Central African Republic), the marking of seed-trees (with a record of GPS coordinates for each one of them), adequate spatial distribution and artificial regeneration work undertaken in some management units.

According to the CITES management authority (Akagou 2008), the annual production forecasts in the managed forests are over 45,000 m^3 raw timber (round timber).

3.6.2. Elements of the arête n° 0222/A/MINEF/ 25 may 2001

The basis of restoration and alleviation measures is outlined in the arête *n° 0222/A/MINEF/ of 25th may 2001,* article 6 (element 5: calculation of the forest possibility) to article 10 as follow.

The possibility is the quantity of wood that can be harvested per hectare after each cutting cycle. The calculation of the annual cutting (logging) possibility is an iterative process of optimization, aiming to well determine the rotation (periodicity of cutting) and the minimum exploitable (or harvesting) diameters for managed trees (this is call the managed minimum exploitable diameter = MED/AME or the minimum managed diameter = MMD).

The management inventory (census) divides the tree species inventoried in five groups which are: (1) the managed tree species which will be used for the calculation of the forest possibility, (2) the complementary principal tree species, (3) the promotion tree species, (4) the special tree species which are subjected to particular sylvicultural regime, and (5) the remaining (other) tree species.

For analysis, all principal timber species are arbitrary classified in group 2. The forest manager may include in group 1 (managed tree species), a minimum of 20 tree species for which the exploitable volume is not less than 75% of the initial exploitable volume of the principal tree species. Group 3 is composed of the promotion tree species, and group 4 contains tree species subjected to special sylvicultural regime.

The parameters used in the calculation of the forest possibility and the determination of the MED/AME include: the choice of the managed trees, the rotation, the growth rate in diameter of trees, the cubage tariff (tariff de cubage in french), the damage rate and the mortality rate.

Rotation is the delay between two successive harvests. It is the time spent between two successive logging years in the same space. In Cameroon, it is fixed at 30 years. However, this can increase in case of some specific constraints revealed by the analysis of the inventory data.

The growth rates in diameter used are published in the technical files (sheets) by the forest administration. For *Pericopsis elata*, the growth rate is 0.4 cm/year.

The minimum exploitable diameter of managed trees MED/AME proposed by the manager (forest company), may not be less than the one (MED/ADM) fixed by the forest administration. The administrative minimum exploitable diameter (MED/ADM) fixed for *Pericopsis elata* in Cameroon is 100 cm, which is the highest in the Congo basin.

For the managed species, stems with diameter high than MED/ADM + 40 cm, are retrieved from the initial population table which serves to simulate the forest possibility. These stems are called the "bonus".

However, all trees of this group "bonus" are subjected to technologic inventory, aiming to appreciate the quality of the wood, and to allow the selection of mother trees (useful for seedlings production) which will be banned (forbidden) for any exploitation in the concession.

The rate of reconstitution (or the recovery rate) of species to manage, the managed minimum exploitable diameter (MED/AME), and the rotation time, interact one another towards the determination of the possibility.

The percentage of reconstitution (or recovery rate) is calculated using the following formula. This formula was developed by Pilot Integrated management project (API) in Dimako, East region (Durieu de Madron et al. 1998). The recovery rate is an index which allows to know if the logged stems will be replaced by other stems situated below of the MED at the end of the rotation and at which proportion.

$$\%RE = (No\ (1-\Delta)\ (1-\alpha)^{T})/Np$$

Where:

No: number of stems of diameter classes < MED, which are used for the reconstitution (reestablishment) of the ligneous resource;

α: natural mortality (1%) per year;

Δ : mortality caused by logging damage;

T : rotation (30 years);

Np: total exploitable stems (MED + 3) to be reconstituted;

%Re: percentage of reconstitution (reestablishment).

The reconstitution (reestablishment) is good when %Re is more than 50%. The principle of the simulation consists of increasing progressively the administrative minimum exploitable diameter (MED/ADM) as to get a %Re ≥ 50%. The new minimum exploitable diameter which provides the best simulation (%Re ≥ 50%.) is called the managed minimum exploitable diameter (MED/AME).

The managed trees cannot be exploited under the MED fixed during the calculation of the forest possibility (MED/AME). All other tree species can be exploited in respect of the MED fixed by the forest administration (MED/ADM).

Some experts think that the TIAMA package should be evaluated and revised, due to the great variability of Cameroon forests (ITTO 2009).

The forest delimitation is done on a map at 1/50 000 based on the results of the management inventory. It is realised in two steps:

Step 1. Firstly, the forest concession is divided into five-years blocs as to obtain a difference of less than 5% of the exploitable volume for the principal tree species (managed and complementary);

Step 2. Secondly, the five-year blocs are then divided as to allow a continuous progression of logging activity in the space and time. Each five-year bloc is divided in 5 logging units (assiette de coupe in French), contiguous and with equitable surfaces.

Sylvicultural treatments, rather than cutting in respect with the MED, must be conducted as to ensure the forest reconstitution (reestablishment) at the end of each rotation.

The nature, objectives, intensity, and the planning of sylvicultural operations are described in the documents of the management plan, and of the five-year management plan. The annual operation plans precise the areas managed, the forest strata logged, and the planning of future interventions.

Research activities useful to complete the based data, which are necessary to ensure sustainable management are précised in the management plan.

As it was said in section 2.1.1., the approbation of the management plan implies two main constraints to exportation: the respect plots (five-year blocs) and the respect of MED.

The area constraint is determined by the respect of annual plots (or logging units) in space and time. Many plots can be opened to forest logging simultaneously, but they must be contiguous. A five-year management unit is definitively closed to forest logging, 6 years after its opening by the forest administration.

Article 35 indicates that the management plan is obligatory realised every 30 years or at the end of the rotation.

Article 41 mentions the requirements of the logging unit certificate or the annual permit. The issuance of that certificate is subordinated to the realisation of the logging inventory in the entire solicited area (unit). This inventory consists of researching all tree species mentioned in the management plan and included in the calculation of the possibility of the FMU. This is a complete (total) inventory (100 % of the surface area), which is limited to the stems ≥ to the minimum exploitable diameter adopted by the concessionaire for the sustainable management of the forest (MED/AME). Those stems are marked in the field. Results of the logging inventory are verified according to the national standards for verification of logging inventories. The forest administration also verifies and checks the fiscal situation of the logging company, and if this company has normally paid its taxes, the forest database (SIGIF) then edits the annual logging permit.

3.6.3. Example of management measures in the Forest Management Unit N° 10 039.

To illustrate the calculation of the forest possibility, let us take the example of ETs ASSENE NKOU, a forest logging company working in the East region.

3.6.3.1. General presentation of the Forest Management Unit.

The FMU 10 039 belongs to ASSENE NKOU forest company (ETS ASSENE NKOU 2003). It covers a total area of 47 585 ha, in the East region, Haut Nyong Division, Lomié Subdivision, Dja district.

3.6.3.2. Synthesis of results of the management inventory

A management inventory was realized in 2002. The characteristics of such an inventory are presented in table 6

Table 6. Characteristics of the inventory realised in FMU 10 039

Characteristics	Data obtained
Surface area of the FMU	47 585 ha

Characteristics	Data obtained
Sample rate	1.29%
Assessed surface area	613.84 ha
Compilation unit	1
Dimension of a given plot	250 m x 20 m = 0.5 ha
Number of complete plots	1223
Total length of the assessed transects	306.92 km
Number of transects	48
Distance between transects	1,500 m
Sample rate of stems ≥ 20 cm of diameter	1.29%
Sample rate of stems < 20 cm diameter	0.02%

Data obtained from the forest inventory are analysed with the TIAMA package. This package provides following elements:

- table of content (areas of forest strata with number of plots);
- the list of tree species inventoried (per group of species);
- the distribution of stems per strata and group of species;
- the curve of stems distribution per diameter class;
- the population table;
- the table of stock (volume for principal tree species);
- the sample rate (obtained from the number of plots of forest strata and the total area of the FMU).

Some of these results are presented for illustration as follow.

a) Density

A total of 424 plant species was inventoried in the FMU. They are distributed in 5 groups as follow:

- Group 1: managed species, 28 species;
- Group : complementary species TOP 50, 25.
- Group 3: promotion species, 23;
- Group 4: special species, 13;
- Group 5: other species, 335.

A total number of 6309 stems of Assamela was inventoried, with 485 exploitable stems. The density of Assamela is 0.14 stems/ha.

b) Volume

The cubage tariff is a formula which calculates quickly for a given parameter, the volume of the log. The cubage tariff established for Asamela during the second phase of the national forest inventory (CENADEFOR – CTFT 1986b) was used. This is $V = - 0.609 + 9.668D^2$.

D = diameter of the log. For example, for a log with D = 25 cm, the volume of Assamela will be: $V = -0.609 + 9.668*(25)^2 = 6041.89\ m^3$

Raw volume

The raw volumes of Assamela is f 33 246 m^3 in that forest management unit. The exploitable volume is 6,757 m^3.

Commercial or trade volume

Commercial volume (Vc) is calculated based on the trade coefficient (CC) and the raw volume (Vr).

Vc = Vr x CC.

The trade rates are published by the forest administration, for all tree species in the technical files (sheets). Those trade rates were proposed by the Pilot Integrated Management project (API) and also by the phase II of the national forest inventory. For Assamela, CC = 0.50; this gives the trade volume of Vc of 3,378.5 m^3.

3.6.3.3. Productivity of the forest

a) Growth rate

Growth rates currently used in Cameroon derive from studies conducted in the Central African Republic (CAR), Ghana, and Côte d'Ivoire. Studies on growth rings have been realised by the Pilot Integrated Management project (API) and have only concerned 10 tree species (API 1994, API Dimako 1995). The annual growth rate used by ETS ASSENE NKOU in the FMU 10 039 is the one arbitrary proposed by the Cameroon forest administration. The annual growth rate for Assamela is 0.4 cm/year.

b) Mortality

The mortality rate used here is 1% for all diameter classes. It is the official mortality rate fixed by the forest administration.

c) Logging damages

Forest logging implies destruction of some remaining (residual) tree species. Those damages vary according to different types of activities. The main activities causing damages on residual tree species are the settlement of the road network, the settlement of the logs parks, the extraction of stems or logs, the cutting of trees, the opening of transects, and many others. The forest administration had fixed the damage rate at 7% of the residual stock of the forest.

3.6.3.4. Proposed management

a) Management objectives

The FMU 10 039 is a forest of the permanent domain. So, the main objective is to ensure a sustainable and long term timber production. This main objective is also that of these management activities. Another objective pursued by ASSENE NKOU activities in the area is to valorise Non Timber Forest Products (NTFP).

b) Soils affectation and usage rights.

b.1. Soils affectation

The forest stratification led to the identification of 9 strata which can be distinguished in two different series of forest: protection forests and production forests.

The production forests are the most important (80% of the total surface area of the FMU). It covers a total area of 44,623 ha, and will be retained for logging activities.

The protection forest is composed of swamp forests: temporary drained swamp forest of bamboos, and permanent drained swamp forest boarding the rivers. These two strata will be

affected to total protection, due to their vulnerable ecology. The remaining 7 strata will be affected to timber logging, although there exist one strata with temporary drained swamp forest.

b.2. Usages rights

According to the proposed management decree that was submitted to the signature of the Cameroon Prime minister (Head of Government) and related to the delimitation of the FMU 10 039, local people are authorized to collect fire wood, construction wood, other non timber forest products (wild fruits, medicinal plants) under respected limits. Only the traditional hunting will be allowed but with some regulations.

c) Management of the production forests.

c.1. List of the managed tree species

All principal tree species assessed in the forest are considered as management species; these are the species on which the management decisions will be taken. A total of 53 tree species was listed for that. Fourteen tree species are less represented. Their density is < 0.01 stem/ha, which is too small for ETS ASSENE NKOU. That is why the company decided to delete the 14 tree species from his list.

Then, the list of the 20 most abundant tree species was fixed (table 7). These species totalise 2 605 069 m^3 and represent 92.27% of the total exploitable volume of all principal tree species. This list was previously retained for the simulation of the net (trade) production.

Table 7. Tree species previously retained for the simulation of the net production

Species	Stem/ ha	Exploitable stems (D ≥ MED)	Volume/ha	Exploitable volume (D ≥ MED)	%Volume
emien	1.93	71174	11.46	504843	17.88
alep	3.74	65216	9.37	356899	12.64
tali	1.21	47351	7.64	340081	12.05
fraké	1.6	49765	7.23	29445	10.43
okan	0.87	18637	4.66	194094	6.87
dabéma	0.97	19642	4.09	161930	5.74
sapelli	0.62	8055	3.74	107413	3.8
ayous	0.23	10391	2.43	100194	3.55
illomba	1.33	13894	2.75	88608	3.14
Padouk rouge	1.62	16545	2.95	85245	3.02
kosipo	0.24	4173	1.41	55527	1.97
bongo H (olon)	1.05	9697	1.81	51650	1.83
abam vrai	0.81	7980	1.37	44885	1.59
fromager	0.14	5090	0.95	41693	1.48
moabi	0.2	2376	1.04	40507	1.43
sipo	0.08	1497	0.79	33274	1.18
kotibé	0.36	6846	0.81	28869	1.02
niové	0.67	6273	0.93	27006	0.96
longhi	0.14	3917	0.64	26612	0.94
mambodé	0.08	2515	0.48	21274	0.75

Species	Stem/ ha	Exploitable stems (D ≥ MED)	Volume/ha	Exploitable volume (D ≥ MED)	%Volume
Total	**17.89**	**371034**	**66.55**	**2605069**	**92.27**

In the second phase, ASSENE NKOU discussed with his trade partner, the PALLISCO forest industrial company. As a result of discussions, it was decided to move from the above list, 4 tree species including Moabi, Sapelli, Kossipo, Ilomba. Many reasons guided ASSENE NKOU in this decision including: the form of their specific curves and economic reasons. Moabi, Sapelli, and Kossipo get an irregular distribution in different diameter classes. It is not easy to obtain for these species, a sufficient reconstitution (reestablishment) rate, without increasing too much the MED. Enhancing the reconstitution (reestablishment) of those tree species through the increasing of their MED, will not profit to the company. Sylvicultural operations will be implemented for those species. Trade in Ilomba timber is not attractive for the moment. This tree species does not currently represent any economic interest for ASSENE NKOU Company.

Assamela and other tree species were considered as complementary tree species (group 2) and added to the selected 20 tree species.

Finally, a total of 28 plant species was retained as managed species for the calculation of the forest possibility.

c.2. Rotation

The rotation has been fixed at a minimum period of 30 years according to the arête n° 0222.

c.3. Simulation of the net production

The simulation of the net production concerned all exploitable managed tree species, with diameter between MED/ADM and MED/ADM + 3 classes, or + 30 cm. These were considered as stems exploitable within the first rotation (EEI).

All trees with diameter ≥ MED + 4 classes, which were considered to be too old (cannot rather grow) were retrieved from the simulation. Those stems are available for the logging, but will not be used for the calculation of the reconstitution (reestablishment). They will constitute the "Bonus" of the first rotation.

To obtain the reconstitution (reestablishment) rate, ASSENE NKOU proceeded in two steps.

Step1. In the first step, logging damages in terms of stems, were deduced on trees with diameter class < MED/ADM.

Step 2. In the second step, the growth and mortality rates, were deduced to the new number of stems obtained from step1. This calculation led to the determination of the number of stems which will be logged in the next rotation (EER). Only stems with diameter class ≥ MED/ADM, and for which the simulation has produced a good reconstitution (reestablishment) of the forest (Re ≥ 50), were retained for logging.

All those calculations were conducted on the 28 managed species. Table 8 shows an example of such a result, for ten tree species.

Table 8. Retained simulation

EEI: possibility for the first rotation; EER: possibility for the second rotation

Species	Possibility =current possibility = EEI (number of stems)	Bonus (number of stems)	EER = next possibility (number of stems)	Reconstitution (Re)	MED (cm)
Assamela	498	0	597	119.88	100
emien	13509	28687	18268	135.23	80
alep	9909	15714	10541	106.38	80
tali	11300	20123	6248	55.29	80
fraké	17872	5553	18893	105.72	80
ayous	3275	2239	1884	57.53	90
padouk rouge	4033	957	5137	127.39	80
bongo H (olon)	8468	559	7200	85.03	60
niové	5706	583	2981	52.25	50
mambodé	89	1634	279	312.1	80
Total	**135377**	**102458**	**103813**		

c.4. Forest possibility (total volume and volume/ha)

The possibility in terms of stems defined in the precedent simulation corresponds to a possibility of 1,005,980 m^3 and a bonus of 1,201,509 m^3 (table 9). This gives a total possibility of 2,207,489 m^3 on an exploitable surface area (production forest) of 45,461 ha. This volume will be harvested during the 30 years, which corresponds to an average annual volume of 73,583 m^3, 48.6 m^3/ha/an.

Table 9. Possibility in term of volume (example)

VEI: possibility for the first rotation; VER: possibility for the second rotation

Species	Possibility (m^3/ha)	Possibility (m^3)	Bonus (m^3/ha)	Bonus (m^3)	VER (m^3/ha)	VER (m^3)	MED (cm)
Assamela	0.15	6929	0	0	0.2	7781	100
emien	1.87	85042	7.05	320334	3.3	149756	90
alep	1.37	62376	3.43	155744	1.5	69551	80
tali	1.56	71136	4.54	206220	0.9	41379	80
fraké	2.71	123070	1.4	63438	3.1	141794	80
ayous	0.88	40037	1.13	51317	0.5	23056	90
Total	**22.13**	**1005980**	**26.43**	**1201509**	**16**	**709039**	

c.5. Determination of MED/AME

The Minimum exploitable diameters for management have been determined for all tree species of group 1.

The percentage of reconstitution rate was established using the formula proposed by the forest administration (see section 2.1.4.b).

$$\%RE = (No\ (1-\Delta)\ (1-\alpha)^T)/Np$$

The evolution of the reconstitution (reestablishment) rate for each species in relation with the increase of the minimum exploitable diameter (MED) is presented in table 10. Only 10 tree species are represented. The forest reconstitution is good when %Re ≥ 50%.

Table 10. MED/ADM and MED/AME for the managed tree species.

SPECIES	MED/ADM	MED/AME	%Re
Assamela	100	100	120%
Emien	50	80	135%
Alep	50	80	106%
Tali	50	80	55%
Fraké	60	80	105%
Ayous	80	90	57%
Bossé clair	80	80	62%
Bilinga	80	80	102%
Dabéma	60	80	58%
Doussié R	80	80	190%

Some tree species have seen their MED increased, in order to obtain an enough reconstitution (reestablishment) percentage. Other species such as Assamela, Bossé clair, Bilinga, and Doussier R get enough reconstitution (reestablishment) percentage (%Re ≥ 50%) at MED/ADM, so their MED do not need to be increased.

c.6. Sylviculture

c.6.1. Distribution of stems per diameter classes.

The distribution of stems per diameter classes for a tree species is important and fundamental for its management. It allows to visualise the structure of the present population, and to identify different anomalies and deficiencies related to the regeneration and the state of the population. It is on this basis that the adapted sylvicultural interventions will be proposed.
Table 11 shows an example of the distribution of those stems per diameter classes for four tree species: Assamela, Ayous, Emien, Fraké.

Table 11. Distribution of number of stems per diameter class (centres of the classes are represented in cm)

SPECIES	MED	25	35	45	55	65	75	85	95	105	115	125	135	145	155	≥ MED	Total
Assamela	100	850	313	317	487	769	1650	709	729	263	222	0	0	0	0	485	6309
Ayous	80	662	636	395	317	653	965	1326	796	1363	1070	1033	261	170	745	6764	10391
Emien	50	5616	4974	5682	7762	9455	11635	13549	8041	11131	4844	3117	839	93	708	71174	87447
Fraké	60	4252	4029	6678	8002	11428	15026	11995	5790	3938	1062	349	0	0	178	49765	72726

Figure 5 illustrates the correspondent specific curves. The diameter classes are as follow: class 1 = 25 cm, class 2 = 35 cm,…class 6 = 75 cm,…,class 9 = 105 cm, …, class 14 = 155 cm.

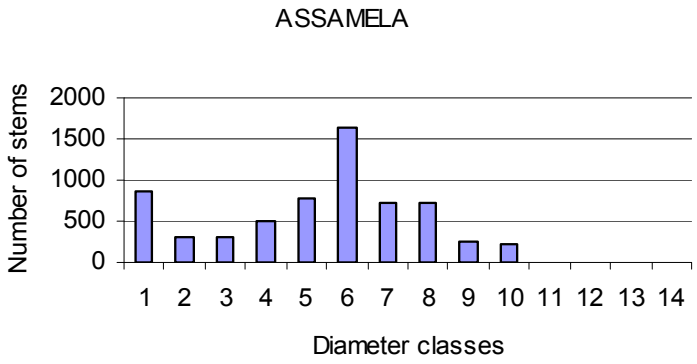

Figure 5.a. Assamela (*Pericopsis elata*)

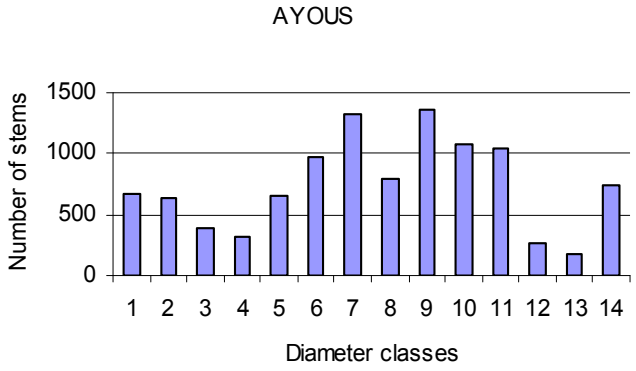

Figure 5.b. Ayous (*Triplochyton scleroxylon*)

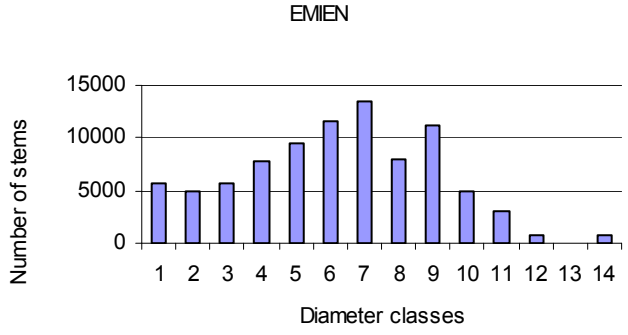

Figure 5.c. Emien (*Alstonia boonei*)

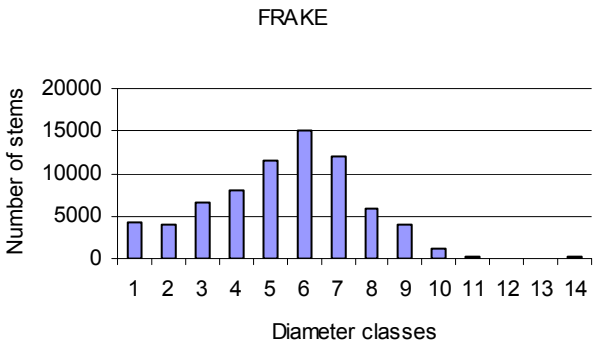

Figure 5.d. Fraké (*Terminalia superba*)

These are exclusively light-demand tree species. Stems with small diameter are less represented, compared to median classes. This characterises species with low regeneration. Except for Assamela, the summit of the curve of those plant species is often located in the right side of the MED/ADM, which characterises an insufficient rate of reconstitution (reestablishment). For example, the summit of the curve of Fraké (*Terminalia superba*) is at 75 cm (class 6), which is in the right side of the minimum exploitable diameter (MED/ADM), fixed by the forest administration at 60 cm. To ensure a sufficient reconstitution (reestablishment) of those species, the manager has to increase the MED/ADM. By adding two more diameter classes to this administrative MED, the reconstitution (reestablishment) rate will be ≥ 50%. The new MED obtained is MED/AME, which is: MED/AME = MED/ADM + 2 X 10 cm = 60 cm + 20 cm = 80 cm.

For most of those species and due to their regular fructification (except for Ayous), there will be not necessary to develop specific sylvicultural interventions; they will profit of the opening of the forest canopy by the logging activities to enhance their regeneration and increase their populations.

c.6.2. Specific case of Assamela

Assamela is the only tree species of this group (light demand plants) for which the manager does not need to increase the MED/ADM. This MED is too high according to most of the forest concessionaires. The individuals of Assamela at diameter ≥ 100 cm are wilting, and stems of many of them are rotten. This is confirmed by many authors (Vivien et Faure 1985, Bourland 2008) and the Association of Timber and Forest Industries in Cameroon (Ouguia pers. Com.). Those individuals are therefore often abandoned in the forest, which lead to an economic loss for both the forest company and the Cameroon government (ETS ASSENE NKOU 2003, Bourland 2008). These problems were largely outlined by the Association of Timber and Forest Industries (ATFI) of Cameroon during the ITTO/CITES regional workshop held in April 2008 at Kribi, Cameroon, on the sustainable logging and trade of Assamela (ITTO 2008). As we can see, the summit of the curve for Assamela is at 75 cm of diameter, while the MED/ADM is at 100 cm. This means that, Assamela is logged in Cameroon when it is not rather alive. Almost dead individuals of this plant species are logged, which is not correct.

In the other side, it has been reported that management through controlled exploitation benefits the natural regeneration and population dynamics of *Pericopsis elata* primarily by creating forest gaps (ATIBT, 2001). *Pericopsis elata* can be easily propagated from seed and from rooted stem cuttings (CITES 2003).

Densities and reconstitution (reestablishment) rate of Assamela are presented in table 12 for 10 forest management units.

Table 12. Distribution of density and the reconstitution (recovery) rate (%Re) of Assamela for 10 FMU, in the East regions of Cameroon.

FMU	DENSITY	%Re
10039	0.14	120%
10063	0.58	74%
10026	0.69	163%
10022	0.3	506%
10023	0.65	75%
10020		228%
10037	0.12	243%
10009	0.17	72%
10038	1.82	282%
10018	0.29	91%
MEAN	**0.53**	**185%**

Data presented in this table tend to show that Assamela is not threatened in the East region of Cameroon, at least in those 10 forest management units. Although the differences observed in the process of census, mainly link to the use of different sample rates by timber companies, it is clear that the density of 0.53 stem/ha is quite high compared to what was suggested for threatened plant species (< 0.05 stem/ha) by the API project (API 1995, 1994, Forni 1997). The value of the percentage of reconstitution (reestablishment) is too high (average 185%) compared to the limit required by the forest administration for sustainable management, and which is 50%. This high level of %Re is due to the high value of the minimum exploitable diameter which is 100 cm.

For ETs ASSENE NKOU and many other managers, it would be interesting to reduce the minimum harvesting diameter of Assamela to 70 or 80 cm in regard with current availability of the resource and the characteristics of its wood. Because of its economic importance, the silvicultural interventions to be conducted by ETS ASSENE NKOU will aim to facilitate its regeneration and to improve the development of future stems (tiges d'avenir in French). Harvesting is said to be the main silvicultural intervention used by the forest managers (ATIBT 2002). ETs ASSENE NKOU will therefore limit the resulting damage caused to the residual stand by logging activities, by putting in place methods and techniques of reduced impact, and prohibiting re-passage in already cut stands so as to facilitate regeneration of the stand.

3.6.4. Current possibility of Assamela in Cameroon

The ToR of the expert in charge of estimating the real density of Assamela in forest concessions in Cameroon within the ITTO/CITES program stipulated that, in case the verification reveals no significative differences with the results of the document of the management plans or in case the inventories are often conducted in conformity with the national standards, the expert should:

- determine for each forest management unit (FMU) the density of Assamela, the specific curve, the minimum exploitable diameter (MED), the reconstitution rate, and the annual possibility;

- take a clear position on the maintenance or not the current MED, and propose the national possibility based on the new MED.

Table 13 presents the characteristics of the management inventories executed in the distribution area of Assamela in Cameroon.

Table 13. Characteristics of management inventories executed in FMUs and Communal Forests exploiting Assamela in the East region of Cameroon

N° FMU	COMPANY	SURFACE AREA (ha)	SAMPLING RATE (%)	NUMBER OF BLOCKS	YEAR OF EXECUTION OF THE INVENTORY
10001, 2, 3,4	CFC	198 310	0.5	2 094	1998
10005	STBK	89 320	0.98	1 757	2003
10007	SEBEC	113 507	1.0	2 324	2000
10008	SEFAC	60 053	0.5	601	2004
10009	SEFAC	88 796	0.5	929	2001
10010	SEFAC	61 760	0.5	618	2004
10011	SAB	60 838	0.9	1 107	1999
10012	SEFAC	62 597	0.5	626	2003
10013	ALPICAM	50 752	1.0	1 016	2009
10015	CIBC	155 421	0.5	1 554	2003
10018	SIBAF	65 832	0.5	659	1998
10020	Ingénierie Forestière	82 571	0.5	826	2003
10021	Green Valley	71 533	0.5	716	2003
10022	SCIFO	48 864	1.0	978	2003
10023	SFCS	57 996	0.46	528	2002
10025	SFIL	49595	1.00	992	2009
10026	ALPICAM	128 449	0.5	1 285	2003
10029	SFDB	46 922	1.0	939	2003
10030 et 31	R. PALLISCO	120 959	0.5	1 210	2007
10037	KIEFFER	51 685	0.5	517	2003
10038	CAMBOIS	145 585	0.5	1 456	2004
10039	ASSENE NKOU	47 585	1.0	952	2003
10041	AVEICO	64 971	0.5	650	2003
10063	SIBAF	68 933	0.51	700	2003
10064	Filière Bois	115 900	0.97	2 250	2004
Communal forest of Moloundou	Council of Moloundou	42 382	0.97	852	2005
Communal forest of Yokadouma	Council of Yokadouma	22 204	0.96	427	2005

As outlined in section 2.5.2.3 (Current ITTO/CITES activity results), the study on Assamela density revealed that, management inventories are conducted in respect to the national standards. No significative differences were noted between the data of forest inventory obtained by timber companies and those obtained during the current ITTO/CITES activity (verification study). This leads to the conclusion that, the results on the abundance of

Assamela outlined in the documents of the management plans can be considered as credible and therefore be used to evaluate the stock (potential) of Assamela in the production forests of Cameroon (Belinga 2009).

3.6.4.1. Possibility at MED 100 cm.

a) Possibility in terms of number of stems

Cameroon government has fixed the minimum exploitable diameter for Assamela at 100 cm. Table 5 shows results of the management inventories executed in the different production forests in the East region of Cameroon. According to Forni (1997), a plant species is considered as threatened, when its density is less than 0.05 stems/ha. The density per hectare of Assamela in the East Region of Cameroon as showed in table 14 is 0.53 stem/ha. The possibility or exploitable number of stems (74541 stems) at a MED 100 cm represents 6.67% of the available resource (Belinga 2009).

This density is 0.53 stems/ha at subnational level (East region), and is not uniform within the distribution area of Assamela in Cameroon. Assamela is much more concentrated in some forests than in others. Indeed, it is abundant in FMU 10 038, 10 064, 10 021, 10 010, 10 030-10 031 and 10 001-2 - 3-4, and almost rare in the FMU 10025 and 10041 (lower density of 0.01 stems / ha). In these two FMU, Assamela deserves to be banned from exploitation.

Table 14: Number of Assamela stems by FMU in the East region of Cameroon

FMU	Total number of stems	Stems/ha	Stems ≥ MED	(Stems ≥ MED)/Total number of stems
10001,2,3,4	133 682	0.67	11 226	8.40
10005	41 737	0.47	8 144	19.51
10007	32 277	0.28	3 458	10.71
10008	23 591	0.39	3 055	12.95
10009	13 156	0.15	2 121	16.12
10010	44 994	0.73	6 600	14.67
10011	13 252	0.22	1 050	7.93
10012	22 200	0.35	2 726	12.28
10015	56 351	0.36	4 525	8.03
10018	18 104	0.28	2 484	13.72
10020	9 157	0.11	557	6.08
10021	62 957	0.88	6 645	10.55
10022	10 409	0.21	203	1.95
10023	37 978	0.65	2 999	7.90
10025	90	0.00	0	0.00
10026	87 114	0.68	2 286	2.62
10029	8 015	0.17	654	8.16
10030,31	107 946	0.89	783	0.73
10037	5 927	0.11	277	4.67
10038	220 003	1.51	1 053	0.48
10039	6309	0.13	485	7.69
10041	147	0.00	0	0.00
10063	49 414	0.72	4 273	8.65
10064	97 483	0.84	6 215	6.38
Communal forest	6 655	0.16	2 366	35.55

FMU	Total number of stems	Stems/ha	Stems ≥ MED	(Stems ≥ MED)/Total number of stems
of Moloundou				
Communal forest of Yokadouma	8 965	0.40	355	3.96
Total	**1 117 914**	**0.53**	**74 541**	**6.67**

b) Possibility in terms of volume

Table 15 shows the distribution of the volumes of Assamela in different FMU in the East region of Cameroon. The exploitable volume per surface area is 2.50 m^3/ha. At the current MED (100 cm), the possibility (initial exploitable volume) is 1 025 487 m^3. This possibility represents 19.36% of the total initial volume. In FMU 10025 and 10041, there is no exploitable volume.

Table 15: Volumes of Assamela in different FMU/ Communal forest (CF) in the East region of Cameroon

FMU	Total volume (m^3)	Volume/ha (m^3/ha)	Volume ≥MED (m^3)	(Volume ≥MED)/Total volume (m^3)
10001,2,3,4	608 800	3.07	138 000	22.67
10005	238 838	2.67	103 183	43.20
10007	145 100	1.28	43 000	29.63
10008	126 286	2.10	38 097	30.17
10009	83 009	0.93	27 803	33.49
10010	224 941	3.64	70 653	31.41
10011	183 432	3.02	55 445	30.23
10012	105 365	1.68	37 943	36.01
10015	243 101	1.56	60 017	24.69
10018	97 530	1.48	29 670	30.42
10020	52 087	0.63	7686	14.76
10021	280 301	3.92	78 123	27.87
10022	43 974	0.90	2 228	5.07
10023	187 777	3.24	39 426	21.00
10025	358	0.01	0	0.00
10026	422 936	3.29	29 248	6.92
10029	50 118	1.07	8 049	16.06
10030,31	327 027	2.70	8 392	2.57
10037	36 334	0.70	3 941	10.85
10038	1 030 644	7.08	69 823	6.77
10039	33 244	0.70	6 757	20.33
10041	822	0.01	0	0.00
10063	267 342	3.88	61 327	22.94
10064	413 905	3.57	70 691	17.08
Communal forest of Moloundou	44 693	1.05	29 168	65.26

FMU	Total volume (m^3)	Volume/ha (m^3/ha)	Volume ≥MED (m^3)	(Volume ≥MED)/Total volume (m^3)
Communal forest of Yokadouma	48 057	2.16	6 817	14.19
Total	**5296022**	**2.50**	**1025487**	**19.36**

c) Annual possibility

The annual possibility is obtained by dividing the initial total exploitable volume by the rotation, which is 30 years. Table 16 below shows the correspondence results. The annual possibility of Assamela at MED 100 cm in all forest concessions in Cameroon is 34 183 m3. It is interesting to note that, this annual possibility is different to the 45 000 m^3 often used by the Cameroon CITES management authority.

Tableau 16 : Annual possibility of Assamela per FMU/CF

FMU	Volume ≥MED (m^3)	Annual possibility (m^3)
10001, 2, 3, 4	138 000	4 600
10005	103 183	3 439
10007	43 000	1 433
10008	38 097	1 270
10009	27 802	927
10010	70 653	2 355
10011	55 445	1 848
10012	37 943	1 265
10015	60 017	2 001
10018	29 670	989
10020	7 686	256
10021	78 123	2 604
10022	2 228	74
10023	39 426	1 314
10025	0	0
10026	29 249	975
10029	8 050	268
10030,31	8 392	280
10037	3 941	131
10038	69 823	2 327
10039	6 757	225
10041	0	0
10063	61 328	2 044
10064	70 691	2 356
Communal forest of Moloundou	29 168	972
Communal forest of Yokadouma	6 817	227
Total	**1 025 489**	**34 183**

3.6.5. Proposed management of Assamela on the population structure and recovery rate based approach.

3.6.5.1. Population structure

Table 17 in appendix presents for each production forest (FMU or communal forest), the distribution of stems of Assamela stems in different diameter classes in the east region of Cameroon. Table 18 below, shows the synthesis of those data.

Table 18 Distribution of stems of Assamela per diameter classes in all production forests found in East region of Cameroon.

Diameter classes (Cm)	Number of stems
20 - 30	59 345
30 - 40	104 559
40 – 50	132 353
50 – 60	191 641
60 – 70	190 634
70 – 80	166 741
80 – 90	108 697
90 – 100	86 873
100 – 110	39 782
110 – 120	19 279
120 – 130	6 545
130 – 140	4 052
140 – 150	3 103
150 – and plus	1 779
Total	**1 117 914**

Figure 6 illustrates the correspondent specific curve. Stems with small diameter (20 – 30 cm) are less represented, compared to medium classes. This abnormal distribution of number of stems in different diameter classes characterises species with a low regeneration in natural forest. The summit of the curve is at diameter class 50 – 60 cm. From there, the number of stems diminishes progressively till the diameter class 120 – 130 cm.

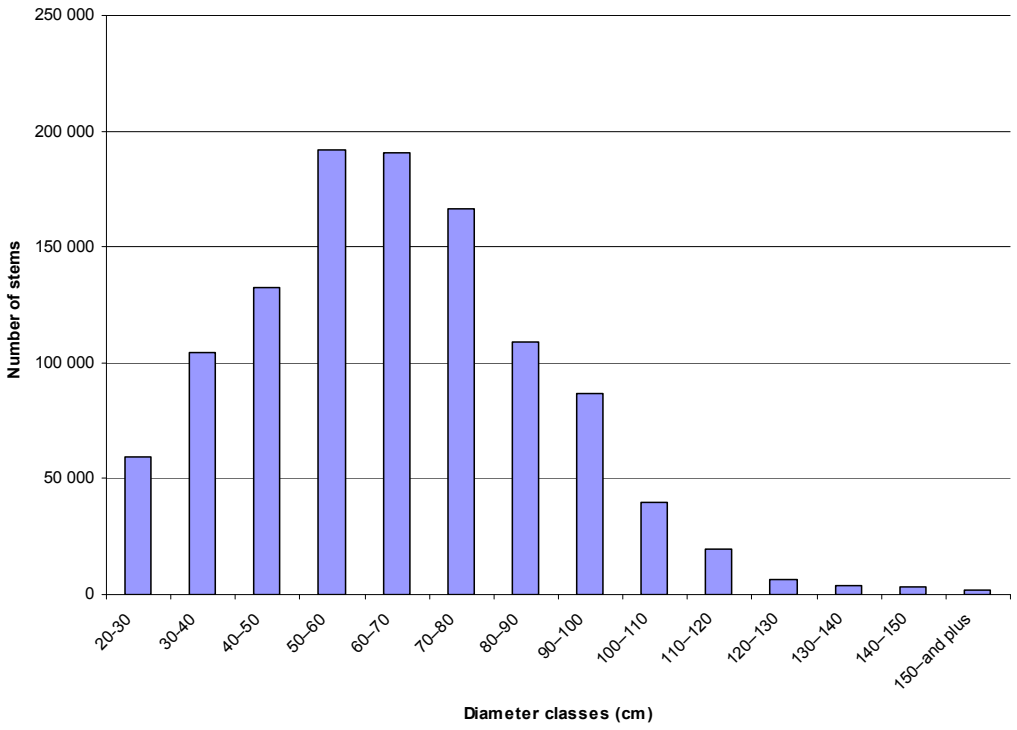

Figure 6. Specific curve of Assamela (number of stems vs diameter classes) in the production forests in Cameroon.

3.6.5.2. Recovery rate (Re)

Table 19 shows for each production forest, the recovery rates (Re) of Assamela in different diameters. The reconstitution is good when Re is ≥ 50 %. The recovery rate of Assamela is good starting at diameter 80 cm (Re = 53.607%). This Re increases and attends its high value at diameter 110 cm (Re = 126.317%).

Table 19: Reconstitution rate for various diameters in different production forests

FMU/Diameters (cm)	50	60	70	80	90	100	110	120
10001,2,3,4	10,695	21,354	32,823	42,195	59,330	123,915	192,322	49,7
10005	10,771	19,523	24,083	30,524	42,571	46,598	38,032	123,654
10007	17,427	22,603	25,400	49,874	34,396	77,964	#DIV/0!	#DIV/0!
10008	12,652	22,890	5,819	26,775	37,614	119,846	58,217	151,931
10009	17,062	14,786	20,000	39,254	29,434	64,450	73,374	234,911
10010	12,032	23,809	18,590	27,748	36,381	80,374	105,577	267,682
10011	30,803	62,362	42,723	20,847	14,960	110,943	103,411	94,0535
10012	14,924	12,846	32,153	42,698	67,398	69,068	53,683	42,8793
10015	17,373	24,608	28,323	48,079	64,046	114,448	92,929	110,715
10018	12,631	14,125	14,333	25,169	47,878	101,689	118,538	83,1601
10020	15,195	12,866	15,337	32,709	64,863	227,990	464,316	55,2816
10021	17,535	24,093	34,413	52,383	37,200	74,898	74,792	329,658
10022	13,048	19,872	17,990	59,882	112,677	507,435	281,967	#DIV/0!

FMU/Diameters (cm)	50	60	70	80	90	100	110	120
10023	13,943	22,632	51,394	54,585	60,112	76,949	536,166	247,583
10025	0,000	0,000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
10026	12,752	31,314	43,928	85,324	190,210	165,910	192,618	123,826
10029	6,472	10,230	25,986	71,709	80,164	105,439	183,487	163,136
10030,31	19,283	34,134	63,955	110,042	159,715	498,009	634,563	179,389
10037	9,722	16,564	19,232	30,684	145,242	243,479	84,956	87,1882
10038	23,444	52,775	101,082	147,371	195,953	456,321	215,549	192,618
10039	7,224	9,817	17,786	64,528	58,876	123,514	126,677	#DIV/0!
10041	0,000	0,000	0,000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
10063	12,959	24,261	36,928	59,768	90,105	74,406	114,290	19,0484
10064	12,890	12,540	32,234	56,191	53,023	164,944	189,141	312,955
Communal forest of Moloundou	21,638	28,057	18,183	12,906	20,673	16,514	73,526	163,725
Communal forest of Yokadouma	13,922	22,694	39,455	48,853	101,548	275,072	42,099	45,8614
All production forests	**15,455**	**26,460**	**38,382**	**53,607**	**63,451**	**109,328**	**126,317**	**108,615**

Anyone of the following diameters 80 cm, 90 cm, and 100 cm can be proposed as the minimum exploitable diameter in Cameroon.

Table 20 in appendix shows for each production forest, the volume obtained per diameter class. Table 21 below shows the exploitable volume of Assamela in the three diameters. The volume of Assamela yielded is 2 647 954 m^3, 1 791 646 m^3, and 1 025 489 m^3 at diameter 80 cm, 90 cm, and 100 cm respectively.

Table 21. Distribution of Assamela volume per production forest in the three potential MED

FMU/Diameter (cm)	80	90	100
10001,2,3,4	359 000	247 500	138 000
10005	173 937	137 258	103 183
10007	85 100	64 000	43 000
10008	94 935	74 762	38 097
10009	51 561	43 206	27 802
10010	159 526	124 260	70 653
10011	79 174	66 718	55 445
10012	69 918	51 582	37 943
10015	142 469	101 668	60 017
10018	72 730	53 080	29 670
10020	35 076	22 619	7 686
10021	157 873	128 355	78 123
10022	22 590	11 580	2 228
10023	93 751	64 980	3 9426
10025	0	0	0
10026	139 689	57 703	29 249
10029	24 237	15 183	8 050

FMU/Diameter (cm)	80	90	100
10030,31	92 595	41 328	8 392
10037	22 271	10 103	3 941
10038	334 519	164 476	69 823
10039	18 921	13 726	6 757
10041	0	0	0
10063	128 986	84 491	61 328
10064	225 880	16 4426	70 691
Communal forest of Moloundou	37 675	33 338	29 168
Communal forest of Yokadouma	25 540	15 304	6 817
Total	**2 647 954**	**1 791 646**	**1 025 489**

The annual possibility of Assamela is shown in table 22, for each of the three potential MED. This annual (yearly) possibility is 88 265 m^3, 59 722 m^3, and 34 183 m^3 at MED 80 cm, 90 cm, and 100 cm respectively.

Table 22. Annual possibility of Assamela in different production forests diameters for the three potential MED.

FMU/Diameter	80		90		100	
	Volume≥DME	Annual possibility	Volume≥DME	Annual possibility	Volume≥DME	Annual possibility
10001,2,3,4	359 000	11967	247 500	8 250	138 000	4 600
10005	173 937	5 798	137 258	4 575	103 183	3 439
10007	85 100	2 837	64 000	2 133	43 000	1 433
10008	94 935	3 165	74 762	2 492	38 097	1 270
10009	51 561	1 719	43 206	1 440	27 802	927
10010	159 526	5 318	124 260	4 142	70 653	2 355
10011	79 174	2 639	66 718	2 224	55 445	1 848
10012	69 918	2 331	51 582	1 719	37 943	1 265
10015	142 469	4 749	101 668	3 389	60 017	2 001
10018	72 730	2 424	53 080	1 769	29 670	989
10020	35 076	1 169	22 619	754	7 686	256
10021	157 873	5 262	128 355	4 279	78 123	2 604
10022	22 590	753	11 580	386	2 228	74
10023	93 751	3 125	64 980	2 166	39 426	1 314
10025	0	0	0	0	0	0
10026	139 689	4 656	57 703	1 923	29 249	975
10029	24 237	808	15 183	506	8 050	268
10030,31	92 595	3 087	41 328	1 378	8 392	280
10037	22 271	742	10 103	337	3 941	131
10038	334 519	11 151	164 476	5 483	69 823	2 327
10039	18 921	631	13 726	458	6 757	225
10041	0	0	0	0	0	0
10063	128 986	4 300	84 491	2 816	61 328	2 044
10064	225 880	7 529	164 426	5 481	70 691	2 356
FC Moloundou	37 675	1 256	33 338	1 111	29 168	972
FC Yokadouma	25 540	851	15 304	510	6 817	227
Total	**2 647 954**	**88 265**	**1 791 646**	**59 722**	**1025489**	**34183**

The individuals of Assamela at diameter ≥ 100 cm are wilting, and stems of many of them are rotten. Those individuals are therefore often abandoned in the forest, which lead to an economic loss for both the forest company and the Cameroon government. Following what precedes, the diameters 90 cm can be proposed for an economic and ecological based exploitation of Assamela in Cameroon. Cameroon government should adopt this MED as to enhance sustainable use of Assamela in the country. This diameter gives an exploitable volume of 1 791 646 m^3 and an annual possibility of 59 722 m^3.

If adopted, this MED (90 cm) will remain more high than the MED used in other Congo Basin countries such as Congo (MED = 60 cm), Democratic Republic of Congo (60) or Central African Republic (80 cm). In DRC, it has been proved that, the diameter of regular fructification (DRF), which is the minimum diameter from which 70% of trees get a regular and efficient fructification is 35 cm (Sepulchre et al. 2008). Similar results have been obtained in the Eastern region of Cameroon by Nature+, a Consultant office that assists logging companies in drafting their management plan (Willy Delvingt of ATIBT, pers. Com.).

3.5. Synthesis on the management measures.

As it can be observed, the management measures undertook by the Cameroonian forest administration in the forest sector take in account the main principles of the sustainable forest management as outlined by the international tropical timber organization (ITTO 1992). Those measures follow the framework developed by the international technical tropical timber association (ATIBT 2002).

According to the results obtained from the current ITTO/CITES project, density of Assamela is 0.53 stems/ha and the annual possibility is 34 183 m3 at MED 100 cm instead of 45 000 m3 as oftehn used by Cameroon CITES management authority. The best diameter which conciliates both the ecological and economic concerns is Diameter 90 cm. This new MED if adopted by the Cameroon government, will produce an exploitable volume of 1 791 646 m^3 and an annual possibility of 59 722 $m^{3.}$ of Assamela in production forests in Cameroon.

IV. UTILIZATION AND TRADE

4.1. Type of use

Pericopsis elata is in Appendix II of CITES with annotation number 5 since June 1992. Logs, sawn wood, and veneer sheets of *Pericopsis elata* are subject to CITES controls. In Cameroon, a ban on log exports was introduced in 1999 for all species except *Triplochiton scleroxylon*. This has led to an increase in secondary processing of *Pericopsis elata* within the country mainly in sawn wood, but increasingly into solid flooring boards. All national production of Assamela comes from wild trees.

4.2. Harvest

4.2.1. Previous considerations for defining national quota

According to the CITES Management authority, the national annual production previsions (possibilities) of Assamela are more than 45 000 m^3 (Akagou 2008). Data obtained from Eastern Delegation of Forestry and Wildlife in 2007 revealed a processing rate of about 43% for Assamela timber for a total of 23 permits (MINFOF 2008).

A total of 43 forest companies exported products from Assamela timber between 2004 and 2006. Table 23 shows for each company, the annual production and possibilities obtained for three years: 2004, 2005, 2006.

Table 23. Produced volume and possibility (available volume) of Assamela found in different permits between 2004 and 2006.

PERMIT NUMBER	YEAR 2004		YEAR 2005		YEAR 2006		TOTAL		MEAN	
	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY
10003	879	2480	1744	6601	2604	4185	5227	13266	1742.3	4422.0
10005	890	8856	577	5430	2148	2579	3615	16865	1205.0	5621.7
10007	93	1017	356	1188	192	531	641	2736	213.7	912.0
10008	0	0	0	0	0	389	0	389	0.0	129.7
10009	884	1008	647	1316	59	151	1590	2475	530.0	825.0
10010	50	228	249	556	227	1184	526	1968	175.3	656.0
10011	203	548	0	935	0	202	203	1685	67.7	561.7
10012	436	625	1568	3168	680	1376	2684	5169	894.7	1723.0
10013	722	1921	0	0	0	0	722	1921	240.7	640.3
10015	280	497	229	3250	388	3340	897	7087	299.0	2362.3
10018	50	1885	4635	5464	1428	4812	6113	12161	2037.7	4053.7
10020	0	360	11	22	0	0	11	382	3.7	127.3
10021	765	1921	1653	2486	1000	2634	3418	7041	1139.3	2347.0
10022	436	812	126	176	0	24	562	1012	187.3	337.3
10023	582	2494	1718	2309	1216	2880	3516	7683	1172.0	2561.0
10026	343	1247	798	2611	1053	1373	2194	5231	731.3	1743.7
10029	750	2120	178	1259	71	963	999	4342	333.0	1447.3
10030	82	299	449	697	416	914	947	1910	315.7	636.7
10031	863	1568	688	1219	580	0	2131	2787	710.3	929.0
10037	0	0	0	1327	0	0	0	1327	0.0	442.3
10038	1050	1449	1147	1683	1103	1758	3300	4890	1100.0	1630.0

PERMIT NUMBER	YEAR 2004		YEAR 2005		YEAR 2006		TOTAL		MEAN	
	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY	PRODUCT VOLUME	POSSIBILITY
10039	120	244	12	223	29	578	161	1045	53.7	348.3
10045	0	19	0	0	0	0	0	19	0.0	6.3
10054	67	132	13	11	0	84	80	227	26.7	75.7
10063	650	1098	758	2449	14	83	1422	3630	474.0	1210.0
10062	0	0	4	0	0	0	4	0	1.3	0.0
10064	1841	1716	48	323	1837	2648	3726	4687	1242.0	1562.3
VC1001116	0	0	0	0	3119	0	3119	0	1039.7	0.0
VC1001153	0	0	0	0	0	5114	0	5114	0.0	1704.7
9006	29	0	0	0	9	4539	38	4539	12.7	1513.0
1475	0	175	0	0	292	101	292	276	97.3	92.0
1478	0	0	0	0	0	498	0	498	0.0	166.0
1002147	0	0	0	0	7	22	7	22	2.3	7.3
807103	0	0	0	0	0	3600	0	3600	0.0	1200.0
VC 1001117	722	0	0	0	0	22	722	22	240.7	7.3
VC 1001119	519	1689	0	0	0	0	519	1689	173.0	563.0
VC 1001140	0	1250	0	0	0	0	0	1250	0.0	416.7
VC 1001155	0	2108	0	0	0	0	0	2108	0.0	702.7
VC 1003143	0	254	0	0	0	0	0	254	0.0	84.7
VC 1004125	0	213	0	213	0	0	0	426	0.0	142.0
VC 104128	0	153	0	153	0	0	0	306	0.0	102.0
AR1005001	0	272	0	272	0	0	0	544	0.0	181.3
AR0000004	0	0	6	100	0	0	6	100	2.0	33.3
	13306	**40658**	**1761 4**	**4544 1**	**1847 2**	**4658 4**	**4939 2**	**13268 3**	**16464. 0**	**44227. 7**

To obtain the 15,200 m^3 as the annual quota (Q), the Forest administration considered a processing rate (R) of 33.77% for the annual production (P) of 45,000 m^3.

Q = P x R

Q = 45 000 x 33.77% = 15,200 m^3.

The above processing rate is less than the 43% obtained in the East region. This confirms the preoccupation of the Cameroonian CITES Management authority who has the problem of lack of exact processing rate, that may guide the attribution of quotas to different companies (Akagou 2008).

Table 24 shows the sawn wood volume of *Pericopsis elata* exported from Cameroon between 1992 and 2006 (UNEP-WCMC CITES Trade Database). The 2007 data were provided by the Cameroonian CITES management authority (Akagou 2008).

Table 24. Exports volume of *Pericopsis elata* from Cameroon (1992 – 2006)

YEAR	EXPORTS (m^3)
1992	4 419
1993	13 009
1994	21 101
1959	17 673
1996	26 147
1997	27 657
1998	19 074
1999	21 379
2000	7 641
2001	2 720
2002	6 501
2003	7 285
2004	7 358
2005	7 626
2006	6 415
2007	7 785

Cameroon exported its main important volume of *Pericopsis elata* in 1997 and 1996, with 27,657 m^3 and 26,147 m^3 respectively (figure 7). In 1995, the new forest law was published, announcing eminent ban of log exports. But any special decision, banning the log exports was not taken. Timber companies therefore profited of this situation to increase their log exports in 1996 and 1997. In 1999, the ban on log exports was introduced, which led to a decrease on Assamela exports. Since 2000, production levels have been under 8,000 m^3 of lumber, although its annual exportation quota is 15,200 m^3 (CITES 2003, Akagou 2008).

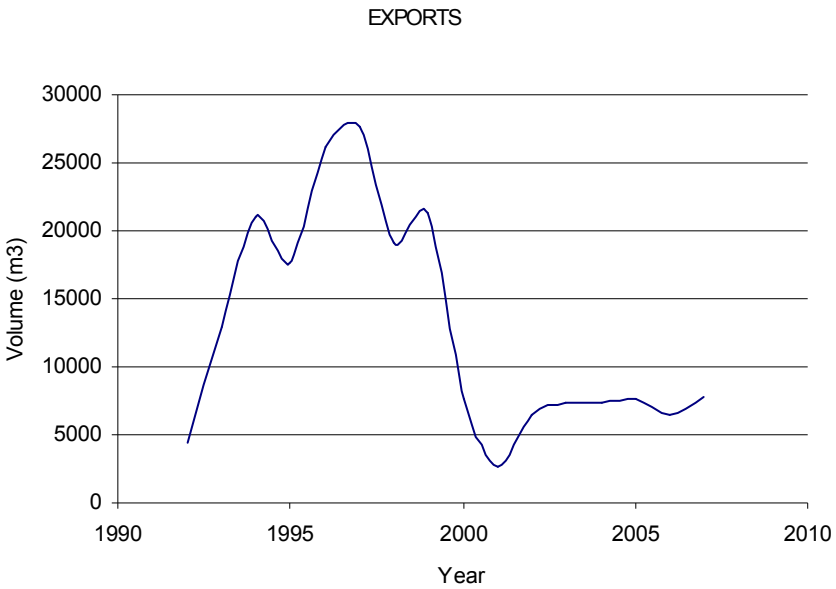

Figure 7. Export volumes of *P. elata* from Cameroon between 1992 and 2006.

Table 25 presents the exports volume per country for the two last years (2006 and 2007). We can note that at total of 18 countries imported Assamela products from Cameroon, for a total volume of 14,303.5 m^3 , which is less than the 15,200 m^3 authorized per year by the CITES.

Table 25. Export volumes per country (Akagou 2008).

COUNTRY	YEAR 2006	YEAR 2007	TOTAL
AFRIQUE DU SUD	94.3	178.5	272.9
Belgique	4673.8	5270.6	9944.5
CANADA	65.1	0.0	65.1
CHINE	19.8	125.8	145.6
Espagne	56.7	63.0	119.7
France	109.7	52.7	162.4
GRECE	91.4	82.7	174.1
Italie	961.2	1397.0	2358.2
TUNISIE	78.0	0.0	78.0
UAE	16.8	0.0	16.8
USA	351.4	382.7	734.1
DANEMARK		31.4	31.4
EMIRATS A		90.9	90.9
MAROC		24.7	24.7
ROUMANIE		25.7	25.7
TAIWAN		59.4	59.4
TOTAL	**6518.2**	**7785.3**	**14303.5**

We can note in figure 8 that, what ever be the year, Belgium (9944.5 m^3), Italy (2353.2 m^3), and USA (734.1 m^3) are in this order the three main importing countries of Assamela of Cameroon for the two years 2006 and 2007.

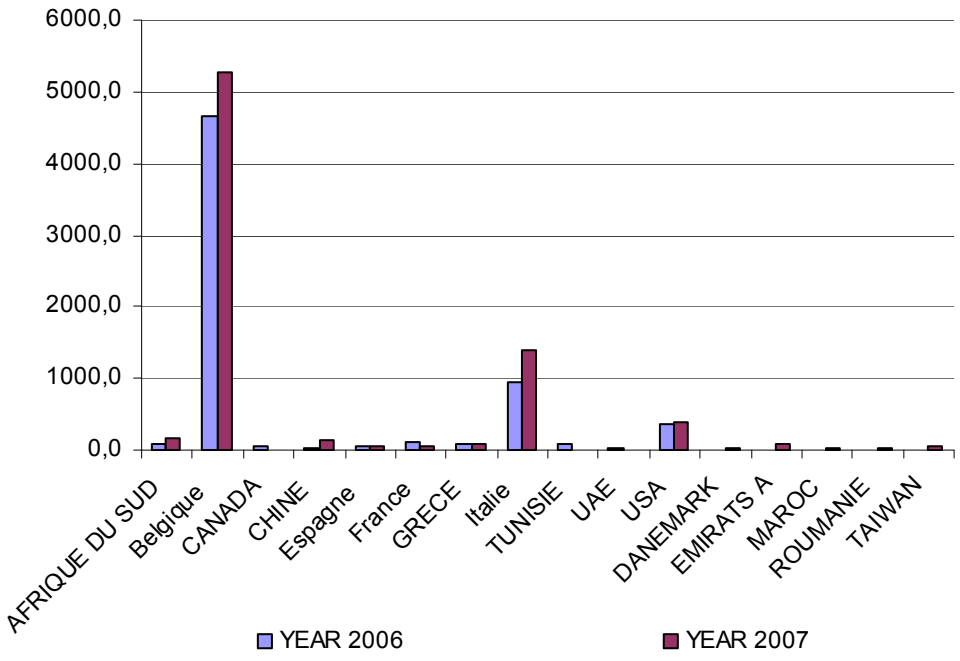

Figure 8: Importing countries

4.2.2. Simulation of real quota based on the current ITTO/CITES project results

4.2.2.1. Processing rate

During the ITTO/CITES training workshop on the Assamela, held in Kribi, Cameroon from 2 to 4 April 2008,the Cameroon Government, represented by the CITES management authority outlined one problem related to the attribution of quota for Assamela. As we can see in section 4.2.1., the processing rate estimated for the East region is 43%, while the one use by the CITES management authority is 33.77%. Due to the lack of fair information on the relation between the raw volume (logs) and the processed volume (sawn wood), it is difficult for the management authority to define a comprehensive export quota and corresponding logging volumes to forest companies. The definition of a fair processing coefficient (conversion ratio) within the framework of this ITTO/CITES project was assigned to address this problem.

Following what precedes, a study was launched (Bindzi, 2009) to establish a sound-based mathematical formula for the processing rate of Assamela (from standing tree to sawn products). The study aimed to analyse data contained in management plans, annual reports, logging book of logging companies, entrance factory book of timber industries, way bills, and others as to estimate a suitable processing rate for Assamela in Cameroon.

According to that study, the processing rate could be determined at an FMU/local level or at a national/global level.

For national level, two partial conversion factors are considered:

- A logging conversion factor RR, which gives the conversion of the standing tree volume into actual log volume. The standing tree volume is calculated using a standing volume tariff (tarif de cubage) and the actual log volume is calculated by the standard formula of a conic volume. On the basis of the statistical data on pre-harvest inventories and on log production at the national level for the 2003-2007 period, and by applying the formula developed for Assamela in the Cameroonian forest sector, we have:

Mean RR = (mean volume of individual Assamela for the given period/mean estimated volume of Assamela standing tree) = 1,027

- A sawmill conversion factor (or sawmill yield) RM, which gives the conversion of the log consumption of the sawmills into sawn products dedicated to export markets. On the basis of the statistical data on sawmills performances related to the conversion of Assamela sawlogs (which show sawmill yields ranging from 25% to 60%), we obtain for the 2003-2007 period:

Mean RM = (total Assamela sawnwood production for the given period/total Assamela log consumption by sawmills for the same period) = 0,413

The Assamela processing rate R would thus be estimated as:

R= (mean RR) x (mean RM) = 1,027 x 0,413 = 0,4242 (instead of 0,3377 given above)

4.2.2.2. Simulation of export quota

a) At MED 100 (Q_{100}):

Given the above value of the processing rate, and considering a sustainable production volume of Assamela logs (forest possibility) of 34 000 cubic meters as shown above, the export quota of Assamela sawn products would be fixed at:

$$Q_{100} = R \times \text{Annual forest possibility at MED 100} = 0{,}4242 \times 34\,000 = 14\,400\ m^3$$

The export quota will be 14 400 m3 instead of 15 200 m3 as often proposed by the CITES management authority.

b) At MED 90 (Q_{90})

$$Q_{90} = R \times \text{Annual forest possibility at MED 90} = 0{,}4242 \times 59\,722 = 25\,334.07\ m^3$$

Since 2000, the national quota has never rich 8 000 m^3 (52.6% of the export quota). This is due to the fact that, timber companies do not get good quality wood for export. The individuals of Assamela at diameter ≥ 100 cm are wilting, and stems of many of them are rotten. Those individuals are therefore often abandoned in the forest, which lead to an economic loss for both the forest company and the Cameroon government. With the new MED (90 cm), we hope this problem will be mitigated and timber companies will exceed 70% of the quota.

V. MONITORING AND VERIFYING HARVESTS

Control of timber exploitation, trade and exportation is the main responsibility of the Ministry of Forestry and Wildlife (MINFOF). Other services are concerned, such as the Ministry of Finance through the Forest Revenue Enhancement Program (FREP) and the General Division of Customs (GDC).

5.1.General elements of control as outlined in the arête n° 0222/A/MINEF/25 may 2001.

Before talking about the control and monitoring of Assamela in Cameroon, it is important to first understand the general elements required by the forest administration. The basic elements of the monitoring or control system are précised in the arête 222, articles 25 - 49. The monitoring starts in the central administration by the attribution of the forest management unit, the approbation of the document of the management plan, till the external services (provincial delegations) of the forest administration.

The process of approbation of the management plan of the FMU comprises eight main steps: (1) attribution of the FMU on a competitive basis (adjudication), (2) signature of the preliminary convention (3) sampling design or protocol, to be approved by the forest administration, (4) the management inventory to be approved by the forest administration, (5) the document of the management plan, (6) sub-commission for analysis of the document of the management plan, in charge to examine and issue a technical avis on the contain of the document of the management plan (7), the inter-ministerial commission for approbation of the management plan assisted by one independent observer; (8) the definitive convention which aims to implement the management plan.

The sub-commission in charge to examine and issue a technical avis on the contain of the document of the management plan is mainly composed of researchers from different domain (foresters, biologists, socio-economists, jurists, etc.), the National Agency for the Forest development (ANAFOR), universities, and the Institute for Agricultural Research and Development (IRAD).

The inter-ministerial commission in charge with the approbation of the document of the management plan is composed of: the Director of forests representing the Ministry of forestry and wildlife (MINFOF): president – one representative of the Ministry of territorial administration: member – one representative of the Ministry of planning and territorial management: member – one representative of the Ministry of scientific and technical research: member – the Director of wildlife and protected areas (MINFOF)/: member – the Director of timber promotion and processing (MINFOF): member – the Director of sustainable development of the Ministry of environment and nature protection: member – the provincial Delegate of environment and forestry (MINFOF) of the region where the forest concession is located.

The Committee meets at least twice a year. The evaluations of the implementation of the management plan are realized at the end of each logging unit (5 years), at the end of the convention (15 years), and also at the end of the rotation (30 years). Those evaluations can even be conducted if necessary at any moment of the year, by the competent forest services.

The management plan can be revised after every 5 years. Any modification of the management plan can imply the realization of new or complementary inventories.

The development, and implementation of the management plan is a fund demand and many companies have problem to get their forests. By the year 2003, some companies used to develop their management plan, using services of the consulting offices (consortium), and

many of those companies did not get the technical know – how, necessary to implement their management plans. One of the innovations made in the forest sector there after, was the creation in each forest company, a management unit. This unit is directed by a forest engineer who is in charge of the development, the implementation, and the revision of the management plan. The existence of this unit as far as the qualification of the person in charged to work on it are some criteria also appreciated by the Government for the approbation of the management plan.

Since 2 – 3 years ago, the International Technical Tropical Timber Association (ATIBT) trains forest managers of timber companies on different tool for the development, revision, and implementation of the management plans for tropical forests. Hence, more than 30 forest managers have been trained in the Congo basin.

During the preliminary convention, the beginning of activities in a new annual logging plot requires the obtention (detention) of an annual logging certificate. The maximal area to attribute within the year is fixed in conformity with the current legislation. Each annual plot cannot be attributed twice.

During the definitive convention, the beginning of logging activities in a new annual plot, or the renewable of a given annual plot requires the obtention (detention) of the annual operation permit. This permit also cannot be attributed twice.

All felled trees obtained during forest logging activities are noted in a logging book. Sheets of this book also called the “DF10 sheets”, are filled every day by the forest company.

The logging book or the “DF10 sheets” are printed by the forest administration, and sold to regular possessors (holders) of annual permits. The cods (numbers) of sheets allocated to a given company, and for a specific title (annual permit) are registered in the forest data base, settled in the Ministry of Forestry and Wildlife/forest department (SIGIF). Each concessionaire is responsible of the “DF10 sheets” perceived. These sheets can only be used for a specific permit and a specific year for which they have been edited. The cods of sheets that have been destroyed (spoiled) or loss, must be declared by the company to the forest administration, so they can be deleted from the forest data base (SIGIF). The control (monitoring) of “DF 10 sheets” that are in movement in the country, is permanently realized by the forest administration officers, who punish any irregular utilization.

Any “DF 10 sheet” must contain the logs coming from the same permit (annual logging plot). Every week, the forest logger must put together, sheets belonging to the same group “month of logging – permit” and transmit them to the provincial delegation of forestry and wildlife.

Each regrouping sheets constitutes a weekly portion. And a weekly control sheet DF 11, must be annexed to each portion.

The portions are consecutively numbered (codified) per year and per permit. A portion can only contain “DF10 sheets” belonging to the same month of logging. In the section “provenance of timber”, the forest logger must precise the councils names. If the permit covers more than one council, the forest logger will have to indicate the percentage of the area of each council. The forest logger must depose (transmit) the “DF 10 sheets” not late than 10 days after the end of the logging month, to the Provincial delegation of forestry and wildlife. The Provincial Delegate has thereafter to deliver the DF10 attestation of deposit to the logger. The compilation of those sheets is done in the provincial delegation of forest/Service of forest database (external SIGIF), before being transmitted to the central forest database in Yaoundé (SIGIF central).

The annual plot is closed to forest logging at the 30th of June of the year. And the company must depose the annual report of forest interventions (RAIF) not late than the 31th of July of the same year.

5.2.Participative implementation of the management plan

The implementation of the management plan focuses on three different stake holders: forest administration, forest company, local population. The management plan must precise how the notion of participative management is applied at the level of the forest concession. It must also describe the mechanisms that should be develop to resolve conflicts.

In the annex of the document of the management plan, there exists an agreement convention linking the forest company and the local communities. This agreement states the obligation of the two parties (logger and the population). Local populations are authorized to harvest some products in the forest concessions, mainly composed of non timber forest products such as wild fruits, vegetables, and medicinal plants. They are also allowed to undertake fishing and small scale traditional hunting of small mammals which are authorized by the forest law. Sometimes, local communities are also authorized to conduct small scale agricultural activities, with low impact on timber production. They are committed to work together with the timber company to combat poaching and illegal or "wild" sawing.

The forest logger has to pay regularly his forest taxes, and to contribute to development projects for the benefice of the community. In fact, the social and cultural dimension is one of the important innovations outlined in the Cameroon forest legislation. This dimension states that, the local people may participate to the management of forest resources and may gain some profits of the exploitation of those resources. The concrete measures undertaken by the Cameroon government in this regard are for e.g., the obligation of forest companies to realise certain number of social activities (duties) such as the creation of schools, health centres, etc… for the benefit of local communities, the payment of the annual forest tax ("*Redevance forestière annuelle"* in French) by the exploiter. The annual forest tax is a specific tax that is settled on the surface area of the forest under exploitation. Revenues coming from this tax are shared between the public treasury or the forest administration (50%), the local council (40%), and the local communities (10%). When the permit is a sale of standing volume, local communities perceived additional informal tax of 1,000 FCFA/M^3 .

The parts of the forest tax allocated to the council and communities are destined to realise some small development projects at the local level. A specific arête was published by the forest administration to precise the modalities of using those funds. Number of dispositions have been put in place to ensure that the money is effectively used for such a projects. The activity reports of councils are regularly sent to the forest administration to monitor the management of the forest revenues.

The forest administration works to ensure the conservation and development of permanent forests all over the country. His job does not only consist of controlling and monitoring the forest logging activities; but also to protect the loggers against illegal sawing done by some villagers in the forest concessions. The forest administration is also committed to plant trees in zones were forests have been destroyed or degraded. All these tasks require lot of money. To enhance the contribution of the forest revenues in the conservation of forests, the Government of Cameroon created the Special Funds for Forests Development (FSDF). The main objective of this fund is to re-inject some parts of the forest revenues in the sustainable management of those forests. The decree n° 96-237-PM of 10 April 1996 fixing the modalities of functioning of this fund states that, the FSDF is a special fund of the public

treasury destined to finance the management, conservation, and sustainable development operations of the forest resources. The revenues of the FSDF comes from different sources including: (i) the quote-part of revenues produced by the annual forest tax (RFA), the felling tax, the tax of transfer of a forest concession, the exit tax (at the port), the progressive surtax paid for the exportation of unprocessed or raw products, the price from selling the forest products, penalties, transactions, damages-interests, other selling forms such as selling the seized products, (2) the recuperation including authorization of gathering logs within the agricultural activities, roads construction, or abandoned logs in the forest, (iii) Revenues affected by the law, (iv) selling of files by the forest concessionaires including forest agreements, permits, (v) selling of administrative documents including the DF10 sheets, the factory entrance book, the way bills book (for logs and for sawn wood), (vi) subventions, contributions, and dons, and others.

Revenues gained from the seized products are shared as follow: 35% go to feed the public treasury and 65% go to the FSDF. The 65% of the FSDF are furthermore shared as follow: 40% for buying different forest material and equipment (Global positioning systems, maps, tents, etc.), capacity building, or as the Government contribution in the financing of some forest projects (The forest administration has like this contributed to the financing of the recent National forest inventory together with the FAO), 25% are paid to the forest officers who have participated to the control mission that led to the payment of those revenues. Before, the money generated by the selling of seized products was collected by the forest officers and reversed in total to the General Directorate of Taxes (GDT) , with the repartitions showed above. The problem is that, the GDT did not used to send back the quote parts of the forest administration. That is why, since the month of March 2006, the forest administration has decided to retain the part belonging to its services. And since there, things seem to work well.

The expenditures supported by the FSDF include (i) management of forest reserves, (ii) regeneration of forests, (iii) forest inventory, (iv) materialization of limits of forest concessions and creation of infrastructures, (v) equipments for forest inventories, (vi) technical control and monitoring of forest management in concessions, (vii) dissemination of results of research on forest management, (vii) research in forestry, (viii) functioning of different committee (for agreements, permits, management plans, etc..), (ix) counterpart funds in the forest projects, (x) contribution of the Government to international Institutions, (xi) motivation of the forest agents and officers.

5.3.Specific CITES provisions

5.3.1. CITES regulations

Cameroon signed the Convention on the International Trade of Endangered Species in June 1981 and ratified it in September of the same year. To guarantee the effective implementation of this Convention, and in pursuance of the relevant provisions of its Articles 8 and 9, Cameroon adopted a number of legislations, composed of tree major measures:

- Decree n° 2005/2869/PM of 29 July 2005 setting forth the enactment provisions of a number of provisions of the Convention on the International Trade in Endangered Species (CITES);
- Ministerial Order N° 067/PM of 27 June 2006 providing the organisational set-up and operational procedure of the Inter-ministerial Coordination and Monitoring Committee for the implementation of the Convention on the International Trade in Endangered Species (CITES);
- Decision N° 0104/D/MINFOF/SG/DF/SDAFF/SN of 02 March 2006 providing the designation and definition of role of the CITES Scientific Authority in Cameroon.

The adoption of these regulations bears witness, if need be, of the ownership process of the CITES Convention by Cameroon at national level.

5.3.2. CITES organs

Cameroon government has appointed two CITES organs: the management and scientific authorities.

During the ITTO/CITES training workshop on the *Pericopsis elata*, held in Kribi, Cameroon from 2 to 4 April 2008, the Minister of Forestry and Wildlife, Prof. Dr. Elvis Ngolle Ngolle, focussed his address on those efforts done by Cameroon to own and implement CITES regulations.

5.3.2. 1. CITES management authority

This role belongs to the Ministry of Forestry and Wildlife, Forest department, Sub-directorate of agreements and permits, service of intervention norms in the forest sector. This service is in charge of allocating annual quotas of Assamela to logging companies, issuance of the CITES permits for export. The service is also concerned with the elaboration, diffusion, and monitoring the respect of qualitative norms of logging, and norms related to the forest certification.

The Cameroon's CITES management authority faces many problems including the lack of scientific data on biology, ecology, phenology, processing, …to ensure a sustainable trade of *Pericopsis elata*. During the ITTO/CITES training workshop on Assamela, the CITES management authority declared that it faces the problem of attributing quotas to different timber companies. Due to the lack of information on the relation between the raw volume (logs) and the processed volume (sawn wood), it is difficult for the management authority to allocate suitable logging volumes to forest companies. Effort should be made to target to address this problem.

5.3.2.2. CITES Scientific authority

The National Forest Development Agency (ANAFOR)'s main mission consists of assisting the public sector, privates and local communities in developing plantation forests in all over the country. It also assists forest concessions in the implementation of their management plans.

ANAFOR was appointed by the Forest administration to play the role of the CITES scientific authority for plants issues in Cameroon. Hence, its mission consists of giving advices to the CITES management authority on scientific questions.

During the ITTO/CITES training workshop held in Kribi, the ANAFOR representative outlined the problem of lack of capacities. Considering the role of the CITES Scientific Authority for plants in the chain of decision for the trade of CITES-listed species, it would be interesting to build its capacities in order for it to be better able to fulfil its mandate. The CITES Scientific Authority for Plants being a rather young body, it suffers from a shortage of technical, financial and material capacities. This situation does not enable this Authority to formulate any Non-Detrimental Findings on the Assamala exports from Cameroon in the present circumstances. It is essentially in view of this situation that the Scientific Authority have submitted to ITTO a project to build the capacities of its executives (Mbarga 2008).

5.3.3. Problems observed in the implementation of CITES regulations

Within the joint ITTO/CITES Project related the Sustainable Management of *Pericopsis elata* in the Congo Basin Subregion and in Cameroon particularly, an expert was committed to study the policy framework for the implementation of the CITES and the European

Commission regulations in Cameroon. The study aimed to assess the level of implementation process of CITES norms in general, and specially on Assamela species in Cameroon. Specifically, the study aimed to review and verify the level of the conformity between the CITES norms and Cameroonian forestry legislation/regulation in general, and those relating to Assamela species mostly.

The study revealed that the implementation of CITES and the European Commission regulations remains problematic in Cameroon (Assembe 2009). Indeed, the general aim of CITIES is to ensure that international trade in specimens of wild animal and plant does not threaten their survival. In this effect, CITES offers a legislative and a regulation framework for interstates collaboration and cooperation on the international trade control of species registered in Appendixes 1, 2 and 3. Moreover, the main organ of decisions - making which is Conference of the Parties (CoP), issues many resolutions and decisions for a better implementation of their provisions. It is in this sense and spirit and taking in consideration the emerged threats outlined by IUCN, that the CoP has decided to include *Pericopsis elata* (Assemela/Afromosia) in the Appendix 2 of CITES.

Such decision from the CITES CoP gives rise de facto and de jure in the domestic regulation system in CITES Member States in terms of transplanting those rules and their implementation. Cameroon is one of country member of CITES which produces and exports *Pericopsis elata.* Cameroon has the obligation to consider evolution of CITES standards. The present review

The economy of the review also demonstrates the following results: The Washington Convention on the international trade in endangered species of wild fauna and flora (CITES) has its own juridical system structured around the lists/appendixes of treated species; the prohibition of the international trade of rare species (appendix 1); licenses and certificates for the international trade of species likely to be threatened (Appendix 2); and the control of the international trade the other species (Appendix 3). Cameroon, Member of the Washington Convention endowed with a potential in proved forest biodiversity and which is potentially threatened, is binding by CITES requirements, notably by transplanting the CITES standards in its domestic legal system. This has been done in a general manner, through the 1994 Forestry law and the 1996 framework law on environmental management in Cameroon, their regulations instruments; and particularly, the Decree No 2005 / 2869 / PM setting up the modalities of enforcement of the Washington Convention in Cameroon. The review of such regulation brings to light that consists on the deliverance of licenses and certificates for the international trade of CITES species, on one hand; and on the other hand, the creation of the Management Organ (MINFOF) and Scientific Authority (ANAFOR). Nevertheless, there are some oversight and shortcomings in such implemented instrument, notably the species lists/appendixes, the clarification of the content of CITES documents and the issuance procedure of CITES documents. The last pillar of the juridical CITES system should be elaborated separately through ministerial decrees which are still waiting. The regulation related to the implementation of CITES in Cameroon is incomplete because there is no lists/appendixes of CITES species; the modalities of issuance of certificates and the content of the documents are not clarified yet. It is therefore urgent to clarify such worst situation and to enact additional instruments.

Any trade transaction of such CITES species must be subjected to the regime of the issuance of licenses and certificates by the national Management Organ after the motivated opinion by not detrimental trade by the Scientific Authority. Additionally, the delay of the real implementation of conventional obligations in the Cameroonian territory commits the international responsibility of the State and could be induced some sanctions on the Cameroon wood exportation, especially within Members of European Union. Indeed, the EU and its

countries members has been chosen for the rigorous compliance of the CITES Convention, such rigor option should be reinforced with the future VPA / FLEGT agreements.

5.4. Other monitoring provisions

Cameroon has also taken some ad hoc measures to ensure healthy trade practices and to meet the challenge(1) the allocation of logging titles by an inter-ministerial commission assisted by one independent observer, (2) the support of one independent monitoring organization (Global Forest Watch) to monitor the status of plant cover, (3) the publication of a national strategy document for forest and wildlife controls in Cameroon which is validated by all stakeholders, (4) the strengthening (securisation) of forest logging documents, (5), the enhancement of the forest revenues through the forest administration and the finances administration, (6) the reinstatement of the visa to certify the legal origin of timber, (7) the suspension or rescission of concession agreements where applicable tax have not been paid or where the details of the forest management plan have not been validated, (8) the requirement to have an environmental impact study implemented before the start of any forest management work for all concessions exceeding 50 ha.

The Government of Cameroon is firmly committed to improving the national forest governance but is also committed to raise the level of confidence that already exists between the Cameroonian forest sector and its external partners who have been providing their long-standing support.

5.4.Control

5.4.1. Control of logging

According to the Cameroon's forest law, two main documents are required before undertaking any forest logging activity in Cameroon: the forest logging agreement and the permit. The agreement gives access to the forest logging profession, while the permit gives access to the forest resource (timber in this case). One must have these two documents before extracting any log from the forest, and mainly from the permanent domain (Republic of Cameroon 1994, 1995).

In the control of logging, one can distinguish two types of controls: the technical control and the administrative control.

Technical control consists of control measures at the point of felling and along transport routes. In 2000, a Central Unit for Control/Unité Centrale de Contrôle (UCC) was set up by the forest administration to coordinate forestry controls nationally and to support provincial Brigades de Contrôle. Since 2004, that unit (UCC) became the National Brigade for Control (Brigade Nationale de Contrôle in French). To reinforce transparency in control measures the forest administration has appointed an independent observer, Global Witness (MINEF, 2002). Global Witness is currently working together with the National Brigade for Control to ensure the sustainable forest logging in Cameroon. In the forest, the technical control consists of verifying the delimitation and the respect of the annual logging area, respect of MED/ADM, the logging inventory, the respect of the sylvicultural prescriptions, the verification of the cubage in the parks, the felling techniques. This is mainly done by the National Brigade for Control assisted by the independent Observer, but also by the provincial Brigade, the provincial chief of forest service, the divisional chief of forest service (chef de section forêts in french), the local chief of forest and wildlife post.

The administrative control consists mainly to the verification of different documents including management plans, DF10 sheets, and activity reports transmitted by the forest company to the forest administration.

5.4.2. Control of timber products along transport routes and in the points of export: circuit of timber from forest to abroad.

This section aims to present the regular circuit of timber, since the felling site, till the points of export by a legal forest company as outlined in the forest law (République du Cameroun 1994, 1995). Let us take the example of a given concessionaire who wants to convey his products to Douala, the economical capital of Cameroon.

Once a log has been confectioned in the logs park, the local chief of forest and wildlife post must deliver, after further verification, two documents to the exploiter: the certificate of origin and the way bill for logs transport. This log is then conducted in the saw mill for processing (here we suppose that the saw mill is not located in the same place of the felling site or wood park). At the processing operation (the entrance of the saw mill), there exists a check point of control. This is, an external service of the Forest Revenue Enhancement Program (FREP). This service aims to verify and to compile, the volume of timber at the entrance and at the exit of the manufactory. When the timber has been processed, the local chief of forest and wildlife post must deliver two other documents which shall convey the sawn wood to the points of export including the certificate of origin and the way bill for sawn wood. Along the road, there are many control forest posts and check points. In each post, the forest agent has to control the existence and the authenticity of the required documents for log or sawn wood transportation including: the forest agreement, the annual permit with volumes indicated, the certificate of origin, cubage, the way bill. He also has to verify the conformity of these documents with the real volume of timber transported, before putting his stamp on the way bill. Thereafter, the controller must record all the data in a register book, provided by the forest administration to this end. The summation of the sawn wood volume recorded at the end of the season should be done for further verifications.

Once in Douala, the company has two alternatives: selling the wood in the domestic market, or exporting this wood. Most of the wood produced by the timber companies in Cameroon is usually destined to export. The local market is furnished by the illegal or “wild sawn wood” (Betti 2007b). In the Douala port, the exporter has to deal with two main administrations: the forest administration and the customs administration. The forest administration is mainly composed of three main services: the chief of forest and wildlife post n° 1, the chief of forest and wildlife post n°2, and the Trade wood database (COMCAM).

The exporter has first to present himself with his product to the Chief of forest and wildlife post n°1, settled at the entrance of the port, known as “port 1”. There, he has to present many documents including: the agreement, the annual permit, the certificate of origin of sawn wood, the way bill for sawn wood, the certificate for export, and the CITES certificate for what concerns the CITES products (*Pericopsis* and *Prunus*). The certificate for export is delivered by the Ministry of Forestry and Wildlife/Division of promotion and processing/Sub-direction of processing. This certificate is issued, after having verifying that the company has paid all taxes related to the volume and quality of the wood subjected to export (felling tax and saw mill entrance tax). The certificate for export provides information on the origin of the wood, the volume, the products (sawn wood, veneer, or flooring board,…), the country of destination, the address of the buyer in the importing country. The company may therefore present the payment receipts issued by the FREP. The CITES certificate is issued by the Ministry of Forestry and Wildlife/Division of forests/Sub-direction of forest management/service of intervention norms in forests. This service is also the one which plays the role of the CITES management authority. The CITES certificate is issued after having verifying that, the company has respect the requirements prescribed for the exportation of CITES products, including mainly the respect of the quotas allocated. Once the Chief of forest and wildlife post n°1 has verified the existence and the authenticity of all those documents in

conformity with the product subject to exportation, he then delivers the specific bulletin. The specific bulletin records data on the origin of the product (FMU), agreement, permit, volume, products, destination (importing country). This bulletin is produced in many copies; some of which are given to the exporter and some to the trade wood database (COMCAM).

With his specific bulletin, the exporter has thereafter to present himself with his product to the Chief of forest and wildlife post n°2, settled in the port 2, together with the customs officers. These controllers (forest and custom officers) have to check the conformity of the declared products with what is mentioned in the specific bulletins. After these verifications (checking), the exporter has to pay the exit taxes (fees) (droits de sortie in French), before putting the product in the container for export.

5.4.3. Problems observed in the field of control

Data discussed in this section derive from the report prepared for the Expert workshop on NDF findings (Betti 2008) and from the study related to the state of the art of *P. elata* production and management in Cameroon, realised within the join ITTO/ITES project in (Tieguhong 2009).

5.4.3.1. During logging activities

During the logging control, forest officers are often faced to problems. The most important being the lack of financial and logistical resources to appropriately conduct forest monitoring and achieve the several tiers of objectives ascribed to SFM. Many chiefs of forest and wildlife post do not get any bike, so they use to be transported in the forest by the forest concessionaire himself. In this condition, they are often sensitive to any "temptation" (corruption) coming from the forest company. Some of the forest officers who refused to make some arrangements with the concessionaire have been abandoned in the forest.

Another problem often observed in the control of timber logging in the forest, is that of the lack of coordination between different services of the forest administration. This problem which has already been outlined for non timber forest products (Betti 2007) is also observed in the timber sector.

Illegal logging constitutes together with poaching, the two serious problems of the forest sector in Cameroon (MINEF, 1995; MINEFI, 2006). Illegal logging is the harvesting of timber in contravention of a country's laws. Together with the associated international trade in illegally-harvested wood products, it causes environmental damage, costs governments billions of dollars in lost revenue, and is closely associated with corruption and organised crime. It also undermines the competitiveness of legitimate forest operations in both exporting and importing countries.

Different forms of illegal logging exist, including: exceeding allowed cutting boundaries, the non respect of the minimum exploitable diameter, the non respect of the volume of timber allocated, illegal felling, false declarations (Betti, 2004). Illegal felling and false declarations are said to be the two major types of illegal practices found in the forest sector in Cameroon (*http://www.idrc.ca/en/ev-28727-201-1-DO_TOPIC.html*). The importance of illegal logging has increased with the implementation of the new forest code. In fact, the more the forest activities are regulated, the more the number of infractions increases (Karsenty, 2006).

Although neglected by forest industries, the national need of wood covers by the informal sector represents some 300 000 m^3/year of timber (Koffi Yeboa, 2005). This sector is growing more and more and its economic impact is crucial at all levels including production, processing, distribution and employment (MINEFI, 1998; 2004). The evolution of the

production and exportations of sawn wood in Cameroon (all exploited timbers) from 1995 to 1997 for both formal and informal sectors is illustrated in table 26.

Table 26. Evolution of the production and exportations of sawn wood in Cameroon from 1995 to 1997 (x 1000 m^3) (MINEFI, 2004).

Products	1995/1996	1996/1997
Production of the formal sector	436	460
Production of the informal sector	245	260
Total production	681	720
Local or domestic consumption	420	445
Exportations	261	275

The informal sector contributed for 505,000m^3, which represents 35.6% of the national production of sawn wood for the two exercises (1995/1996 and 1996/1997). The formal sector contributed for 64.5% with 896,000 m^3. Knowing that the logging companies prefer to produce their wood for the foreign market (536,000 m^3 for the exportation of the two periods), it is clear that the remaining 360,000 m^3 is not enough to satisfy the domestic demand which is about 865,000 m^3.

Different reasons explain the proliferations of illegal logging or sawing sector in Cameroon. The main reasons include: the lack of motivations among the logging companies, the lack of clearance in the management of funds that have to be given to local communities, the complexity of the conditions required for allocating small permits and the economic crisis.

Some important questions tackled during the study related to the state of the art of *P. elata* production and management in Cameroon, realised within the join ITTO/ITES project (Tieguhong 2009) were: Are the companies with authorised volumes the corresponding producers? Are there timber companies without authorized volumes that produce? The analysis showed that only one company produced all the annual volumes authorised between 2002 and 2007. 14 companies that had authorized volumes did not produce while 25 companies actual produce part of their authorized volumes during the same period. In reality only 35.19% of the authorized volume of 230 955 m^3 was actually harvested between 2002 and 2007. The remaining 64.81% was either not harvested or harvested but not reported for assorted technical, material, or illegal reasons. The proportion reported as harvested (35.19%) could be interpreted as a low production rate despite the fact that during the same period, four companies were found to have harvested 10 508 m^3 of Assamela without having authorization. These companies included SIBAF, TRC, SFIW and MP (Table 27). Other possible legal or illegal sources of Assamela could include community forests and sale of standing volumes, the use of waybills of community forests, false declaration associated with difficulties in the identification of Assamela, buying wood from other companies with or without partnership contracts etc.

Table 27: Total volume (m^3) of Assamela authorized, produced & remaining for all concessions from 2002- 2006

Concessionaire	Authorized	Produced	Remaining	% produced	% remaining
201 (CRM)	498	498	0	100.00	0.00
118 (PALLISCO)	2822	2613	209	92.59	7.41
363 (SODETRAN)	1705	1141	564	66.92	33.08
420 (FB)	9036	5757	3279	63.71	36.29
297 (SEBAC)	3120	1946	1174	62.37	37.63
189 (SEFAC)	9024	4965	4059	55.02	44.98
276 (CAMBOIS)	11006	5969	5037	54.23	45.77
1080 (Ing F)	3799	1827	1972	48.09	51.91
546 (GREEN VALLEY)	11242	4920	6322	43.76	56.24
268 (SFCS)	15866	6759	9107	42.60	57.40
412 (SFDB)	8180	2967	5213	36.27	63.73
214 (SFID)	458	159	299	34.72	65.28
215 (SCTB)	1504	519	985	34.51	65.49
321 (STBK)	44328	13097	31231	29.55	70.45
693 (HABITAT 2000)	838	236	602	28.16	71.84
198 (SEBC)	6022	1677	4345	27.85	72.15
311 (CFC)	36533	9282	27251	25.41	74.59
196 (SAB)	1778	401	1377	22.55	77.45
175 (ALPICAM)	15959	3468	12491	21.73	78.27
253 (CIBC)	8572	1329	7243	15.50	84.50
348 (SFF)	276	38	238	13.77	86.23
426 (ASSENE)	1792	161	1631	8.98	91.02
277 (CFE)	8555	722	7833	8.44	91.56
680 (SCIFO)	7195	230	6965	3.20	96.80
1072 (SFEES)	5716	71	5645	1.24	98.76
328 (GEC)	3600	7	3593	0.19	99.81
1100 (NK)	1692	0	1692	0.00	100.00
1112 (NE)	2108	0	2108	0.00	100.00
1200 (CRD)	4324	0	4324	0.00	100.00
1202 (CMY)	22	0	22	0.00	100.00
150 (J.PRENANT)	19	0	19	0.00	100.00
212 (KIEFFER)	1399	0	1399	0.00	100.00
352 (APRODE/AP)	306	0	306	0.00	100.00
372 (SOKADO)	360	0	360	0.00	100.00
457 (SAFIE)	100	0	100	0.00	100.00
487 (ELOUNGOU)	153	0	153	0.00	100.00
498 (TAGNE)	544	0	544	0.00	100.00
586 (BUBINGA)	39	0	39	0.00	100.00
6003 (MARELIS)	250	0	250	0.00	100.00
757 (TTS)	215	0	215	0.00	100.00
1111 (TRC)	0	6	-6	#DIV/0!	#DIV/0!
188 (SIBAF)	0	9315	-9315	#DIV/0!	#DIV/0!
312 (SFIW)	0	1183	-1183	#DIV/0!	#DIV/0!

Concessionaire	Authorized	Produced	Remaining	% produced	% remaining
320 (MP)	0	4	-4	#DIV/0!	#DIV/0!
Grand Total	230955	81267	149688	35.19	64.81

Other questions that arose from the above analysis included:

- Why are some companies that were not authorised volumes found to top in production data?
- Why do companies ask and get authorised volumes of Assamela but do not produce?

The answers to these questions require further field research. Anyway, preliminary investigations conducted in the forest administration revealed that, timber companies export products according to the buyer's requirements.

The recent evaluation made by the International Tropical Timber Organisation revealed some limits in the arête n° 222/A/MINEF for what concerns monitoring and control. Some experts think that the TIAMA package should be revised, due to the great variability of Cameroon forests. Also, the arête 222 does not prescribe the post-logging inventory. This inventory is important in the monitoring of the management plans. The evaluation of the implementation of the management plans précised in the arête and attributed to the forest companies is the normal task of the government, as far as the control and the monitoring. It is important to understand how the forest reacts after logging. This task should be devoted to the forest officers, rather to the forest company itself. (ITTO 2009).

5.4.3.2. Along transport routes

Along the transport routes, technical control consists of verifying relevant documents and their conformity with the product transported. The problems observed here include the lack of sufficient and qualified personal, the lack of material of control, the lack of motivation for the forest agents, the competence conflicts with other administration. Following the structural economic adjustment undertaken in the late 1990, the Cameroon government has stopped the recruitment of forest officers in the forest administration. This had a negative impact in the forest control and monitoring activities. In many forest posts and check points settled along the road, there are one, two or three forest agents who are currently doing control. This number is not enough to ensure the control of log trucks all days and nights (24 hours/24). Also, many of the agents affected in those posts are too old now and do not get sufficient material for staying awake and resisting to cold all night long. Due to the lack of motivation, following the reduction of the salary, most of the forest agents are sensitive to any corruption activities. Many of them do not record data from checking in their register book, as required by the forest administration. So many of these register books cannot be used, for further verifications. One cannot try to retrace the timber volume trade transported to Douala, through data recorded in those books (Betti 2007).

Another problem largely observed along the roads is that of conflict of competency with other administrations such as police forces. These persons use to stop cars for checking forest products (Betti 2007).

5.4.3.3. At the points of export

The Cameroon wood is exported from the ports of Douala, Kribi, Limbé, Tiko. The first and main problem observed here is the lack of synergy between the custom officers and the forest officers. Often, the custom officers, who are posted at the end of the exportation chain, refuse

to consider the specific bulletins dressed by the forest officers. Also, they used to refuse that the forest officers check the final container and consigns the transport document "connaissement in french". In this condition, some products are exported without the visa of the forest officers.

The second problem in export is at the level of the chief of post N°1 and 2. Normally, the chief of forest and wildlife post n°1 must transmitted all specific bulletins to the Trade Wood database (COMCAM). This is not always the case, since some specific bulletins do not exist or disappear. Such behaviour which is certainly link to corruption is detrimental to the monitoring, and checking of statistical data on the trade wood.

Also, export data registered in COMCAM are supposed to equal those registered in Port 2. This is not the case. For illustration (Tieguhong 2009), a total of twelve variables were selected to compare the data collected at Douala Port II and COMCAM for base years 2007 and 2008. Results showed that data collection and entry at the two government controlled offices were the same for only 25% of the variables with some minor to major variations in 80% of them involving exported and imported volumes for 2007 and 2008 (Table 28).

Table 28: Comparison of data collected at Douala Port II and COMCAM database

Variables	**Douala Port II**	**COMCAM**
Total volume exported in 2007 (m^3)	6 719.99	7 037
Total volume exported in 2008 (m^3)	4 084.96	4 122
Total volume imported in 2007 (m3)	6 719.99	7 037
Total volume imported in 2008 (m3)	4 084.96	4 121
Total number of exporting companies in 2007	13	12
Total number of exporting companies in 2008	12	13
Total number of importing countries in 2007	15	14
Total number of importing countries in 2008	09	09
Highest exporting company (%) in 2007	STBK (34%)	STBK (34%)
Highest exporting company (%) in 2008	STBK (19%)	STBK (21%)
Highest importing country (%) in 2007	Belgium (62%)	Belgium (60%)

The third problem is that of the non existence of COMCAM in other ports. Only COMCAM Doula has work correctly till date. COMCAM Limbé, Kribi, Tiko have not been functioning in fair manner. COMCAM Kribi has just started working.

The fourth problem observed in the control of timber products is that of the proliferation of the "criques". "Criques" are informal points of export, found in many localities settled along the frontier Cameroon – Nigeria, in the south region of Cameroon. These are unsafe sites, where forest officers cannot undertake any control mission (Betti 2007).

The fifth problem is that of lack of connection between the two forest database systems belonging to the Ministry of Forestry and Wildlife. As we can see, specific CITES requirements for *Pericopsis elata* are the responsibility of MINFOF which is the Cameroonian Management Authority for CITES. MINFOF records information on trade in timber through two database systems for the collection of revenue and to support law enforcement: SIGIF at Yaoundé and COMCAM at Douala. The problem is that, there is no connection between the two database systems. In Yaoundé, SIGIF records data on a log by log basis, while in Doula, COMCAM records data on sawn wood by sawn wood basis. Such a system cannot allow to monitor the circulation of timber in the whole country, and to make a linkage between the logs volume and the processed volume.

The sixth problem is that of lack of such a system for monitoring domestic trade in wood products. Till date, the forest administration has never developed a fair system for controlling and monitoring domestic trade, which cannot help to get a global trade volume of wood in the country.

In 2001, the Scientific Review Group (SRG) convened under EU legislation, on which member States' Scientific Authorities are represented, formed a negative opinion on the conservation effects of imports of *Pericopsis elata* from Cameroon, resulting in an effective suspension of imports. The grounds for this decision, which was based on a proposal from Belgium, were doubts as to the legal provenance of much of the timber being exported. This decision was reversed following consultation with Cameroon. The SRG was sufficiently reassured to allow imports to resume, pending the outcome of the Significant Trade process. During 2002, various fines and withdrawal of permission to export have been imposed for activities relating to trade in *Pericopsis elata* in contravention with the provisions of CITES (CITES 2003, MINEF, 2002).

5.4.4. Achievements, challenges and perspectives

Although the control and monitoring system put in place in Cameroon faces many problems, there are some perspectives which need to be outlined here (Betti 2008, Tieguhong 2009). The IITO/CITES training workshop held at Kribi in early April 2008, provided the Cameroonian Minister of forestry and wildlife, the opportunity to introduce the Cameroonian forest sector in its assets in terms of achievements, challenges and perspectives. The most important are the implementation of the Forest and Environment Sectorial Program (PSFE), the certification of some forest concessions and the implementation of the FLEGT process.

The PSFE is a national program for sectorial development, elaborated by the Cameroon Government and opened to the funding of all donors, including international or bilateral aids, the civil society, and NGOs. It aims to develop a coherent framework for all interventions which contribute to the realisation of the objectives of the forest and wildlife policy of the country.

Through the PSFE, the Cameroon Government wants to get a guide that will allow him to ensure a fair monitoring and an efficient control of the forest and environmental activities by strengthening a global dynamic to the isolated efforts made by projects. The PSFE aims to ensure that those projects be coherent with the objectives of sustainable development of the country.

The PSFE was developed in 2003 (MINEF 2003) for a period of 10 years, distributed in two 5 years phases. The first 5 years phase was estimated at 66,148 millions of FCFA (1 FCFA = 650 euros).

The implementation of the PSFE is done on a participative basis, with the forest administration being the main interlocutor. The architecture of the program distinguishes three main levels: (1) the national level of the global management, (2) the national level of component management, (3) and the provincial level of implementation. At any level, a program Committee defines the orientations, the programmes, and the Annual work plans (AWP).

The Forest and Environment Sectorial Program is made of 5 components including: (1) environmental management of forest activities, (2) management of production forests and valorisation of the forest products, (3) biodiversity conservation and valorisation of faunal or wildlife resources, (4) community management of forest and wildlife resources, (5) institutional building, training, and research.

The Component 2, dealing with the management of production forests and valorisation of the forest products is the one that largely interests us in this document. This component is composed of five sub-components including: (1) zoning the remaining national territory (mainly the northern part of the country), (2) management of production forest, (3) valorisation and processing of the timber resources, (4) valorisation and processing of the Non timber forest products (NTFP), and (5) forest control, monitoring and forest tax enhancement.

Under the pressure of the ecologist movements, le external market becomes more and more reluctant on products coming from natural forests, and mostly non managed forests. By 2010, it is obviously possible that only products harvested in managed forest will enter the international market.

Although the Principles, Criterion, and indicators (PCI) for the sustainable management of forest are not yet approved by all parties in Cameroon, the efforts made by the Government in the forest sector can be useful for the forest certification. In fact, the Cameroon forest law together with the measures undertook to enhance the sustainable management of forest resources as underlined in this document, are a suitable framework to reach the forest certification target. The challenge here is that of implementing strictly those measures in the field. Six out of the forests concessions which are exploiting the Pericopsis elata timber species in Cameroon have already been certified by ICILIA or FSC.

Cameroon is currently engaged in negotiations with the European Union to reach a Voluntary Partnership Agreement (APV/FLEGT) to improve the governance and transparency of the timber trade between the two partners. At the core of the Action Plan are Voluntary Partnership Agreements with timber-producing countries that wish to eliminate illegal timber from their trade with the EU. These agreements will involve establishment of a licensing scheme to ensure that only legal timber from producing countries ("Partner Countries") is allowed into the EU. Unlicensed consignments from Partner Countries would be denied access to the European market under the scheme. Several meetings have been organized between representatives of the two parties (Cameroon and European Commission). The main area of discussions include: the nature of products that will be concerned by the FLEGT, the

origin of those products, the chain of custody, the system of licences issuance, audit, the institutional framework, the forest governance. The final document of agreement will be signed soon and the commencement of the FLEGT process is planned for next year 2010.

VI. CONSERVATION AND THE PRECAUTIONARY PRINCIPLE

The conservation and the precautionary principle will be discussed at the level of planted forests and natural forests.

5.1. Forest plantations

5.1.1. Problem

Forest plantations – a subset of all planted forests – are defined as forests of introduced species and in some cases native species, established through planting or seeding, with few species, even spacing and/ or even-aged stands. Productive forest plantations are defined as forest plantations predominantly intended for the provision of wood, fibre and non-wood forest products. They can also provide protective, recreational, amenity and other functions, which are not precluded by the harvesting of products. Subregions reporting the least area of productive forest plantations are the African subregions, the Caribbean, Central America and Western and Central Asia. A total area of 10 764 000 ha productive forest plantations is found in Africa, representing a percentage of 2.5% of the total forest area. Fifty six (56%) percent of these planted forests are found in Northern Africa (FAO 2006, Betti 2007).

Since 1930, the Cameroon Government has engaged in a forestation and regeneration policy. This policy pursued numerous of objectives including: (1) timber production, (2) charcoal production, (3) environment protection, and (4) improvement of ecological know ledges on the forest dynamic, which still constitute a limit for the elaboration of management plans. Those objectives were compatible with ecological zones where those plantations were settled. Hence, a total of 35,000 ha of forests have been planted in the country (MINEF 1995) and distributed as follow: 4,100 ha in the dried savannah area (production of charcoal), 8,700 ha in humid savannah one (same objectives) and 23,000 ha in the forest zone (timber production). The 23,000 ha found in the forest zone has a growth rate of about 18 m^3/ha/year, and their harvesting potential is estimated at 200,000 m^3, which is less than 10% of what is actually obtained from the natural forest, and only 6% of what is lost through agriculture. Sylvicultural trials were realised in many forest species, including *Baillonella toxisperma* (Moabi), *Entandrophragma sp* (Sapelli, Sipo, Kossipo, …), *Milicia excelsa* (Iroko), *P. elata*, *Triplochyton scleroxylon*,…. *P. elata* was planted in two forest reserves: the Ndeng Ndeng forest reserve in East region, and the Kienké sud forest reserve, in the South region.

Different sylvicultural methods were developed and tested with some interesting results. The problem is that those plantations have been abandoned following the economic crisis which attacked the country in the late 1990 and the economical structural adjustment (MINEF 2004c). Data are not available to capitalise those results. Today, most of those plantations are exposed to different forms of pressures including the extension of agricultural areas, the wild sawing, the bush fires, … These activities are not compatible with the research targets assigned to those plantations.

The Cameroon's 1994 forest law recommends timber loggers to replant in their forest concessions after logging. The complete program of this regeneration, mainly composed of enrichment methods, is often mentioned in the document of the management plan of each company. One of the main problems forest companies usually face for this regeneration is the lack of quality and sufficient seeds and seedlings. In fact, the seeds and seedlings of Assamela are easily attacked once they fall from the mother tree. Timber companies need to be assisted to address this critical sylvicultural problem.

5.1.2. Rehabilitation of *P. elata* plantations in Cameroon

Within the joint ITTO/CITES programme, Cameroon government submitted to ITTO an activity entitled "rehabilitation of *P. eleta* plantations in Cameroon". This Activity goes in line with the Cameroon's Forest and Environment Sectorial Program (FESP) developed in 2003 (MINEF 2003). The activity meets the objectives of 3 out of the 5 components, including: Component 2 (Sub-component 2.2/Activity 2.2.4: to establish the state-of-the-art of the forest reserves and plantations, Activity 2.2.5: to develop the management plans for forest reserves and plantations, and Activity 2.2.6: to ensure the implementation of the management plans for forest reserves and plantations), Component 4 (Sub-component 4.2./Activity 4.2.2: to promote the development of the forest plantations), and Component 5 (Sub-component 5.3: research).

This activity addresses the management of *Pericopsis elata*'s plantations in Cameroon with a view to determine the important tools for enhancing the sylviculture of this plant species in the country. The specific objectives of the activity are to (1) establish the state-of-the-art and dress a fair management plan for *P. elata*'s plantation, and (2) to implement this management plan. The expected outputs are (i) a report drawing the state-of-the-art of the plantation (ii) zoning, (iii) protection of the plantation, (iv) research results, (v) capacity building and dissemination of the sylviculture *P. elata* among communities and timber companies.

A total of 2 national experts have been appointed for that activity: (1) state of the art and development of a simple management plan for Pericopsis plantation, (2) research on biology, ecology and sylviculture of *P. elata*. A total of three MSc students from the Department of forestry at the University of Dschang are currently conducting their thesis in different aspects related to the two expertises. No difficulties are foreseen at this stage of its implementation.

At the end of the Activity, the two forest plantations concerned will be protected against the numerous pressures conducted by local people: agriculture, wild sawing, bush fire. Relevant communities will gain know ledges on different techniques of regeneration of *P.elata*, nurseries of *P. elata* will be developed in rural areas as useful tool and step for plantations development.

To date, management of the nursery of the Institute for Agricultural Research and Development (IRAD)/Kribi branch has been strengthenned and the nursery has been provided with more than 4 000 seedlings with the support of the ITTO/CITES activity (Ngueguim 2009, Onana 2009). The document of the simple management plan has been produced and is currently on the review process by members of the steering Committee.

Results of the previous evaluation of some plots conducted by the forest administration in 2004 are shown in table 28. Different sylvicultural methods were developed and tested with some interesting results. Assamela was largely tested with the enrichment method (Table 29). As it is said above, the problem is that those plantations have been abandoned.

Table 29. General physiognomy of *P. elata* plantations in Cameroon (MINEF 2004).

PLANTATION	YEAR	SPECIES	PLANTED SURFACE AREA (HA)	METHOD	SEEDLINGS AND ORIGIN	SURFACE AREA IN 2004 (HA)	STATE OF THE PLANTATION

PLANTATION	YEAR	SPECIES	PLANTED SURFACE AREA (HA)	METHOD	SEEDLINGS AND ORIGIN	SURFACE AREA IN 2004 (HA)	STATE OF THE PLANTATION
BIDOU	1973 -1975	Assamela	2	Enrichment planting (recrû in French?)	Seeds from local mother trees	2	Øm = 17 cm Trunks are extremely branched and crooked so that satisfactory intermediate yields cannot be provided. This result cannot militate to use this plantation as a demonstrative plot.
Dend-Deng	1996-1997	Assamela Framiré Moabi Bibolo	8	Enrichment planting		5.5	Lack of cleanings and multiple damages caused by the passage of herds of cows. Only Moabi and Cedrella have resisted.
Dend-Deng	1998-1999	Assamela Bibolo	5	Enrichment planting		3.5	Assamela seems to grow well and has Øm = 7 cm, Hm = 6 m. layons need to be cleaned.
Deng-Deng	1999-2000	Assamela Cedrella	16	Enrichment planting		11	Assamela grows well, but needs cleaning operations.
Total			31			22	29% of the surface area lost.

Table 30 shows the current physiognomy of the Bidou and Kébé plantations. The average high varies from 14.8 m in plot P741 (“recû” method) to 28.84 m in plot P.73 (great layons method or “grands layons” in french). The average diameter varies from 16.74 cm in plot P746 to plot P. 741. We conclude that, the “recur” method with space/distance of 20 m x 3 m provide better growth in High, while the “recur” method with space of 5 m x 4 m allows better diameter growth. The survival rate is above the average, which is a good situation.

Table 30. Current physiognomy of the Assamela plantations in Bidou (Kienké south reserve) and Kébé (Ndeng-ndeng reserve) (Ambara 2009).

Plot (age)	Space/distance	Sylvicultural method	Initial number of trees	Initial density (stem/ha)	Actual number of trees	Actual density (stem/ha)	Medium high (m)	Medium diameter (cm)	Percentage of survival (%)
P72 (37 years)	3 m x 3 m	recrû	425	1111	333	871	28.84 ± 7,20	29.30 ± 16,10	77,2
P75 (34)	4m x 3 m	recrû	255	884	234	765	28.33 ± 6,53	23.46 ± 9,98	91.7
P741 (35)	5m x 4 m	recrû	493	500	263	263	14.80 ± 5,67	29.76± 17,76	53.3
P745 (35)	15m x 3 m	Great layons	511	256	284	142	15.98 ± 5,68	16.74 ± 12,03	55.5
P746 (35)	20m x 3 m	Great layons	383	192	265	133	16.67 ± 4,94	15.87 ± 9,8	69.2
Total									

NB. Plots P73 and P75 are found in the Bidou (Kribi) forest plantation, while plots P741, P745, and P746 are found in the Bloc Kébé (Ndeng-ndeng) forest reserve.

Germination trials conducted with seeds collected in those plantations took place in 9 days. (Onana 2009).

Specific curves of Assamela for three plots are illustrated in figure 9 for the Bidou plantation and figure 10 for the Kébé plantation (Ambara 2009, Nguguim 2009). Those curves illustrate the problem of regeneration for small diameter classes. The high number of stems are observed between diameter classes 10 and 40 cm.

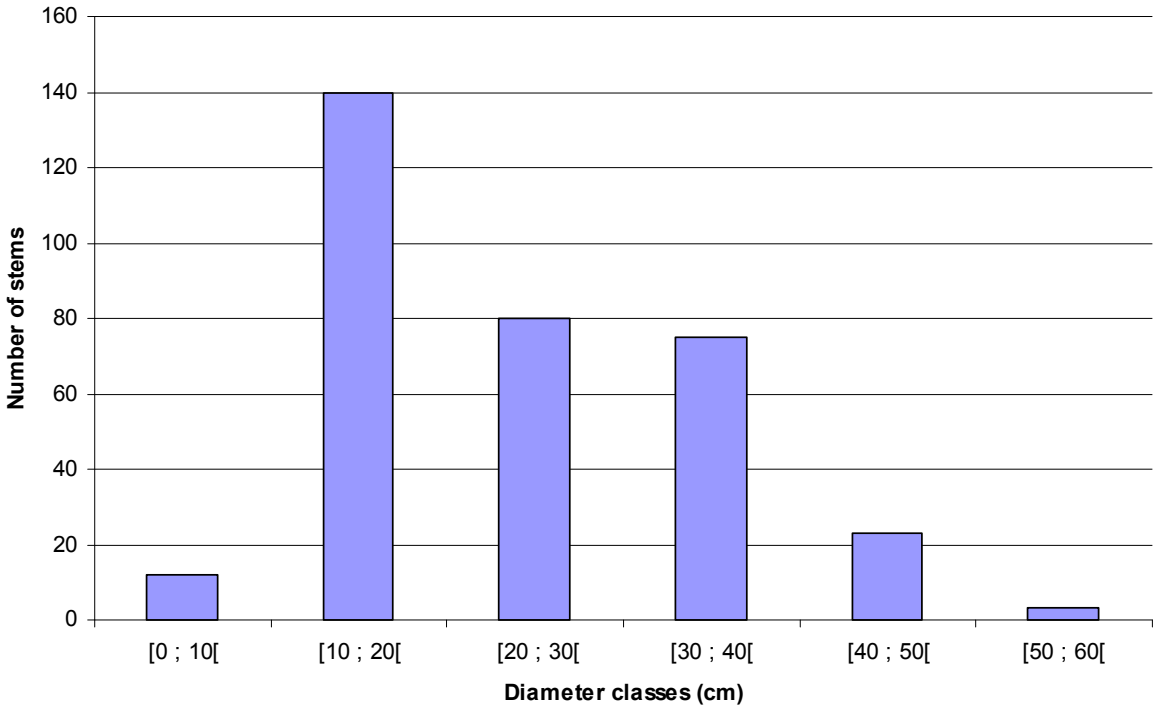

Figure 9a. Specific curve of Assamela in Bidou plantation, plot n° 73 (36 years old).

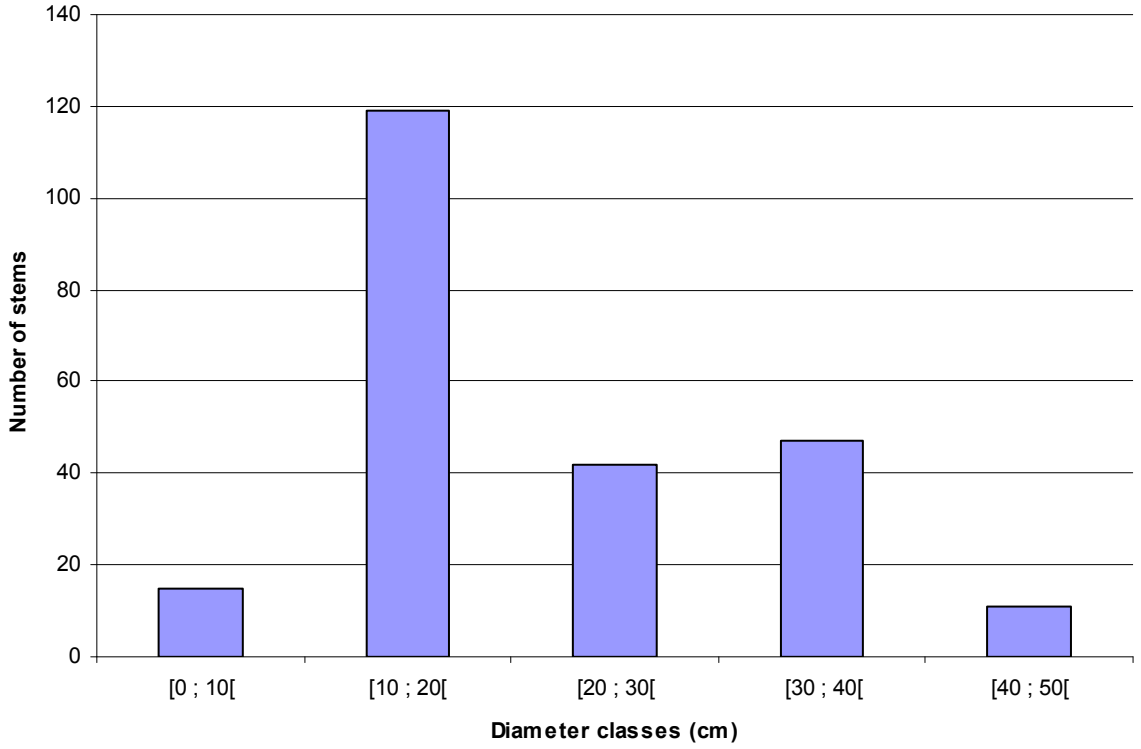

Figure 9b. Specific curve of Assamela in Bidou plantation, plot n° 75 (34 years old).

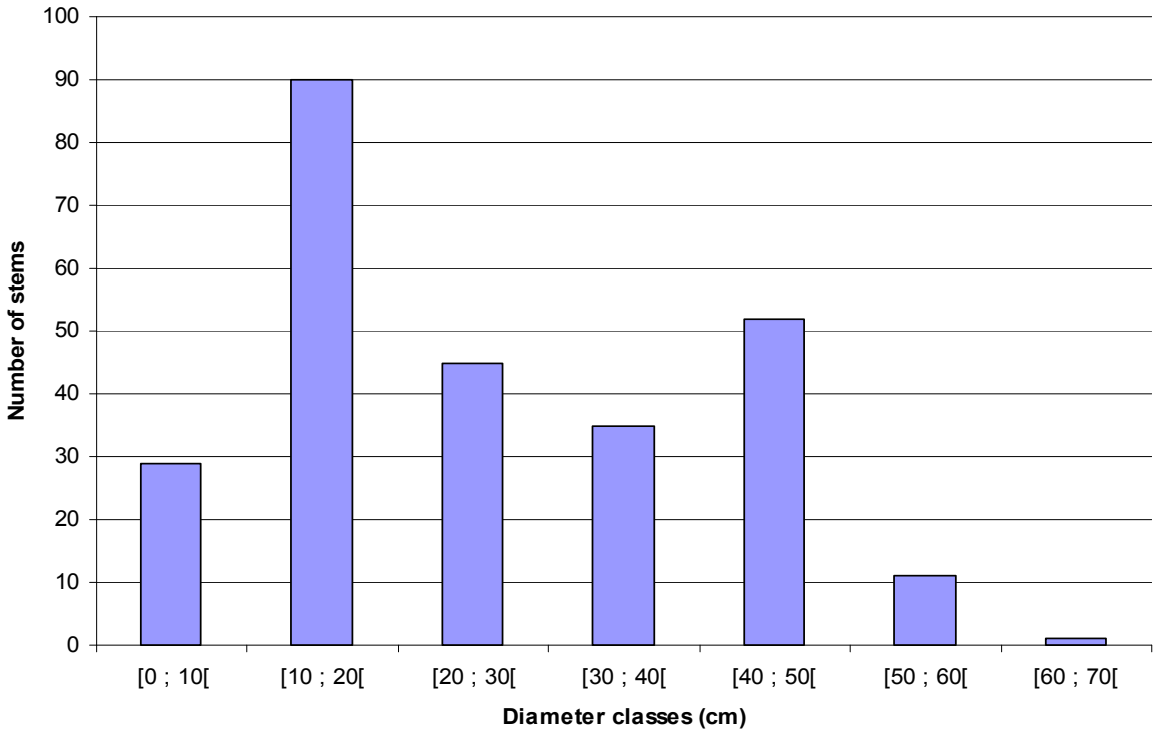

Figure 10. Specific curve of Assamela in Kébé plantation, plot n° 741 (35 years old).

Data are not available to capitalise those results. For example, nothing is said concerning the nature and origin of the seedlings used in the Deng-Deng forest reserve. Also, most of those plantations are currently exposed to different forms of pressures including the extension of agricultural areas, the illegal logging and sawing, the bush fires, … These activities are not compatible with the research targets assigned to the plantations (MINEF 2004, Ambara 2009). Compared to the 2004 situation (table 29), it is clear that the surface area has been reduced drastically, from 2 ha to 0.689 ha.

Germination trials conducted by ETS ASSENE NKOU showed that, Assamela can easily be educated in nurseries. Germination takes place in five days, without particular sylvicultural treatments. Assamela has a regular fructification (fruits production) regime, and seeds are easily collected. In plantation, Assamela grows well in high light, and can therefore be easily reintroduced. This confirms the idea that *Pericopsis elata* can be easily propagated from seed and from rooted stem cuttings. In Ghana, trials conducted showed that germination takes place in 8 days but seedlings are scarce (Dei-Amoah & Cardoso 2008). Plantation trials in Côte d'Ivoire have shown growth to around 20 cm in diameter after 20 years (Kouame cit. CITES 2003). In Cameroon, the highest growth in diameter is 29.76 cm in 35 years, in plot P741. The low values observed in Cameroon are linked to the fact that the plantations have been abandoned no technical monitoring.

In the Democratic republic of Congo, sylvicultural trials were conducted during years 1940 – 1950, mainly on the enrichment planting method and the monitoring of the natural regeneration. Some interesting results were obtained (Kabala Tshikala et al. 2008): (1) Afrormosia is a typical light-demand plant species during its early age (young individuals), the natural seedlings need a relative light of about 40-50% after 2 – 3 weeks of germination; (2) the regeneration rate (germinative power) decreases with the intensity of the clearings and the natural forest was considered as the suitable milieu for the germination; (3) in forest management, cleanings and clearings (éclaircies in french) are necessary during the first year to obtain quickly the massif that will combat the overhead shade. The Afrormosia trees introduced in those plots are exploitable in DRC where the minimum exploitable diameter is 60 cm. The average annual growth observed was 0.45 m/year between 1949 and 1974. Growth trials undertaken in Nigeria have shown that the rate of growth was medium but sapling growth was extremely branched and crooked so that satisfactory intermediate yields were not provided. Furthermore the coloured resistant heartwood is valuable rather than the pale sapwood. These factors militate against the use of the species in timber plantations because the economics of plantation forestry depend considerably on sale of material early in the rotation (Lowe, in litt. 2003 cit. CITES 2003).

5.2. Natural forests

Forest Management Units (FMU) are assigned to the sustainable production of the wood and other resources (non timber forest resources for example) in respect to the conditions that allow the preservation of ecological functions of the forest.

The distribution area of *Pericopsis elata* in East Cameroon is covered by protected areas and forest management units. The four protected areas are: the national park of Boumba-Bek (321,078 ha), national park of Nki (238,853 ha), national park of Lobeké (217,200 ha) and the integral ecological reserve of Messomesso (51,797 ha). There are some 29 production forests (27 FMU and 2 communal forests) which exploit *P. elata*, 27 of which (93.1%) have finalised

their management plans. Nine FMU have not yet been allocated (MINEF 2002, 2004a, Belinga 2009).

The forest law recommends timber companies to replant in their forest concessions after logging. The complete program of this regeneration, mainly composed of enrichment methods, is often mentioned in the document of the management plan of each company.

5.3. Precautionary principle

In Cameroon, *P. elata* can be logged at MED 80, 90, or 100 cm. MED 90 cm seems better, since it allows to conciliate both the conservation and economic concerns. In fact, MED 90 cm provides a recovery rate of 63.45%, which is the percentage of stems which were left during the first rotation (stems < MED), but which will have at least 90 cm during the second rotation (this is after 30 years). Also, MED 90 cm is at least twice high than the diameter of regular fructification (DRF). DFR is the minimum diameter from which 70% of trees get regular and efficient fructification. It was estimated at 35 cm in DRC (Sepulchre et al. 2008). Following what precedes, we consider MED 90 cm as one of the precautionary measure.

CONCLUSIONS AND RECOMMANDATIONS

Pericopsis elata is classified by the World Alliance for Nature (IUCN) as endangered species, which led to its listing in the Appendix II of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). The annual quota of export volume for Cameroon is 15,200 m^3 while the girth limit or the administrative exploitable diameter was fixed by the Government at 100 cm.

All the legal and technical instruments for the sustainable management of natural production forests are available and are of a good quality. The only problem of Cameroon is making people apply the official rules. The basis of restoration and alleviation measures or Non-Detriment Findings (NDF) is outlined in element 5, article 6 of the arête *n° 0222/A/MINEF of 25 May 2001/:* calculation of the forest possibility and determination of the managed minimum exploitable diameter. The distribution area of *Pericopsis elata* is 5 339 023 ha, more large than the 4 855 738 ha outlined in the literature. This area is largely restricted to the East region of the country, the moist semi-deciduous forest with annual rainfall of 1 000 – 1 500 mm being its specific habitat. Density of Assamela is 0.53 stems/ha and the annual possibility is 34 183 m3 at MED 100 cm instead of 45 000 m3 as often used by Cameroon CITES management authority. Three diameters can be proposed to the discretion of the Cameroon government as MED: 80 cm, 90 cm, or 100 cm. The best diameter which conciliates both the ecological and economic concerns is Diameter 90 cm. This new MED if adopted by the Cameroon government, will produce an exploitable volume of 1 791 646 m^3 and an annual possibility of 59 722 $m^{3.}$ of Assamela in production forests in Cameroon. The Assamela processing rate is 0.4242 instead of 0.33 as often used. This processing rate leads to an export quota of 14 400 m^3 at MED 100 cm instead of 15 200 m^3 and 25 334.07 m^3 at MED 90 cm. Since 2000, the national quota has never rich 8 000 m^3 (52.6% of the export quota). This is due to the fact that, timber companies do not get good quality wood for export. The individuals of Assamela at diameter ≥ 100 cm are wilting, and stems of many of them are rotten. Those individuals are therefore often abandoned in the forest, which lead to an economic loss for both the forest company and the Cameroon government. With the new MED (90 cm), we hope this problem will be mitigated and timber companies will exceed 70% of the export quota.

Cameroon signed the Convention on the International Trade of Endangered Species in June 1981 and ratified it in September of the same year. To guarantee the effective implementation of this Convention, and in pursuance of the relevant provisions of its Articles 8 and 9, Cameroon adopted a number of legislations. However, studies conducted reveal that the implementation of CITES and the European Commission regulations remains problematic in Cameroon. Control of timber exploitation, trade and exportation is the main responsibility of the Ministry of Forestry and Wildlife. Many problems are observed on the chain of control of timber products from the forest up to the exit ports at Douala. Even at the ports, accessibility is difficult for the forest officers who encounter many problems with custom agents. There is little linkage between the main databases (SIGIF and COMCAM) that gather statistical data on forest products. Anyway, Cameroon is currently engaged in negotiations with the European Union to reach a Voluntary Partnership Agreement (APV/FLEGT) to improve the governance and transparency of the timber trade between the two partners. This will contribute to mitigate monitoring limits and combat the illegal logging

The main recommendations raised from different studies conducted within the ITTO/CITES project in Cameroon included:

(1) for what concerns monitoring and control: the re-organization of the control and monitoring system as outlined in the Forest and Environment Sector Programme (PSFE), development of a database encompassing logging, processing, transportation and trade statistics components, the provision of adequate materials and logistics for data collection and analysis and the training and sensitization of forest and custom officers at different levels ;

(2) for problems related to CITES provisions, the first option which does not lead automatically abrogates of the 2005 Decree, consists by complementing the current CITES regulation in Cameroon. In fact, the study revealed that, the regulation related the implementation of CITES in Cameroon is incomplete because there is no lists/appendixes of CITES species; the modalities of issuance of certificates and the content of the documents are not clarified yet. It is therefore urgent to clarify such worst situation and to enact additional instruments. The second option should consist of the abolition of the Decree No 2005 / 2869 / PM of July 29th, 2005 and the order No 067 / PM of June 27th, 2006. The abolition of these two texts would be justified on the fact that the lists/ appendixes of species and modalities of issuance of documents are fundamental elements in the framework of the CITES Convention. The third recommendation should be the readjustment of the 1994 forestry law and the order No 0222 / MINEF / on the modalities of forest management plan and inventories. This would consist for example in setting specific management plans for assamela in the corresponding FMUs, and also by transforming the CITES management Authority into a special unit in charge of control of inventories, logging, processing, transport and trade to enhance coherent and timely information gathering and analysis.

(3) for what concerns the management of *P. elata:* increase knowledge of the stock of Assamela existing in protect areas, improve the knowledge on the wood quality of Assamela, adopt of a new Minimum Exploitable Diameter (90 cm), conduct inventories as to verify the credibility of the formula often used to calculate the reconstitution (recovery) rate, improve knowledge on the sylviculture of *P. elata,*

(4) for what concerns the management of the harvest of assamela, base the determination of assamela quotas on an individual basis (harvest quotas for individual FMUs, and next export quotas for corresponding timber plants), using formulas and methodology developed in the course of the present NDF. This would help taking into account the fact that assamela is not uniformely distributed in its area and that its harvest should be banned in specific FMUs (where it is very scarce) ;

(5) for what concerns the CITES scientific authority (ANAFOR), enhance its capacities in terms of infrastructures, technical know how, and funds necessary for regularly making fair non-detriment findings for assamela and other CITES listed plant species.

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Table 18. Distribution of Assamela stems per diameter classes in all production forests (FMU/CF) in east region of Cameroon

FMU/Diameter classes (cm)	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150	150+	
10001,2,3,4	0	16853	8998	20911	23065	19215	16369	14516	7007	956	956	956	675	675	**133682**
10005	2352	1398	3230	5380	5312	5970	5753	4198	2326	3572	1130	868	156	92	**41737**
10007	0	4611	3458	4611	4611	5764	2305	3458	3458	0	0	0	0	0	**32277**
10008	1425	2051	1602	3619	327	3831	3164	4517	911	1419	341	285	99	0	**23591**
10009	1010	1015	1300	1150	1510	2300	1100	1650	935	875	186	0	125	0	**13156**
10010	1792	2838	3560	7237	4486	6345	5531	6605	3475	2344	434	347	0	0	**44994**
10011	777	2197	2055	3195	1322	595	458	1603	503	274	274	0	0	0	**13252**
10012	1841	2796	1886	1720	3641	3035	2875	1680	936	572	366	372	320	160	**22200**
10015	4012	4350	7034	8562	7433	8904	6399	5132	1778	1558	318	200	0	671	**56351**
10018	1115	1070	1456	1799	1692	2522	3082	2884	1360	492	417	99	116	0	**18104**
10020	439	662	974	864	972	1523	1650	1516	446	0	111	0	0	0	**9 157**
10021	2908	4040	8126	9493	10257	10669	4630	6189	2811	3075	433	216	0	110	**62957**
10022	465	459	1219	1618	1104	2462	1727	1152	118	85	0	0	0	0	**10409**
10023	1599	1199	4787	6061	9540	5392	3808	2593	2599	200	200	0	0	0	**37978**
10025	0	0	0	0	90	0	0	0	0	0	0	0	0	0	**90**
10026	3556	5207	10540	19048	16381	16254	10794	3048	1524	381	127	127	127	0	**87114**
10029	91	91	535	767	1619	2302	1192	764	434	129	91	0	0	0	**8015**
10030,31	6997	11122	16869	21681	22382	16010	8042	4060	627	78	78	0	0	0	**107946**
10037	188	99	565	840	754	942	1602	660	94	94	0	89	0	0	**5927**
10038	21067	25883	38824	53421	43489	22572	9631	4063	602	301	0	0	150	0	**220003**
10039	850	313	317	487	769	1650	709	729	263	222	0	0	0	0	**6309**
10041	0	0	0	0	0	147	0	0	0	0	0	0	0	0	**147**
10063	3170	5238	4548	7719	8408	7719	5858	2481	2481	0	689	207	896	0	**49414**
10064	3090	10135	8699	9220	19176	18843	10005	12100	3912	1747	111	111	334	0	**97483**
Communal forest of Moloundou	380	378	690	725	575	454	680	407	1183	763	212	104	104	0	**6655**
Communal forest of Yokadouma	221	555	1080	1513	1718	1321	1333	869	0	142	71	71	0	71	**8965**
Total	**59345**	**104559**	**132353**	**191641**	**190634**	**166741**	**108697**	**86873**	**39782**	**19279**	**6545**	**4052**	**3103**	**1779**	**1117914**

Table 20. Distribution of Assamela volume per diameter class in different production forests (FMU and CF)

FMU/Diameter classes (cm)	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150	150+	
10001,2,3,4	2100	2300	34800	36000	89200	85400	111500	109500	41600	40200	40200	16000	0	0	**608800**
10005	-11	804	4356	12458	18462	28832	36679	34075	23373	43496	16384	14764	3081	2085	**238838**
10007	500	1000	8000	8100	21200	21200	21100	21000	14300	14300	14300	100	0	0	**145100**
10008	-7	1180	2160	8380	1136	18502	20173	36665	9158	17284	4847	4849	1959	0	**126286**
10009	1225,5	1820	3337,3	4064,3	7088,8	13911	8355,1	15405	10538	11722,9	2923,6	0	2617,5	0	**83009,14**
10010	-9	1633	802	16758	15591	30640	35266	53607	34922	28542	6287	902	0	0	**224941**
10011	319,59	640,1	24984	24048	28300	25966	12456	11274	18510	12604,9	12605	11725	0	0	**183432,3**
10012	-9	1609	2545	3984	12658	14660	18336	13639	9409	6967	5307	6329	6311	3620	**105365**
10015	-19	2503	9488	19826	25836	42998	40801	41651	17873	18970	4604	3401	0	15169	**243101**
10018	0	620	1960	4160	5880	12180	19650	23410	13670	5990	6040	1680	2290	0	**97530**
10020	175,6	595,8	1607,1	2307,7	3790,8	8533,4	12458	14933	5579,5	0	2106,8	0	0	0	**52086,75**
10021	-14	2324	10960	21981	35652	51525	29518	50232	28251	37440	6272	3680	0	2480	**280301**
10022	-2	264	1645	3748	3837	11892	11010	9352	1189	1039	0	0	0	0	**43974**
10023	650	1088	7916	16189	37975	30208	28771	25554	32523	3109	3794	0	0	0	**187777**
10025	0	0	0	0	358	0	0	0	0	0	0	0	0	0	**358**
10026	4314,4	9338	27058	67320	76904	98313	81986	28454	17174	5103,99	1996	2315,3	2659,2	0	**422936,5**
10029	110,42	163,2	1373,4	2710,7	7600,5	13923	9053,9	7132,8	4891,3	1728,29	1430,4	0	0	0	**50118,34**
10030,31	-33	6399	22752	50203	77792	77319	51267	32936	6303	954	1135	0	0	0	**327027**
10037	228,11	177,6	1450,5	2968,7	3539,7	5697,6	12168	6161,9	1059,4	1259,37	0	1622,7	0	0	**36333,57**
10038	8577,4	23475	64255	143408	212630	243779	170044	94653	51615	8577,42	5266,8	0	0	4364	**1030644**
10039	335	275	508	1262	2972	8971	5195	6969	3304	3453	0	0	0	0	**33244**
10041	0	0	0	0	0	822	0	0	0	0	0	0	0	0	**822**
10063	3846,4	9395	11676	27280	39472	46687	44495	23163	27961	0	10830	3774,1	18762	0	**267342,1**
10064	-15	5328	11485	20598	62969	87660	61454	93735	39312	21275	1616	1896	6592	0	**413905**
Communal forest of Moloundou	-2	218	931	1678	1999	2194	4337	4170	12961	9292	3080	1776	2059	0	**44693**
Communal forest of Yokadouma	120	627	2099	4537	7391	7743	10236	8487	0	2092	1252	1479	0	1994	**48057**
Total	**22381**	**73777**	**258148**	**503970**	**800234**	**989557**	**856309**	**766157**	**425476**	**295400**	**152277**	**76293**	**46331**	**29712**	**5296022**

MAPS

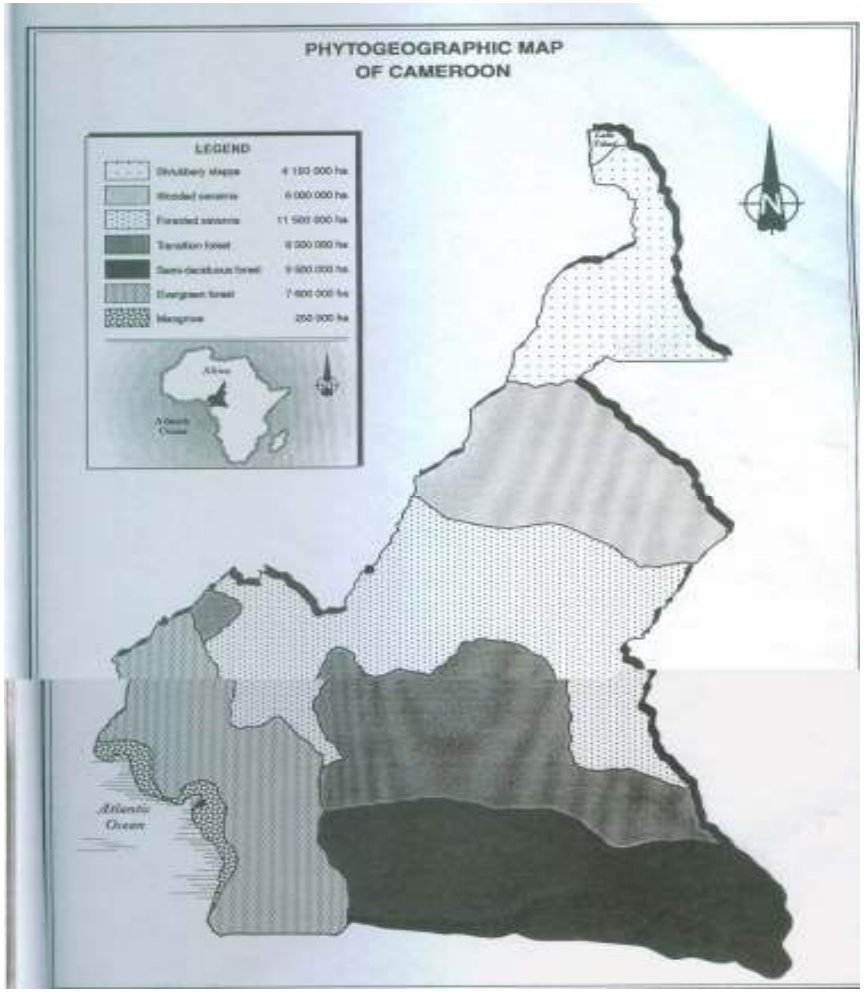
PHYTOGEOGRAPHIC MAP
OF CAMEROON
LEGEND
Shrubbery steppe
Wooded savanna
Forested savanna
Transition forest
Semi-deciduous forest
Evergreen forest
Mangrove
Atlantic
Ocean

Figure 1. Phytogeographical map of Cameroon

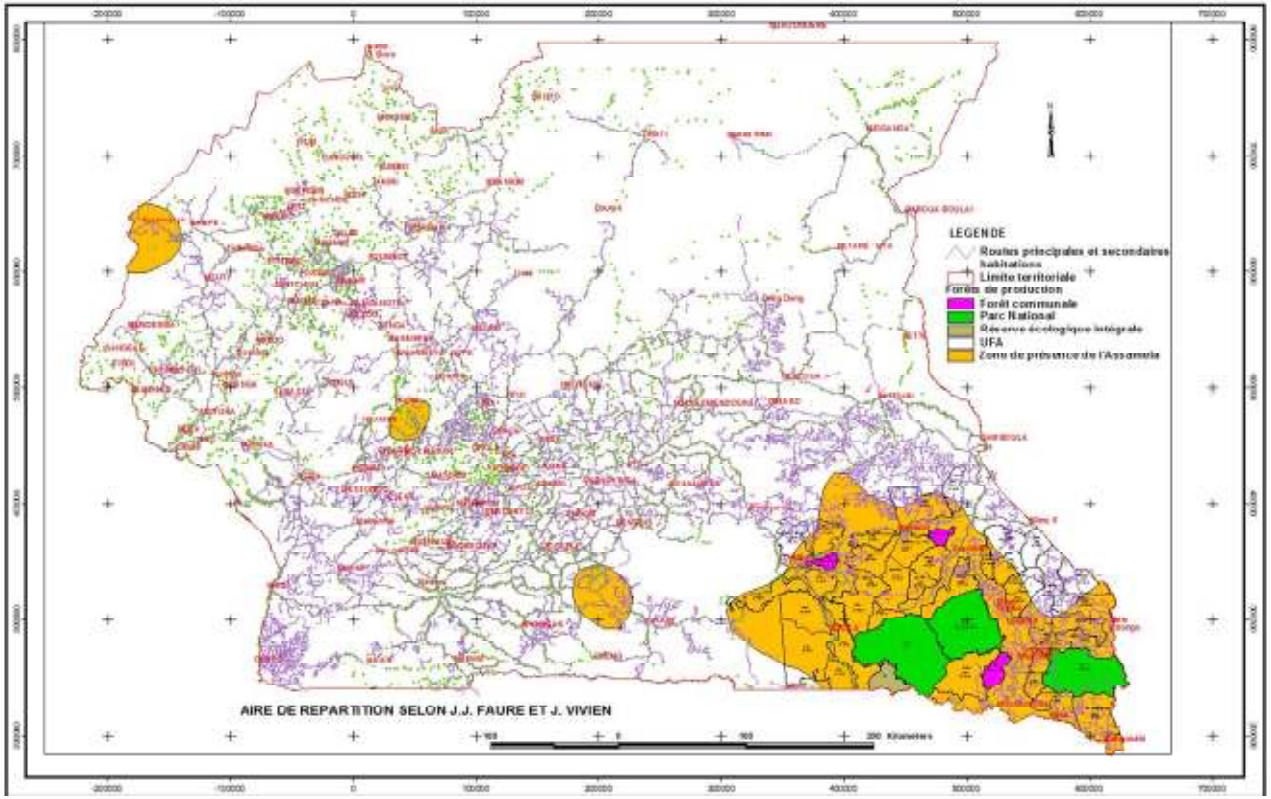

Figure1 : Carte de l'aire **de** répartition selon FAURE et VIVIEN

Figure 2. Distribution area of *Pericopsis elata* in Cameroon according to Vivien et Faure (1985)

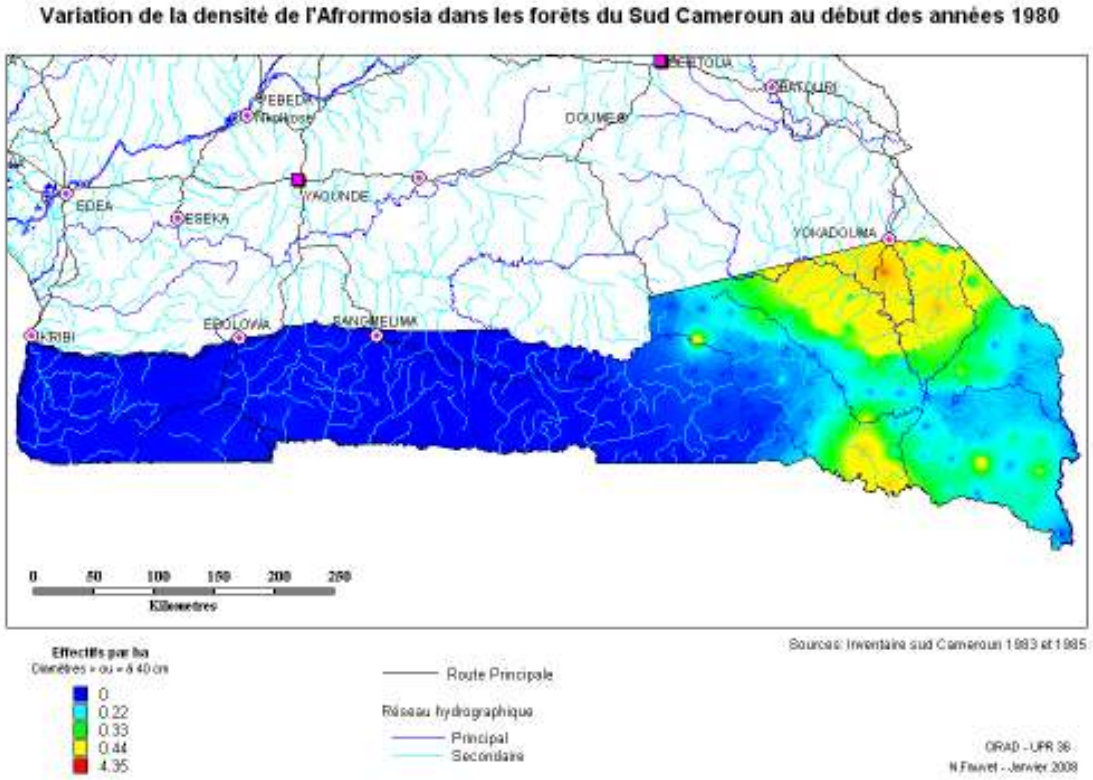

Figure 3. Population size of *P. elata* in its main area in Cameroon (Fauvet 2008)

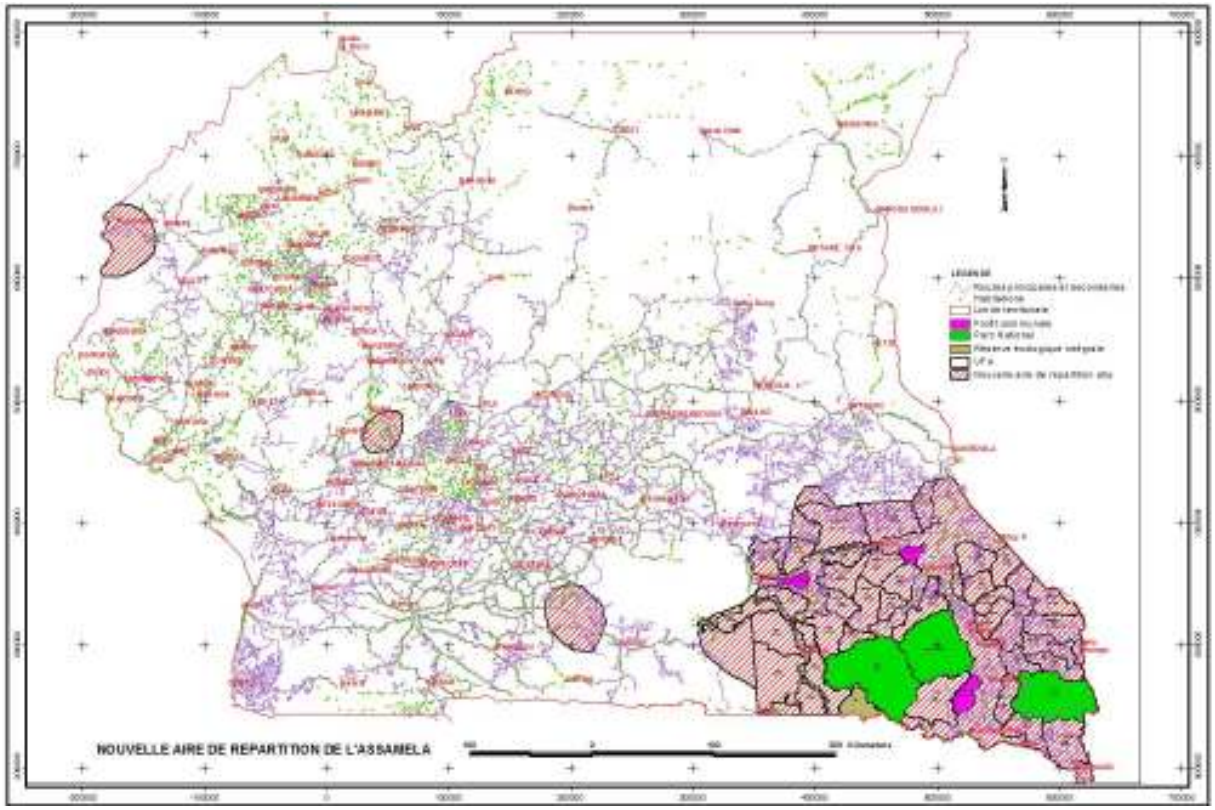

Figure 4. Current and updated distribution area of *P. elata* in Cameroon (Belinga 2009, Betti 2008)