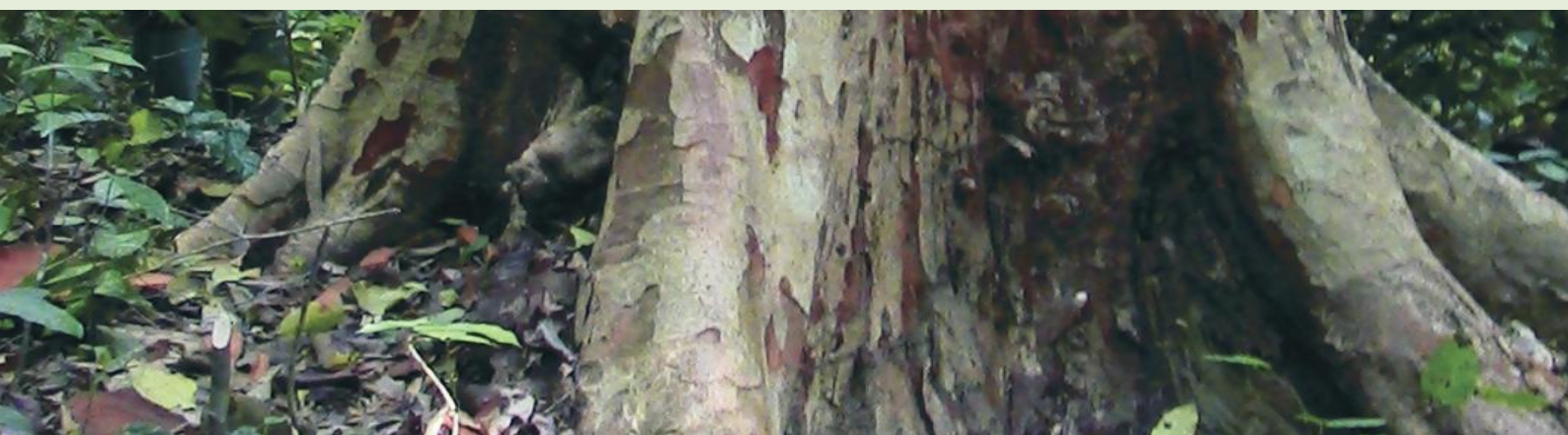
Conservation of *Pericopsis Elata* (Afromosia) in Ghana:

Evidence from the Field



This report has been produced by the Nature and Development Foundation; with funds from the International Tropical Timber Organisation.

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Published by:
Nature and Development Foundation

Cover photos:
Nature and Development Foundation

Available from:
Nature and Development Foundation
Margaret Appiah / Mustapha Seidu
PMB L45
Legon, Accra

Design & Printing: Tach of Klass Media Co. Ltd. tachofklass@yahoo.com Tel: 233 242172804

Conservation of *Pericopsis Elata* (Afromosia) in Ghana: *Evidence from the Field*

This publication is an output of project TMT-SPD 017/15 Rev.2 (M), entitled "Improving Sustainable Pericopsis elata Conservation and Trade Regulation in Ghana" financed by the International Tropical Timber Organization. For more information about ITTO, visit www.itto.int

May 2017

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Foreword

Nature and Development Foundation's (NDF) aspiration to work on *Pericopsis elata* was birthed during a review of management plans for forest reserves where it was revealed that, there were few standing trees of the species within its range in the country. It was also clear during engagements with the Forestry Commission that, current knowledge of the status of the species (in situ as well as associated trading) was not known. Furthermore, though there was no official trading information on the species, visits and discussions with some timber companies and wood depots indicated some level of trading in the species.

Sustainable forest management and protection of bio-diversity would not be successful without adequate information and data. With funding from the International Tropical Timber Organization (ITTO) under the thematic programme on Trade and Market Transparency (TMT), two studies were conducted. The findings of the studies are contained in this document which makes available current data on the distribution, conservation and trade of *Pericopsis elata* in Ghana.

This report lays bare the state of conservation and trade in *Pericopsis elata* in our country. The information in this publication has to make us stop and think about our approaches to protection, conservation and trade; not only in the species but on the entire forest management system. As Natural Resource Managers what kind of future do we hold for the species and at large the country's bio-diversity?

The data presented in this document looks very worrying. We must therefore work to find and adopt the solutions that will safeguard the future of this species and the entire bio-diversity of the country.

It is our conviction that, this report would be a wake-up call to natural resources managers, environmental organizations and all non-state actors of the forestry sector.

Mustapha Seidu,
Director,
Nature and Development Foundation

Acknowledgments

This publication was made by Nature and Development Foundation under the financial support of the International Tropical Timber Organization (ITTO). At the time when funding for species and forestry conservation has drastically reduced, the ITTO continued to fund projects that are invaluable in changing conservation practices. We are grateful for the support and guidance. We thank all the divisions of Forestry Commission including, Forestry Services Division, Timber Industry Development Division, Wildlife Division, Resource Management and Support Centre for etc their assistance and co-operation during the conduct of the studies. Our sincere appreciation also goes to Professor Samuel Kingsley Oppong and Elvis Kuudar who were consultants for the studies. Finally, our sincere thanks go to the project implementation team for their invaluable services and contributions.

List of Acronyms

CITES	Convention on International Trade In Endangered Species
CSO	Civil Society Organization
DOLTA	Domestic Lumber Traders Association
FC	Forestry Commission
FSD	Forest Services Division
IUCN	International Union for Conservation of Nature
ITTO	International Tropical Timber Organization
NDF	Nature and Development Foundation
RMSC	Resource Management And Support Centre
TIDD	Timber Industry Development Division
TUC	Timber Utilization Contract
WD	Wildlife Division

Executive Summary

Pericopsis elata (Fabaceae) is a valuable timber species occurring in moist semi-deciduous forests with annual rainfall of 1250-1500 mm. In Ghana, it is threatened by excessive logging and estimated to have a resource life (the number of years that a species can be exploited commercially at the current rate of extraction) of zero. There is still some trading in the species even though harvesting in any form is prohibited. The major problem with the management of *P. elata* is inadequate data on distribution, conservation and trade status of the species in Ghana. This studies therefore seeks to provide information on the distribution, population, conservation and trade status of *P. elata* in Ghana for its sustainable management and for improved trade in the species.

The objectives of the studies are to provide current data on the distribution of *P. elata*, estimate plant density and wood volumes of the species in the selected reserves, determine the habitat conditions of the selected forest reserves, describe the conservation status of the *P. elata* in Ghana, establish the current statistics on trade volumes and trade chains of *P. elata* in Ghana, examine the trade volumes versus quantities in the context of sustainability, evaluate the trade mechanisms instituted and their effectiveness in maintaining sustainable trade in the species and assess the level of knowledge of market players on the protection status of P. elata and the required procedures for engaging in trading in the species.

Study findings show that, the species is distributed in many forest reserves in the moist semi-deciduous vegetation zone in the Western and Brong Ahafo regions of Ghana, particularly in the Juabeso, Goaso and Dormaa Ahenekro forest districts. Tree stock densities are quite low ranging between 0.013 -0.526. The diameter class (10-29 cm) contributes the least (0.05 %) to the volume of wood in the reserves studied. The study also reveals few individuals in the smaller size classes and which confirm the view that natural regeneration in this species is unreliable and recruitment to the exploitable intermediate and larger size classes are often inadequate. Currently, the total wood harvest can reduce to a third when *P. elata* is harvested using the felling limit of 110 cm (DBH). It is also clear that in maintaining the legal felling diameter (110 cm DBH) the existing volume of wood at the estimated harvest level will only last for three years. This corroborates the finding of its resource life (the number of years that a species can continue to be commercially utilized at the current rate of extraction) to be zero. Again, the reserves are not in any better condition than what has been reported in all management plans of these reserves. Asukese Forest Reserve had poor habitat condition and that could be the reason for the lowest estimated tree density. *P. elata* is a true pioneer species, stimulated to germinate by gaps in the canopy. There are several forest policies aimed at enhancing sustainable forest management that will improve and sustain the production of wood and wood products from the existing forest reserves and off-reserve areas. The Forestry Commission allocates Concessions, known as Timber Utilization Contracts and the Forest Services Division of the Commission sets the total annual allowable cut for timber within the country. The 2012 Ghana Forest and Wildlife Policy noted a very high bio-diversity loss of about 10 prime indigenous species including *P. elata* which may become extinct in less than a decade. Ghana has successfully established *P. elata* on a small scale in enrichment plantings (line and group methods) and in taungya and direct plantations and must be up-scaled.

There is the need for more research in the phenological patterns and fertility, to help analyze the impact of logging on seed tree populations. In addition, there should be a study on the history of *P. elata* populations and why regeneration is dramatically lacking in its natural distribution area. A study must also be carried out on the genetic variation and spatial genetic structure of *P. elata*, to help us to understand the origins of its natural populations as well as their evolution. Plantation trials need to be conducted to identify affordable and effective enrichment methods (including pest identification and control techniques) that could be routinely applied by logging companies. Again, there should be regular monitoring of plant densities and estimates of wood volumes of the species. It has been reported that management through controlled exploitation benefits the natural regeneration and population dynamics of *P. elata* primarily by creating forest gaps. Consequently, more research is needed before a definitive decision can be made to allow harvesting of *P. elata*, in order to ensure that this action does not threaten the species with extinction.

On the market survey, it was revealed that, to conserve biodiversity in the forest reserves some forest management practices have been implemented. The Forest Service Division has set a felling limit of 110 cm (DBH) for *P. elata* thus delaying harvest for the species to recuperate naturally. A permit is also required prior to harvesting of the species. The export of logs and sawn timber of *P. elata* would require a CITES certificate. To further restrain overexploitation, there is an export levy of 30 percent on air-dried lumber exports for *P. elata*. Currently, the FC has stopped allocating P.elata as yield and by extension grant of timber rights for *P. elata* in an effort to curtail any further exploitation and enhance protection of the species from extinction. Thus, all *P. elata* products originating from Ghana (to international or domestic markets) are illegal according to the FC. However, the species was found in some local markets in the country. The FC is challenged with measures to track illegal trade of *P. elata* on the local market and possible miss-labelling for export to international markets. All FC officials interviewed were aware *P. elata* is a restricted species that require approval from RMSC of the FC before harvesting yet, only 20% were aware of the requirement of CITES certificate from WD to export the species. Timber companies are aware *P. elata* is a restricted species and requires a CITES certificate to export in it but domestic timber traders across the six regions are not aware of the restricted status of *P. elata* and the requirements for trading in it; CSOs are also unaware of the restricted status of *P. elata* and the requirements for its trade. The chain of trade for the species on the domestic market involves four main actors; illegal loggers, sawmills, market traders or retailers and then the final consumer with an estimated annual trade volume of 48.74 cubic meters. The scenario at the moment is not different from the situation some three decades ago which suggests that the species is still under threat and may not be sustainably harvested. It is therefore recommended that, the FC should institute mechanisms to track mislabeling of the species for export and trade on the local market. Mislabeling can be checked through the use of pre-felling and post-felling checks from the forest to the port and/or markets (domestic & international). In addition, the FC will need to recruit competent wood scientists to lead their wood products inspection operations and ensure that, records presented by timber traders correspond to the materials in their possession. The identification and confiscation of *P. elata* products being traded on the local market could serve as disincentive and a possible source for documenting estimated trade volumes. Finally, a rigorous awareness raising and sensitization programme need to be put in place to improve the knowledge of FC officials, timber companies, timber traders and Civil Society on the protection status of *P. elata* and the requirements for its trade.

Plate 1: *P. elata* tree in the Mpameso Forest Reserve in Ghana © Margaret Appiah/NDF

Chapter One

1.1 Background of the Study

Mustapha Seidu[1] and Margaret Appiah[2]

Pericopsis elata, a leguminosaea species of the fabaceae family, popularly known under its trade name as Afrormosia, 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).

The species (P. elata) is a victim of over-exploitation and consumption mainly for its precious wood. The wood (trade names: afrormosia, assamela, kokrodua) is highly valued on the international market, mainly for furniture and as decorative veneer, but also for interior and exterior joinery, stairs, flooring and boat building. It is considered a substitute for teak. It is also suitable for heavy and light construction, railway sleepers, vehicle bodies, interior trim, handles, ladders, agricultural implements, sporting goods, musical instruments, toys, novelties, boxes, crates, carvings, turnery and draining boards. In traditional medicine in the Congo, the pulped bark is rubbed into scarifications as an anodyne.

[1]*Mustapha Seidu is the Program Director of Nature and Development Foundation, Center for African Wetlands Building, University of Ghana Legon, Accra*

[2]*Margaret Appiah is a Projects Officer at Nature and Development Foundation*

Ghana is one of the countries where this species occurred in commercial quantities and was heavily logged because of its highly valued timber. Exportation of P. elata timber from Ghana to England started as far back in 1948 (Bourland et al., 2012: Howland, 1979). Currently, it is one of the few commercial timber species that has been listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

This means that for any export of the species to happen, the exporting country must produce a scientific and technical opinion that trade in the species is not detrimental to its conservation known as non-detrimental findings (NDF). Accordingly, timber from the species is not permitted without special authorization in addition to other documents normally required in the export of timber. This authorization is by way of CITES certificate issued by the CITES

Management Authority upon application by the exporter. In the case of Ghana, the Wildlife Division of the FC is the responsible authority for issuing CITES certificate.
As stated above, the species is heavily logged and occurs in specific forest types in Ghana. It is under heavy stress from logging and general degradation of the forest. As a strategy for reducing such pressure on the species from logging, the FC has by administrative process classified it as a restricted species for harvesting since its enlistment under CITES Appendix II. What this means is that a special administrative procedure has to be followed and certain conditions have to be met before a restricted species such as P. elata will be granted in yield for harvesting. According to records from the RMSC, the technical wing of the FC, no yield has been issued since 2002 that included P. elata and therefore there are no current official trade information on the species since that date. Notwithstanding the lack of yield allocation and official records on its trade in the country, a visit to and discussion with some timber companies and wood depots around the forest regions indicate some level of trading in the species in the domestic market. This brought to fore, the need to inquire further and to find answers to the following questions, how large is the domestic trade in the species? Which regions is it traded? Whether or not the traders are aware of its status as CITES Appendix II species?

It is acknowledged fact that P. elata is highly endangered within its habitat and range in Ghana. Such a precarious status is not just because it is heavily logged but also because there is little published and unpublished information on the species. For example, there is little information of the regeneration of the species in its range. In addition, there has not been any monitoring and assessment of the species to understand the impact of the government intervention such as being listed under CITES Appendix and the classification as a restricted species. Therefore, it is safe to state that one of major problems with the management of P. elata in Ghana is the inadequate data on distribution, conservation and trade of the species. This is a problem that is compounded by the non-assessment of the in situ conservation and the lack of dedicated initiative for the protection of the species.

Inspired by the challenges of conservation and the problems enumerated above, the Nature and Development Foundation with support from International Tropical Timber Organization (ITTO) initiated two concurrent studies on conservation of, and market and trade on, the species. This publication is an analysis of the findings and discussions from the studies.

1.1 Purpose of this Publication

This publication presents first-hand field evidence of the impact of administrative measures on the conservation and management of P. elata in Ghana and intends to fill some the information gaps with respect to the species. It is targeted at and will benefit all stakeholders in the forestry sector. The emphasis is to improve the conservation and management regulation of P. elata in and from Ghana through;

- Providing current data on the habitat conditions, availability, distribution, quantities and trade status of the species to aid effective CSOs advocacy for conservation of the species.
- Engage authorities to pay critical attention to the impacts of irresponsible harvesting and wood removal on the survival of commercial species such as P. elata.
- Provide industry and industry associations with a better perspective on the status of P. elata as a motivation for the protection and conservation of the species in their concessions.
- Contribute to address the information gap on and the threat to the sustainable management of P. elata in Ghana

Plate 2: A matured *P. elata* tree at Mpameso Forest Reserve Ghana © Margaret Appiah/NDF

Chapter Two

The Distribution, Population Dynamics and Conservation Status of *Pericopsis elata* in Ghana

Samuel Kingsley Oppong

2.1 Introduction

Pericopsis elata (Fabaceae) is a valuable timber species occurring in moist semi-deciduous forests with annual rainfall of 1250-1500 mm (Anglaaere, 2008; Dickson et al., 2005; Swaine, 1996). In Ghana, it is currently threatened by excessive logging (Hawthorne, 1995). Alder (1989) estimated the resource life (the number of years that a species can be exploited commercially at the current rate of extraction) of P. elata as zero. P. elata is a gregarious to semi-gregarious species with a limited but widely dispersed distribution. It is observed to occur along water courses and seasonally water-logged soils (Anglaaere, 2008; Dickson et al., 2005; Swaine, 1996).

Swaine and Whitmore (1988) consider this species to be a true pioneer, stimulated to germinate by gaps in the canopy. P. elata is classified among either pioneer or non-pioneer light-demanders by various authors (Kyereh et al., 1999; Hawthorne, 1995; Swaine et al., 1988;

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Ampofo et al., 1972). The lack of natural regeneration for this species has been widely noted (Hawthorne, 1995). The classical succession theory predicts that shade-intolerant species should eventually disappear from the forests and the forests could be composed of only shade-tolerant species. This theory generally assumed natural disturbance, like gap formation, as an unusual event. However, the 'gap dynamics theory' predicts an alternative scenario; shade-intolerant species can maintain their populations by regenerating within gaps in the mature or old-growth forests (Yamamoto, 2000).

The exportation of *P. elata* timber from Ghana to England started in 1948 (Bourland et al., 2012: Howland, 1979) and has become a victim of over-exploitation and consumption mainly for its precious wood. The wood (trade names: afromosia, assamela, kokrodua) is highly valued on the international market, mainly for furniture and as decorative veneer, and in traditional medicine as an anodyne. *P. 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 (Bourland et al., 2012; Anon, 2003). The species is endangered and has become locally extinct in West African countries, including Côte d'Ivoire, where the exploitation and international trade in this species began seven decades ago (Betti, 2008).
This study seeks to provide information on the distribution, estimate of quantities and conservation status of *P. elata* in Ghana for its sustainable management.

2.1.1 Objectives

The specific objectives of this study are to;

1) provide current data on the distribution of Pericopsis elata
2) estimate plant density and wood volumes of the species in the selected reserves
3) determine the habitat conditions of the selected reserves
4) describe the conservation status of the species in Ghana.

2.2 Study Approach

2.2.1 Selection of study sites

The consultant had several informal interviews and formal discussions with the staff of the Resource Management Support Centre (RMSC) of the Forestry Commission in selecting potential sites for the study. The selection was based on the probability of encountering the species when a search is conducted. The field workers of the Forest Services Division and tree spotters of Timber firms operating at the Forest Districts visited also confirmed and gave further clues for sites where there is a high likelihood of encounter of the species. Data from permanent sampling plots (PSPs) were also gleaned from existing survey records held by the production unit of the RMSC of the Forestry Commission. Overall, data were accrued from seven forest reserves (Table 1: Forest Reserves visited during the field work and data obtained from existing survey records)

Table 1: *Forest Reserves visited during the field work and data obtained from existing survey records*

Forest Reserve	Forest District	Compartments/PSPs
Asukese	Sunyani	105, 169, 2, 28, 93, 100, 101, 126
Bia North Tributaries	Juabeso	2, 4, 19
Bonkoni	Goaso	23
Bonsam Bepo	Goaso	2, 3, 4
Mpameso	Dormaa-Ahenkro	166, 172, 173, 190, 191, 192, 193, 194, 195, 227, 243, 146, 247
Subim	Goaso	125, 150, 135, 159

2.2.2 Data collection and analysis

Measurements and estimates of data

In each forest reserve compartments with *Pericopsis elata* were visited. The individual *P. elata* trees encountered, had their diameter at breast height (DBH) and height recorded. The habitat condition scores were noted based on the physical environment and percent canopy gap using ocular assessment. The reserves were scored between poor to excellent (1-5). Photographs of the species were also taken. The variables recorded were used to estimate the volumes of standing wood within the selected reserve. The numbers of individual trees were noted and densities estimated based on the area of the reserves.

2.2.3 Assumptions

a) The projected increase in diameter was set at 1 cm per year (Anon, 2003)
b) Tree density was estimated based on areas of the reserves
c) Number of tree stems per hectare adopted was 2 stems/ha (Asukese Forest Reserve Management Plan, 2010)
d) Potential wood export per year was estimated as 392.27 m3 (Five-year average; 1998-2002; Anon, 2003)

2.2.4 Calculations

Areas of the selected forest reserves were estimated from the existing shape files using a menu in the ArcGis software. The stems per hectare for the selected reserves were estimated using the following relationships; the number of individual trees measured divided by the number of sampled compartments to obtain the average stem per compartment. The size of each compartment was estimated by dividing the area of the reserve with the number of compartments: and finally the plant density was estimated by dividing the average stem per compartment with the area of the compartment. The tree stocks were not assessed using the Interim Yield Formula (Foli, 200) due to the limitations of the approach. The estimated volume of *P.elata* wood is obtained using the formula derived by Wong & Blackett, (1994): Volume of wood (m3)= 0.0006426D2.058 .The probable number of years a given volume of wood can be exploited was calculated by dividing yield with quantity exported per year.

All the estimates as detailed above were then tabulated. The reserves visited were used to create a distribution map using ArcGis software.

Formulas for the calculations;

$$\text{Average stems per compartment} = \frac{\textit{Number of individual trees measured}}{\textit{Number of sampled compartments}}$$

$$\text{The size of each compartment} = \frac{\textit{Area of the reserve}}{\textit{Number of compartments}}$$

$$\text{Plant density} = \frac{\textit{Average stem per compartment}}{\textit{Area of the compartment}}$$

$$\text{Volume of wood } (m^3) = 0.0006426D^{2.058}$$

$$\text{Years of potential exploitation} = \frac{\text{Yield}}{\text{Quantity exported per year}}$$

2.3 Findings of the In-Situ Surveys

2.3.1 Distribution of Pericopsis elata in Ghana

Pericopsis elata is distributed in many forest reserves in the moist semi-deciduous north-west vegetation zone in the Western, and Brong Ahafo regions of Ghana Figure 1 and particularly in the Juabeso, Goaso and Dormaa Ahenekro forest districts. This distribution pattern has also been reported by Anglaaere (2008) and Swaine (1996).

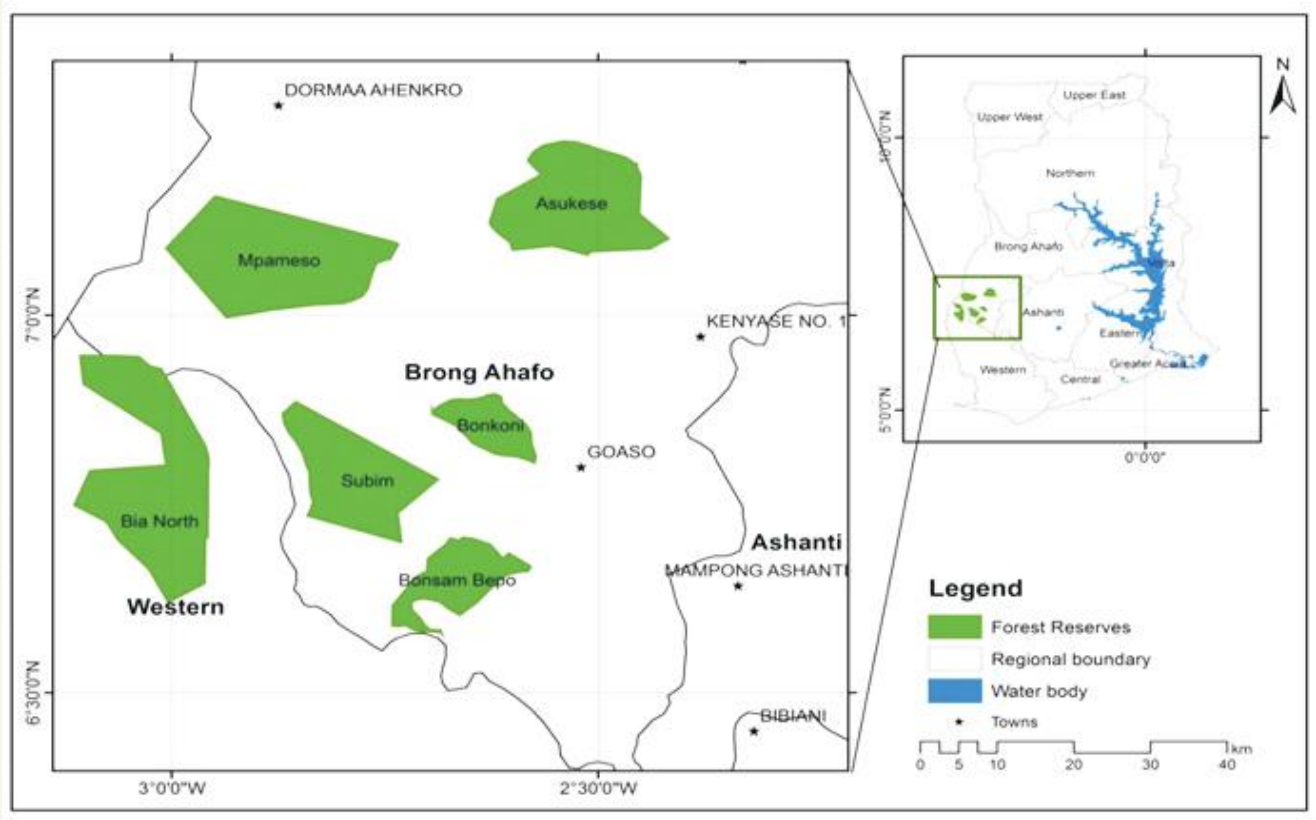

Figure 1: *Distribution of P. elata in Ghana.*
Source: Wildlife and Range Management GIS Lab., KNUST

2.3.2 Estimated tree stocks and volume of Pericopsis elata wood in selected forest reserves in Ghana

Tree stocks were generally low in all the reserves studied more particularly in Bonkoni (153 trees) followed by Asukese and Bia North Forest Reserves. The stocking density at Asukese Forest Reserve is as low as 0.013 tree stems per hectare (Table 1) which is far lower than that stated in the management plan for the reserve (2 stems/ha; Anon, 2010). The 2 stems per hectare as noted in the Asukese Forest Reserve's Management Plan (Anon, 2010) seems an overestimation of the density due low encounter rate of the species during the field visit. The low density estimates obtained for the selected reserves are similar to that obtained for P. elata in Cross River State in Nigeria (Anon, 2003). The diameter class (10-29 cm) contributes the least (0.05 %) to the volume of wood in the reserves studied with the diameter class (90-109 cm) being the highest (43 %: Table 2). Surveys have revealed few individuals in the smaller size classes and therefore confirm the view that natural regeneration in this species is unreliable and recruitment to the exploitable intermediate and larger size classes are often inadequate (Howland, 1979).

The total wood harvest can reduce to about a third when P. elata is harvested using the felling limit of 110 cm (DBH) (Table 3). As the felling diameter is reduced to 70 and 90 cm, the wood yield is increased. It is also clear that in maintaining the legal felling diameter (110 cm at DBH) the existing volume of wood at the estimated harvest level will only last for three years (Table 4). To corroborate the finding, Alder (1989) reported the resource life (the number of years that a species can continue to be commercially utilized at the current rate of extraction) for P. elata to be zero. The scenario at the moment is not different from the situation some three decades ago which suggests that the species is still under threat and may not be sustainably harvested. With an annual diameter increment of averagely one centimeter (Bourland et al., 2012) it may take 20 and 40 years to harvests trees that have diameters of 70 and 90 cm respectively.

Table2: *Tree stocks of P. elata in selected forest reserves*

Forest Reserves	Area (hectares)	Trees/hectare	Number of trees in each reserve
Asukese	25301.31	0.013	322
Bia North	34165.5	0.022	765
Bonkoni	7325.90	0.021	153
Mpameso	33771.55	0.128	4331
Subim	2371.77	0.429	1018

Table 3: *Estimated volume of P. elata wood in the selected forest reserves*

Forest Reserves	Volume of wood (m^3)							
	10-29	50-69	70-89	90-109	110-129	130-149	150+	Total
Asukese	1.31	15.64		40.09				83.46
Bia North			26.41	30.07				30.07
Bia Tano		7.82	13.21	10.02	14.18			45.23
Bonkoni		3.91	528.29	1002.22	14.18	19.07		37.16
Mpameso		121.24	6.60	140.31	680.42	57.21	19.33	2408.72
Subim					99.23			246.14
Total	**1.31**	**148.62**	**574.52**	**1222.71**	**807.99**	**76.28**	**19.33**	**2850.78**

Table 4: *Potential exploitable P. elata wood at different diameter classes in selected reserves*

Forest Reserves	Estimated Volume of wood at harvest (m^3) Diameter classes at harvest (m^3)		
	70+	90+	110+
Asukese	66.50	40.09	
Bia North	30.07	30.07	
Bia Tano	37.40	24.20	14.17
Bonkoni	33.25	33.25	33.25
Mpameso	2287.48	1759.19	756.96
Subim	246.14	239.54	99.23
Total	**2700.84**	**2126.32**	**903.61**

Table 5: *Potential number of years P. elata wood can be harvested at the three diameter classes*

Variables	Diameter classes at harvest (cm)		
	70+	90+	110+
Volumes (m^3)	2700.84	2126.32	903.61
Years	9.24	7.28	3.09

2.3.3 Habitat conditions

The habitats of the selected reserves were graded as being poor to good. They are not in any better condition than what has been reported in all management plans of the reserves studied. Asukese Forest Reserve had poor habitat condition (Table 5) and that could be the reason for the lowest estimated tree density. The rest were in good condition. *P. elata* is semi gregarious to gregarious tree which grows on flat ground, valleys and slopes (Anglaaere, 2008; Dickson et al., 2005). *P. elata* is a true pioneer species, stimulated to germinate by gaps in the canopy (Kyereh et al., 1999; Hawthorne, 1995; Ampofo et al., 1972,).

Plate 3: A degraded forest reserve in Ghana © Margaret Appiah/NDF

Table 6: *Habitat conditions of the selected forest reserves*

Forest Reserve	Habitat Conditions
Asukese	Poor
Bia North	Good
Bonkoni	Good
Mpameso	Good
Subim	Good

2.3.4 Conservation status

In Ghana, stocks of *P. elata* are reported to have declined (Hawthorne, 1995; Dickson et al., 2005). To forestall the situation, the Forest Service Division has set a felling limit of 110 cm DBH for *P. elata* thus delaying harvest for the species to recuperate naturally. A permit is also required prior to harvesting of the species. The export of logs of *P. elata* has been banned since 1979 whiles a general log export ban has been introduced in Ghana since 1995. To further restrain overexploitation there is an export levy of 30 percent on air-dried lumber exports for *P. elata*.

Several forest policies are being implemented to enhance sustainable forest management that will improve and sustain the production of wood and wood products from the existing forest reserves and off-reserve areas. The 1994 Forest and Wildlife Policy established the basis for sustainable forest resource management and this was implemented through the Timber Resources Management Act (Act 547) of 1997, the main legislation that governs the use of

forest resources (Anon, 2003). The Forestry Commission is the executive agency responsible for forest management and forest industry and allocates Concessions, known as Timber Utilization Contracts. Further, the Forest Services Division of the Commission sets the total annual allowable cut for timber within the country (SGS, 2002). The recent Ghana Forest and Wildlife Policy (Anon, 2012) noted a very high bio-diversity loss of about 10 prime indigenous species including *P. elata* which may become extinct in less than a decade.

Further, Ghana has been successful in establishing *P. elata* on a small scale in enrichment plantings (line and group methods) and in taungya and direct plantations. The annual diameter increment of these plantings ranged between 10.8-13.1 mm (Anglaaere, 2008; Howland, 1979).

2.4 Conclusion and Research Needs

2.4.1 Conclusion

Pericopsis elata (Fabaceae) is a valuable timber species occurring in moist semi-deciduous forests with annual rainfall of 1250-1500 mm. It is distributed mainly in the Western, and Brong Ahafo regions of Ghana and particularly in the Juabeso, Goaso and Dormaa Ahenekro Forest Districts. Estimated stocking densities were quite low ranging from 0.013-0.429 stems per hectare. Wood volumes are also low with the least (0.05%) occurring at the low diameter class (10-29 cm). From the estimates, the total wood harvest can reduce to a third when *P. elata* is harvested with the felling limit of 110 cm at DBH. As the felling diameter is reduced to 70 and 90 cm the wood yield is increased. It is also clear that in maintaining the legal felling diameter of 110 cm at DBH, the existing volume of wood at the estimated harvest level will only last for three years and therefore similar to the previous situation where the resource life of *P. elata* was estimated as zero. The habitat condition for growth is fairly good in its range. Attempts to conserve the species have led to maintaining the legal felling diameter of 110 cm at DBH and improving value addition to the wood of the species. There have been several policy reforms aimed at enhancing sustainable forest resources management.

2.4.2 Research Needs

There is inadequate information on *Pericopsis elata* ecology in spite of its listing both in CITES Appendix II and on the IUCN Red List in Ghana (Howland, 1979; Anglaaere, 2008). It is therefore necessary for more research in the phenological patterns and fertility of the species, to help analyze the impact of logging on seed tree populations. In addition, there should be a study on the history of *P. elata* populations and why regeneration is dramatically lacking in its natural distribution area. A study must also investigate the genetic variation and spatial genetic structure of *P. elata*, to help us to understand the origins of its natural populations as well as their evolution. Plantation trials need to be conducted to identify affordable and effective enrichment methods (including pest identification and control techniques) that could be routinely applied by logging companies. Finally, there should be regular monitoring of plant densities and estimates of wood volumes of the species. It has been reported that management through controlled exploitation benefits the natural regeneration and population dynamics of *P. elata* primarily by creating forest gaps. Consequently, more research is needed before a definitive decision can be made to allow harvesting of *P. elata*, in order to ensure that this action does not threaten the species with extinction (Bourland et al., 2012).

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Plate 4: A freshly sawn beam of *P. elata* © Sally Tetteh/NDF

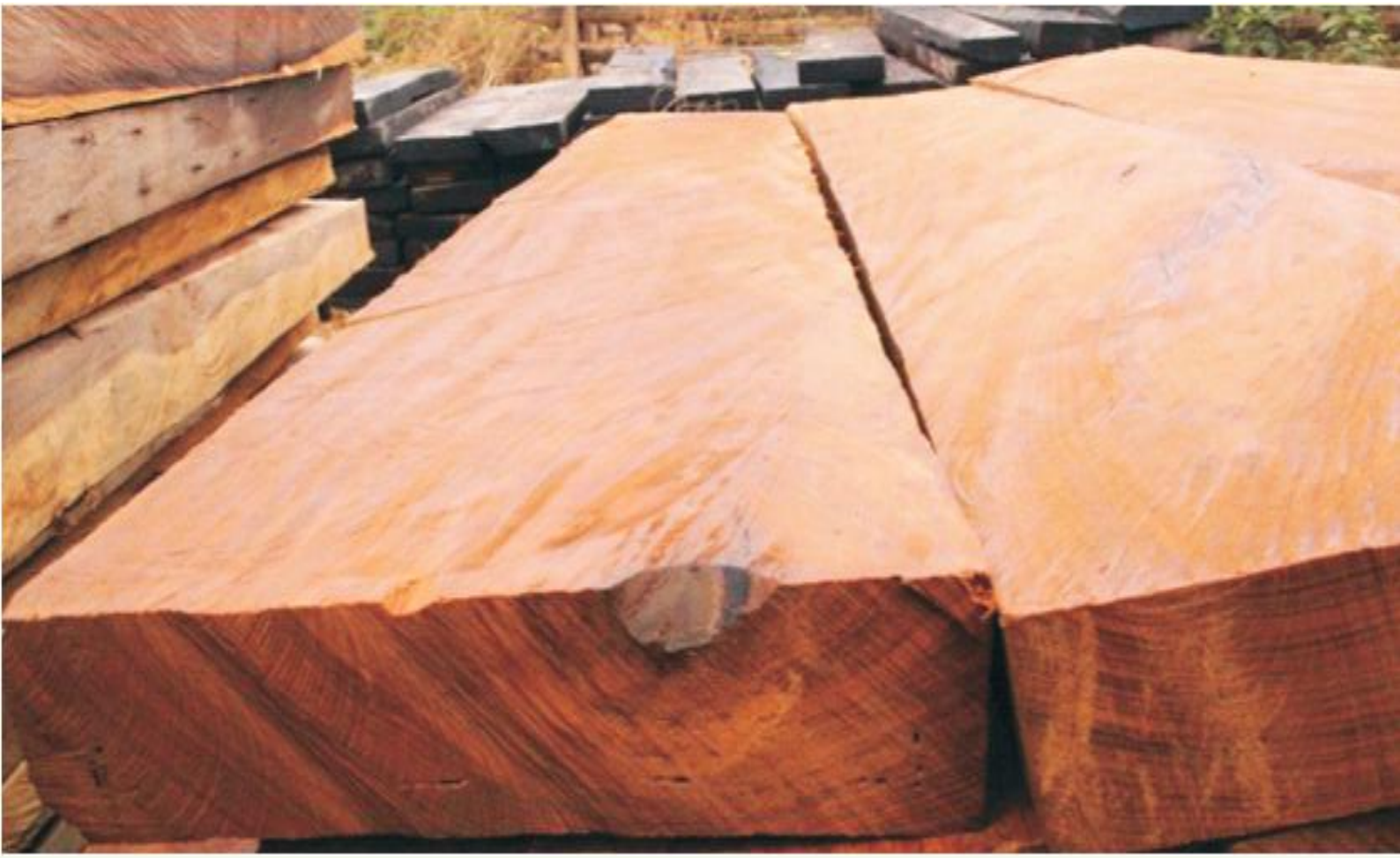

Plate 5: Beams of *P. elata* in the local timber market in Accra © Salormey Tetteh/NDF

Chapter Two

Domestic Timber Consumption and Conservation of *Pericopsis Elata* (Afromosia) in Ghana

Elvis Kudaar[4]

3.1 Introduction

Ghana is one of the countries where Pericopsis elata (trade names: afromosia, assamela, kokrodua) occurred in commercial quantities. Being a precious commercial timber species in an era of unsustainable forest management, P. elata became the target of timber merchants mainly for the export market. The international market values it. Indeed, it fetched a good price of money and remains the most expensive timber per cubic meter. As a natural consequence, the species got scarce, endangered and feared becoming locally extinct in the next few years if nothing is done to increase its regeneration.

In response to its disappearance, the government of Ghana through the Forestry Commission classified P. elata as restricted for harvesting. This action is subsequent to the International Community effort to save the species from extinction by listing it under CITES Appendix II (refer to paragraph 3 of page 11 for the effect). Since its classification as CITES Appendix II and a restricted species for harvesting, little is known of any intervention in Ghana to establish whether or not the species is being traded in the domestic market. In addition, does trade of the

[4]*Elvis Kudaar is A freelance consultant in Environment and Natural Resources in Ghana*

species in the domestic market pose any threat to the conservation and management of the species? In fact, it appears little efforts are made to prevent export of the species through mis-labeling. This study is therefore a forerunner for establishing the current market information on trade of P. elata in Ghana.

The market survey focused specifically on the following key aspects:

- Establish the current trade chain of P. elata in Ghana,
- Examine the trade volumes versus quantities in the context of sustainability,
- Evaluate the trade regulations mechanisms instituted and their effectiveness in maintaining sustainable trade, and
- Determine the level of knowledge of market players on the protection status of P. elata and the required procedures in its trade.

3.2 Study approach

The methodology adopted for the market survey was basically in two phases – reviewing of secondary data and primary field data collection from timber markets (through interviews guided by a questionnaire).

3.2.1 Selection of interviewees and markets

Stakeholders (interviewees) for the study were selected based on their roles and experiences in P. elata trade chain either as statutory authorities, trade associations, timber traders, timber companies, and/or civil society actors. Markets were selected to span across the Western, Central, Eastern, Greater Accra, Ashanti and Brong Ahafo Regions of Ghana based on probability of encountering the species on the market when a search is mounted.

In all, a total of 43 stakeholders made of thirteen (13) FC officials, five (5) timber companies, twenty (20) timber traders and five (5) CSOs in the timber production and trading hubs of Ghana were interviewed. The timber trading hubs visited were the Accra Agbobgoloshie timber market, Kumasi Sokoban timber market, Koforidua timber market, Takoradi Kokompe timber market, Makessim timber market, Techiman timber market and Sunyani timber market. These markets were selected because there was a high possibility of encountering the species should trade in the species exist and also because these markets are located within the high forest zones in Ghana. The markets were also selected based on information analysed from DOLTA and the FSD.

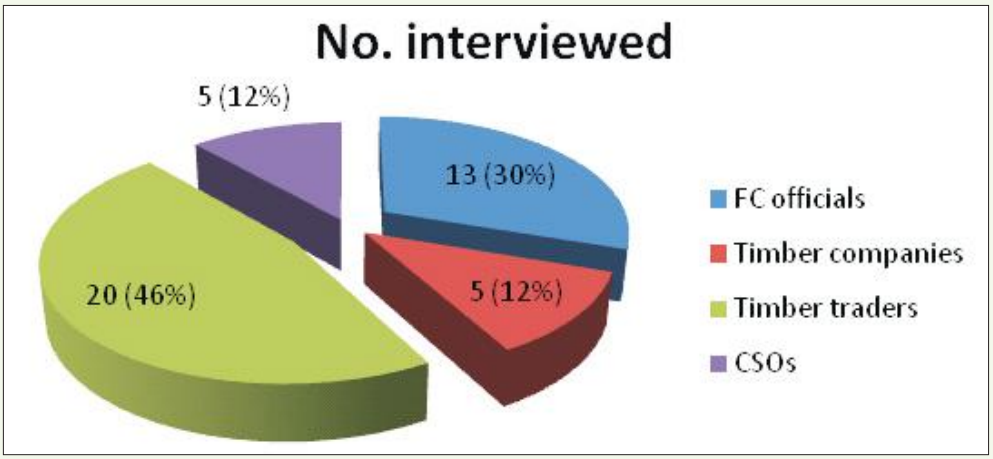

Figure 2: *Diagram of stakeholders interviewed*

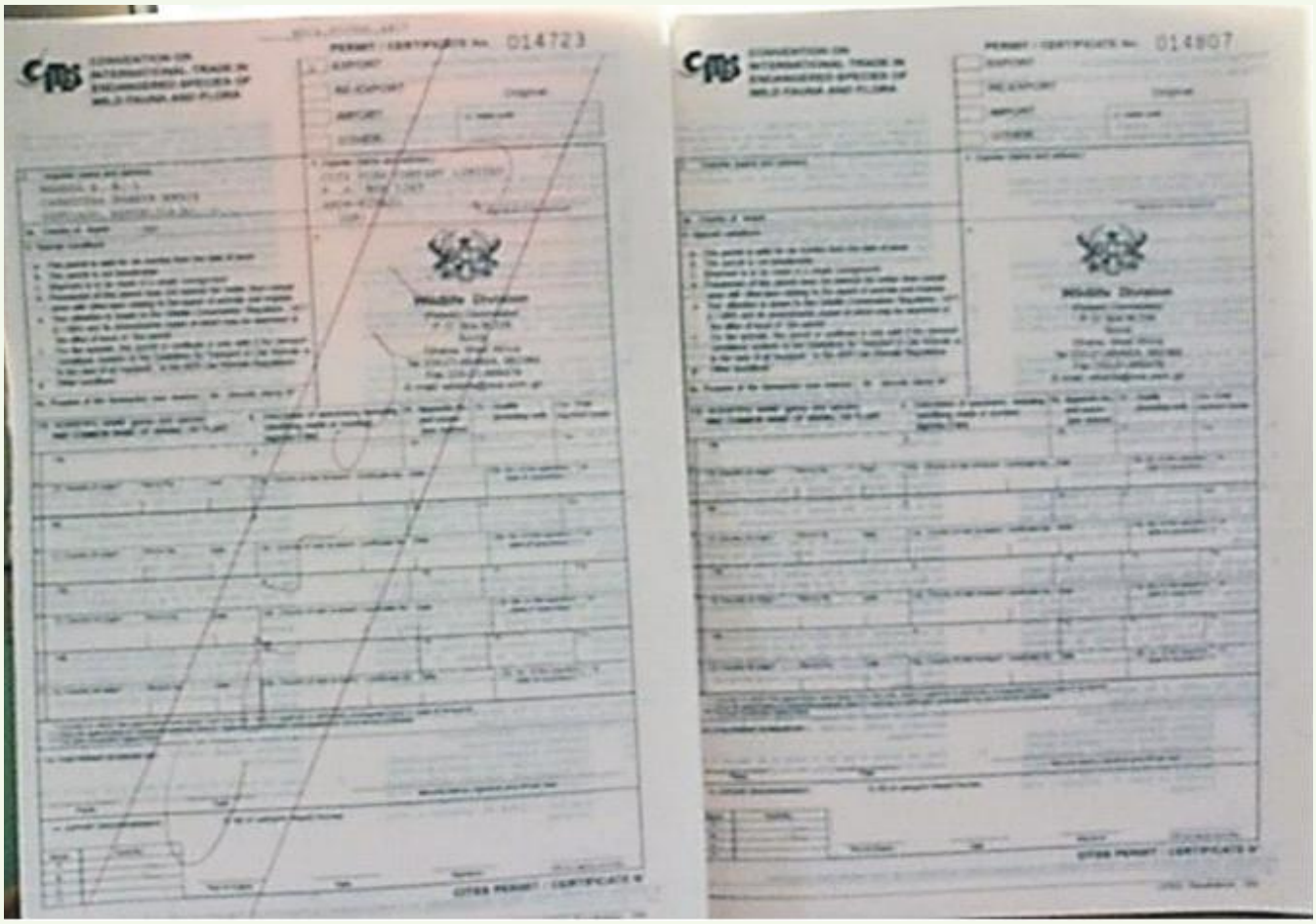

Plate 6: Scanned sample of a CITES certificate. © Sally Tetteh/NDF

3.2.2 Review of Secondary Data

In consultation with the FC (RMSC, TIDD, Wildlife Division, FSD), NDF, CSOs/NGOs, DOLTA and other relevant bodies for the assignment, secondary data was gathered. The documents reviewed for the data included TIDD quarterly reports, information on concession areas where *P. elata* is found, yield allocation on *P. elata*, information on CITES certificates issued, and appropriate markets where *P. elata* trade could be found. The information retrieved was however scanty as there was virtually no hard data on *P. elata* available at the various forestry institutions which was of relevance to this study. Much reliance was therefore placed on primary information gathered from stakeholders during interview discussions.

Plate 7: A local timber market at Techiman in the Brong Ahafo Region of Ghana © Sally Tetteh/NDF

3.2.3: Field Data Collection

This (Field data collection) included direct observation and site visits, one-on-one interviewing and/or group interviewing, focus group discussion and transects walks in the timber markets.

Field visits to offices of the various divisions of the Forestry Commission including the FSD, WD, RMSC and TIDD was done to gather data through one-on-one interviews and focus group discussions using a questionnaire. The questionnaire had both quantitative and qualitative items and was administered in appropriate language preferred by the interviewee. The FC officials were asked questions on their knowledge of the protection status of P. elata and the requirements or laid down procedures to enable trading in the species.

Producers or timber companies were asked whether they engage in P. elata trade; that is whether they log or have ever logged the species and where they usually trade or market their produce. The producers were also asked about their knowledge on the protective status of the species and the processes they go through or have ever gone through to acquire permits to trade in the specie.

Identified market traders and CSO respondents were also interviewed through face to face interviews and telephone correspondence for mob up data collection.

3.3 Findings of The Study

3.3.1 Trade Chain of *Pericopsis elata* in Ghana

FC Level

Interviews with all thirteen (13) FC officials and records obtained could not provide any official data in relation to the existing trade chain in P. elata. This is mainly because the RMSC indicated that the species is considered a restricted species hence does not include the species as part of yield to be harvested by TUC holders. The RMSC, further explained that, *P. elata* is usually

removed from yield allocations when detected. In addition, they explained that, most of the *P. elata* found in the stocks sometime does not meet the stipulated minimum 110cm diameter requirement for allocation. However, it is common knowledge that, one of the common illegal acts committed by timber companies is logging outside the yield and exporting this illegally harvested timber under different trade names to the international market or sell them on the domestic market which does not require a CITES certificate. According to the RMSC, the last time yield allocation included *P. elata* was in 2002 which was observed during the bio-diversity assessment of the high forest zone. They also indicated that *P. elata* is mainly found in forest reserves along the Brong Ahafo Region. Thus the impression is that, *P. elata* has not been logged over the last fourteen years and does not have an established official trade chain. However, the possibility of miss-labelling mentioned by officials means that there is a loophole for exporters to evade the measures put in place by FC and the International Community to protect the species from local extinction.

At the WD, which is the administrative authority of CITES in Ghana, it was indicated that a CITES certificate has not been issued since *P. elata* was listed as an appendix II species. This, according to the WD is because the Division has not received any application from traders for a CITES certificate to trade in the species. It was also clear from the division that, there exist no records of issuance of CITES certificate for the export of *P. elata* since the species was listed as an appendix II species of the CITES. Thus, officially Ghana does not export P. elata and or its products and have no existing trade chain.[5]

Timber Companies Level

All five (5) Timber companies – Logs Lumber & Limited (Kumasi), ABTS[6] (Sunyani), AGTI (Takoradi), Naja David (Kumasi) and Ayum timbers (Sunyani) - interviewed indicated that they do not harvest or trade in *P. elata* as it is not added to their harvestable yields. They also mentioned that the procedure of securing harvesting rights for restricted species from the FC is cumbersome and serves as disincentive for them.

Timber Markets

P. elata trade was only observed in two timber markets in two (2) regions – Greater Accra and Brong Ahafo out of the six (6) regions visited. Out of twenty (20) Timber Traders interviewed, only five (5) indicated they traded in *P. elata* and could identify it. Ten (10) indicated they did not even know how the species looks like and thus risk the possibility of trading in the species unknowingly, while five (5) said they have never traded in the species. The five (5) timber traders who trade in *P. elata* indicated that they got their products from sawmills (mainly illegal chainsaw operators) in the form of beams which they then processed to various sizes for sale but all refused to name the actual sources of their *P. elata* products. According to the traders, buyers hardly demand specifically for *P. elata* but usually come to buy hardwood except for only two (2) consumer companies (i.e. Kings Furniture and Agorwu Furniture) as mentioned by traders in Accra who specifically demand for *P. elata* from traders but this could not be verified.

[5] *Trade chain or supply chain here refers to the movement of the material from the forest floor to the consumer.*
[6] *Asuo Bmosadu Timber and Sawmill Limited*

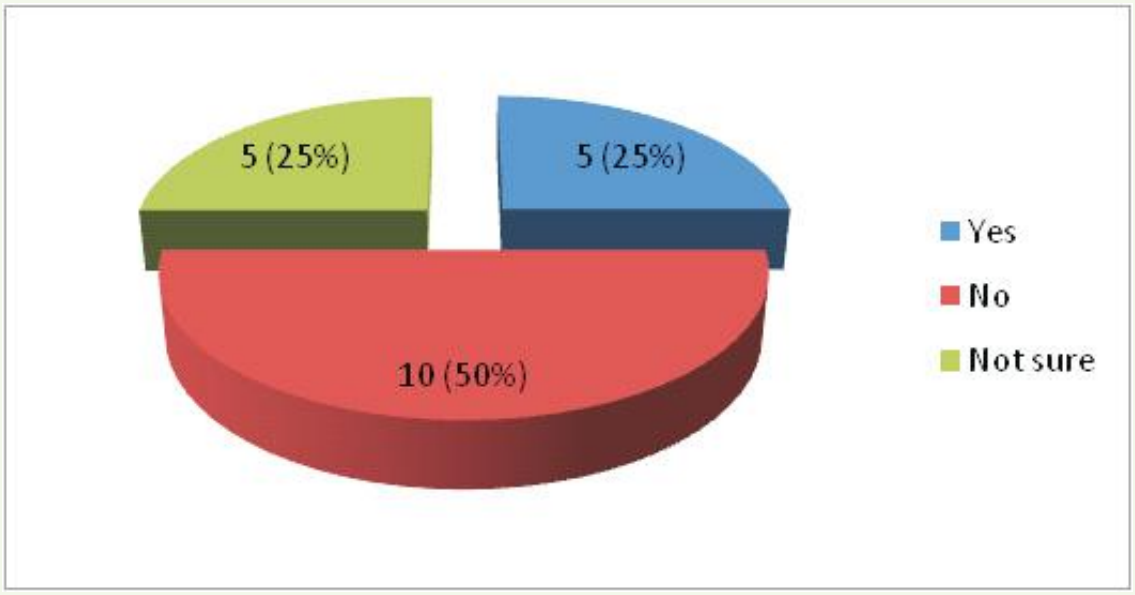

Figure 3: *Diagrammatic representation of timber traders dealing in P. elata trade*

Even though, officially no established trade chain exists for P. elata in Ghana, the study revealed that, there exists unofficial trade chain for the species involving four (4) actors. These actors were found to comprise of illegal loggers, saw millers, market traders or wood vendors and then the final consumer.

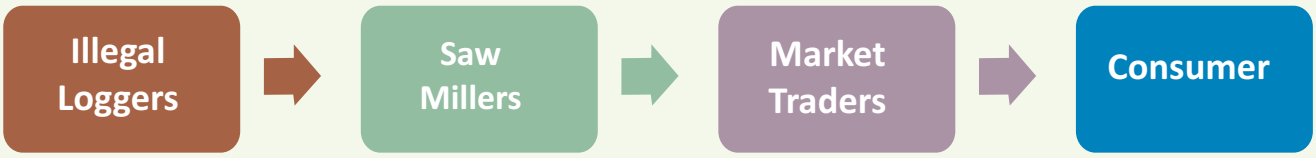

Figure 4: *Pictorial representation of P. elata trade flow in Ghana*

3.3.2 Trade Volumes/Quantities

Trade Volumes from FC Records

There was no available quantitative data on production and trade volumes on P. elata at the FC offices. All TIDD reports reviewed and officials interviewed indicated P. elata has not been part of species traded over a very long time. The same scenario was encountered at the FSD, RMSC and WD offices. Officials however raised the possibility of mislabelling the species under different trade names by timber companies. This perception was strongly held by FC officials.

Trade Volumes from Timber Companies

All five (5) timber companies interviewed stated that they did not trade in P. elata and has no records on trade volumes.

Trade Volumes from Timber Markets

The five (5) Timber traders who indicated that they deal in P. elata products found it difficult providing actual quantities of the species as they did not document their sales. The table below is a summary of their estimates in terms of container of wood products.

Table 7: Trade volume estimate of P. elata in observed markets

Name of Timber Market	Source of P. elata products	Are you a producer, trade and/or buyer?	Estimated Trade Volumes per year *P. elata* traded			Three year estimated totals
			2013	2014	2015	
Accra Timber Market	Sawmills from all parts of Ghana	Traders	One 20ft Container = 32.85 cubic meters	One 20ft Container = 32.85 cubic meters	One 20ft Container = 32.85 cubic meters	98.55 cubic meters
Sunyani Timber Market	Sawmills from all parts of Ghana	Traders	One 10ft container = 15.89 cubic meters	One 10ft container = 15.89 cubic meters	One 10ft container = 15.89 cubic meters	47.67 cubic meters
Totals			48.74 cubic meters	48.74 cubic meters	48.74 cubic meters	**146.22 cubic meters**

According to figures from the Accra Timber Market, in every year they trade one container of P. elata. They, however, could not provide further details and information that could be used to determine the actual volumes traded other than estimations using the regular container' dimensions[7]. Thus average estimated traded volume of P. elata per year is 48.74 cubic meters in the timber markets mainly at Sunyani and Accra. These are mainly from illegal sources and traded illegally. Thus using these estimates, in three years (2013, 2014 and 2015), 146.22 cubic meters of P. elata has been traded in the domestic market from illegal sources. However, the sustainability of these traded volumes remains uncertain taking into account the estimated volume of P. elata available and their diameter classes as has been shown in the distribution, population dynamics and conservation survey presented above.

[7] *http://www.shippingcontainers24.com/dimensions/20-foot/*

3.3.3 Trade regulations mechanisms instituted and their effectiveness in maintaining sustainable trade

Existing Regulations

As stated before, P. elata is CITES Appendix II listed species. This means that the species cannot legally be exported out of the country without prior approval by the Wildlife Division through a document called CITES certificate. This is administered by the WD of the Forestry Commission of Ghana. The WD indicated that it has not issued CITES certificate since 1992 when the species was first listed under CITES Appendix II.

The RMSC of the Forestry Commission of Ghana which approves yield allocations and ensure the non-harvesting of protected species indicated that it has not allocated P. elata for harvesting since 2002. The species has since been classified as a restricted species because of the threat to its survival from commercial exploitation. Being classified as a restricted species means that P. elata will not normally be allocated for harvesting except certain conditions are satisfied.

However, trading of the species in the domestic market, unlike export, does not require CITES certificate. In fact, one does not require any special permit to put the timber of P. elata on the domestic market. Nevertheless, just like harvesting of any tree for commercial purposes, one needs either TUC, salvage permit or special permit in the first place before one can harvest timber. Secondly, the particular tree (s) must have been allocated to the person in the yield. In other words, one must have complied with the legality requirement of Ghana timber sector. RMSC however indicated that, the center has not allocated P. elata in any yield since 2002. It can therefore be deduced that, current trading of P. elata on the domestic market most likely comes from illegal logging.

It is not clear from the different dates given by WD and RMSC, how companies were able to export the species for a decade without obtaining CITES Certificate. Either one of the dates is not correct or companies were exporting under some dubious circumstances. This reinforces the earlier point made that companies may still be exporting the species without obtaining CITES certificate through mis-labeling.

3.3.4 Monitoring and enforcement

All thirteen (FC) officials interviewed indicated that the FSD prepares yield data for approval by RMSC and that P. elata is treated as a restricted species [8]which is no longer approved by RMSC in yield allocation. If P. elata is identified at TIDD check points it will be confiscated but FC officials indicated that such reports have not come up over decades now. Officials also indicated that identification of P. elata products by its staff is the biggest challenge and such products could escape their notice when miss-labelled. The FC taskforce only establish checkpoints along major roads but do not undertake market monitoring of possible illegal trade in P. elata especially in the local market where these products are found even though the FC has not granted harvesting to any entity. At the ports, TIDD officials inspect trade in wood products but

[8]*A restricted species is one that is not available for allocation and in the event where it is added to the yield, the RMSC will have to grant approval before it can be harvested. The RMSC has developed a list of restricted species that require approval from the RMSC and P. elata is one. A restricted species is one that can only be harvested after some special conditions have been met.*

the same issue of inability to identify P. elata products when miss-labelled was mentioned as the challenge.

3.3.5 Level of knowledge on the protection status of *Pericopsis elata* and the required procedures in its trade

FC Level

All the thirteen (13) FC officials interviewed were aware that *P. elata* is a restricted species that require approval from RMSC. However, but 80% (10) of them were not aware that traders need CITES certificate from WD to export *P. elata* products.

Timber Producers

All the five (5) timber companies interviewed are aware they need a CITES certificate to export *P. elata* but indicated that the procedure is cumbersome and they do not get the approval from RMSC to log *P. elata* in the first place. Ayum Timbers indicated that it ever made a request to harvest *P. elata* as part of its yield but was not approved by the RMSC and so the procedure stopped at that point.

Timber Traders

In all the seven (7) timber markets visited across the six (6) regions not a single trader interviewed was aware of the protection status of *P. elata* neither are they aware that they require a CITES certificate to export P. elata products.

Civil Society

All five (5) CSOs (manily NGOs active in forest sector advocacy) interviewed indicated they have no knowledge on the protection status of *P. elata* and the requirement of a CITES certificate to trade in *P. elata* products.

4.1 Conclusions and Recommendations

4.1 Conclusion

All *P. elata* products originating from Ghana currently are illegal since the FC has stopped yield allocation and by extension, grant of timber rights for *P. elata*. Thus no timber rights are being granted for *P. elata* harvesting in Ghana. So whether a *P. elata* product is traded locally or exported from Ghana means the product is from an illegal source. The survey results indicate that over a very long time, no official approval has been granted to any timber company or trader to log or trade in *P. elata*. This partly accounts for the non-availability of trade data in order to compare with conservation status and predict whether current trade patterns are sustainable or not. Until the FC begins to approve yields and yield allocations that include P. elata, such data cannot be officially available.

The FC currently do not have specific measures to track illegal trade in *P. elata* on the local market and miss-labelling beyond the measures put in place to avoid illegal harvesting. Even though the perception of mis-labelling and illegal trade in the local market is so strong and real, the FC has not been able to verify and track such activities especially in the domestic market. This has a very serious consequence for sustainable conservation of P. elata.

4.2 Recommendations

The FC should institute mechanisms to track the illegal trade through mis-labelling and trade of the species on the local market. Miss-labelling can be checked through the use of pre-felling and post-felling checks from the forest to the port and/or markets (domestic & international).

Tracking and documenting trade data from illegal sources is very challenging and virtually impossible since the actors are not prepared to give any information of the trade volumes and sources of their products. The identification and confiscation of *P. elata* products traded in the local market could thus, be the only option of documenting the estimated trade volumes.

To address the possible logging and miss-labelling for trade in *P. elata* products, the FC will need to recruit competent wood scientists to lead their inspectorate divisions for wood products in order to ensure the records presented by timber traders correspond to the wood products packed in containers

A rigorous awareness raising and sensitization programme need to be put in place to improve the knowledge of FC officials, timber companies, timber traders and Civil Society on the protection status of *P. elata* and the requirements for its trade

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- *Mobilising key players such as industry, local communities, consumer markets and governments in relevant countries in West Africa to create the conditions and solutions that can drive sustainable natural resource utilization.*
- *Creating partnership with key organizations, such as industry and governments in relevant countries in West Africa plus other strategic civil society organizations in policy dialogue and developing market mechanisms to act as stimuli for positive change.*
- *Engaging in activities around other land-uses impacting the forest landscape in West Africa , focusing on sustainable forms of land use in appropriate locations.*

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