
An Assessment of the Ghanaian Forest Sector

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AN ASSESSMENT OF THE GHANAIAN FOREST SECTOR

1.0. INTRODUCTION

USAID has designed an US\$80 million Trade and Investment Program that is designed to assist the Ghanaian government to diversify its export base. The program aims to achieve this objective by providing assistance to the private sector that will enhance the ability of firms to compete in the international marketplace. One of the industries identified as having the potential to substantially increase exports are furniture manufacturers. It has been estimated by the Ghana Export Promotion Council that, as a result of TIP, furniture exports from Ghana could increase from their current level of US\$5.5 million per year to US\$44 million by 1995.

An increase in export activity of this size is bound to have an impact on the raw material base. Specific indicators for monitoring these impacts, as well as appropriate mitigation measures, have been presented in the environmental impact review included with the Program Assistance Authorization Document (PAAD). However, because of the concern regarding the impact of US foreign assistance program on the environment in developing countries, it is important to provide policy makers with a more general understanding of the forest resource in Ghana. To achieve this objective, this paper presents a background discussion concerning the state of the Ghanaian forest resource, current forest management practices, the demands of the timber industry with respect to the resource base and the export markets for Ghanaian tropical hardwood products.

2.0. THE GHANAIAN FOREST RESOURCE

The west African country of Ghana, formerly known as the Gold Coast, is located along the northern edge of the Gulf of Guinea. Bordered by Burkina Faso to the north, Cote d'Ivoire on the west and Togo on the east, Ghana's land area totals approximately 238,000 km² while the population is estimated to be approximately 14.5 million.

The climate in Ghana varies from semi-arid in the north to tropical in the south-west. The northern third of Ghana is comprised of Guinea savannah-woodlands, where annual rainfall seldom exceeds 900mm. The northern savannah-woodlands gradually give way to a woodland-forest mosaic in the central and eastern regions of the country. The southwestern third of the country is located within the tropical forest zone where annual rainfall exceeds 2,000mm (Martin, 1991).

Traversing through the rainforest zone from the north towards the coastal region in the southwest, the tropical rainforest zone is comprised of several different vegetation types. Dry semi-deciduous forest forms a band around the perimeter of the region in the north and east where the Guinea savannah woodland-forest mosaic meets the rainforest zone. The dry semi-deciduous forest habitat is associated with the *Antiaris-Chlorophora* species composition. Annual rainfall in this forest zone ranges from 1,000mm to 1,500mm.

The dry semi-deciduous forest successively gives way to moist semi-deciduous forest, moist evergreen forest and wet evergreen rainforest zones (Hall and Swaine, 1976; Martin, 1991). The moist semi-deciduous forest zone is associated with the *Celtis-Triplochiton* species composition and annual rainfall in this zone ranges from 1,200mm to 1,750mm. The moist evergreen forest zone is regarded as a transitional zone between rainforest habitat and the dryer semi-deciduous forest zones. The characteristic species in this forest zone are *Lophira-Triplochiton* and annual rainfall ranges from 1,500mm to 1,700mm. Located at the southwestern corner of the country, the wet evergreen rainforest zone is associated with the *Cynometra-Lophira-Tarrietia* species composition. Annual rainfall is highest within this forest zone, typically exceeding 1,750mm.

It is estimated that at the beginning of the nineteenth century the forest resource in Ghana covered 88,000 km², approximately 40% of the total land area of the country. Logging and agricultural activity during the colonial period resulted in a halving of the forest resource (to 42,000 km²) by 1950. As a result of continued deforestation, the rainforests of Ghana are currently estimated to total just 19,000 km². In addition, a recent inventory of the forest resource indicates that there is virtually no primary rainforest remaining in Ghana.

2.1. The Forest Reserve System

Traditionally, land in Ghana was communally owned by the village and administered by the village chief. However, in 1911 the Forest Ordinance Law was passed giving the Forest Department the authority to establish forest reserves. Despite facing strong opposition by tribal authorities, by 1939 the Forest Department had incorporated 1.6 million hectares into the forest reserve system (Asabere, 1986). The forest reserve system is constituted of 252 individual forest reserves of varying size as well as an undetermined number of unreserved, or open, forest areas. The fragmented nature of the forest reserves presents a unique challenge in the management of the forest resource.

The forest reserves of Ghana are classified as production forests or protection forests, Table 1. Production forests are managed on a sustainable basis for the production of both traditional and non-traditional forest products. Protection forests are usually located in ecologically sensitive areas (ie: streamsides, steep slopes and areas of particularly fragile soils) and the extraction of logs is prohibited. In addition, wildlife reserves have been established throughout the country to preserve and protect the fauna and these reserves are protected from exploitation. Finally, forest land that has not been incorporated into the forest reserve system is classified as open forestland. Open forestland is not subject to a forest management plan and has been designated for eventual conversion to agricultural end-uses.

Table 1. The forest resource in Ghana in 1990.

		Area (km ²)
Total land base	238,000	
High forest zone	88,000	
Forest reserves (252)	24,709	
Rainforest reserves	15,913	
Production		11,590
Protection		4,323
Savannah reserves	8,796	
Production		515
Protection		8,281
Wildlife reserves (13)	12,100	
Open (unreserved) forest	3,740	

2.2. Preliminary Results of the Forest Inventory

The Forestry Department, with the support of the British Overseas Development Authority, has been conducting an inventory of the forest resource. This inventory, which will eventually cover both the reserved forest as well as the unreserved open forest, is expected to be completed by 1993. By early 1989 almost 550,000 hectares of forest had been inventoried.

The preliminary results of the forest inventory indicate that the standing volume of merchantable timber in Ghana totals 188 million m³, located almost exclusively within the rainforest zone, Table 2. A summary of the inventory results based on species classifications indicates that the Forest Inventory Project (FIP) class 1 species represent over three-quarters of the volume of inventoried species, Table 3. FIP class 1 species are those timber species that have been exported from Ghana at least once since 1973, Appendix A. FIP class 2 species, while never having been exported from Ghana, were found to attain diameters exceeding 70cm and occurring within the forest at a density exceeding one tree per kilometer, indicating a potential for exploitation (Appendix A). All other species, which do not attain a diameter of 70cm or do not occur within the forest with a density exceeding one tree per kilometer, were identified as FIP class 3 species.

Table 2. Summary of the Ghanaian forest inventory by region.

Region	Production forest (km ²)	Estimated volume (million m ³)	Volume of class 1 species >70 cm (million m ³)
Eastern	872	13	6
Central	1,228	22	9
Western	5,134	88	42
Ashanti	2,340	36	19
Brong-Ahafo	2,016	29	14
Total	11,590	188	100

Source: Preliminary results of the forest inventory, 1989.

Table 3. Summary of the Ghanaian forest inventory by species classes.

		Volume (million m ³)	Percent of total
diameter:			
30-70 cm	FIP Class 1	54.5	28.9
	FIP Class 2	23.4	12.4
	FIP Class 3	9.4	5.0
>70 cm	FIP Class 1	89.7	47.5
	FIP Class 2	11.1	5.9
	FIP Class	0.6	0.3

Source: Preliminary results of the forest inventory, 1989.

The most abundant species in the Ghanaian forest reserves are summarized in Table 4. These species, which represent 59% of the standing volume, are all FIP class 1 species. However, most of these species, with the exception of the *Entandrophragma* species, are lesser-known species. It should be noted that the inventory only included those trees that exhibited marketable form and quality. As a result, the inventory results tend to underestimate the volume of timber present in the forest.

Table 4. Most abundant timber species in Ghana.

Species	Local name	Volume (million m ³)
<i>Triplochiton scleroxylon</i>	Wawa	28.2
<i>Celtis</i> spp.	Celtis/Esá	22.6
<i>Ceiba pentandra</i>	Ceiba/Onyina	15.0
<i>Piptadeniastrum africanum</i>	Dahoma	11.3
<i>Terminalia superba</i>	Ofram	7.5
<i>Entandrophragma</i> spp.	Edinam/Sapele/ Utile/Condolleii	5.6
<i>Antiaris toxicaria</i>	Kyen-Kyen	5.6
<i>Nesogordonia papaverifera</i>	Danta	5.6
<i>Pycnanthus angolensis</i>	Otie	5.6
<i>Petersianthus macrocarpus</i>	Esia	3.8
Other species		77.1

Source: Preliminary results of the forest inventory, 1989.

The preliminary results of the inventory, in conjunction with growth data from permanent research plots and timber harvest data, provided a basis for calculating the estimated resource life of a number of timber species, Table 5. The analysis was limited to only those species for which growth data was available. The results of the analysis indicate that many of the traditional export species, particularly the Entandrophragma species, Odum and Mahogany, are being seriously overcut. Each of these species is being harvested at a rate that substantially exceeds its rate of growth. Several other lesser-known species such as Dahoma, KyenKyen and Avodire could be harvested at higher levels of intensity without posing a threat to the resource base.

Table 5. Estimated resource life for some commercial timber species.

Species	Girth Limit	Resource > GLimit (m ³)	Annual growth (m ³ /yr)	Rate of extraction (m ³ /yr)	Resource life (years)
11 feet					
Odum		1,408,000	28,650	172,983	10
Edinam		468,000	7,155	33,167	18
Mahogany		692,000	31,488	66,877	20
Utile		465,000	8,081	31,891	20
Sapele		702,000	13,496	41,135	25
7 feet					
Hyedua		154,000	1,966	10,620	18
Guarea		524,000	4,592	10,972	82
Danta		1,254,000	10,098	24,787	85
Wawa		26,356,000	135,779	366,064	114
Mansonia		695,000	2,753	5,830	226
Dahoma		5,254,000	75,569	14,915	*
KyenKyen		3,726,000	33,331	14,801	*
Avodire		2,365,000	13,548	269	*

* Rate of growth exceeds rate of felling (Alder, 1989).

On the basis of growth data obtained from research plots and a growth simulation model (GHAFOSIM), the annual growth increment of the forests in Ghana is estimated to be 4 m³/ha/yr. The growth simulation model estimates that an allowable annual cut of 1.25 m³/ha/yr could be maintained on a sustainable basis (Alder, 1989). With a productive forest area estimated at 1,159,000 hectares, the annual growth increment for the productive forests would be 4,636,000 m³. As a result, the annual allowable harvest in Ghana would be approximately 1,400,000 m³ (Nolan, 1989).

The timber harvest in Ghana during the period 1970-1990 is displayed in Figure 1. It can be seen that from 1970-1977 the timber harvest exceeded the annual allowable cut. However, since 1978 the annual timber harvest has generally fallen below the allowable harvest limit. Two factors that relate to the volume of timber harvested in Ghana should be noted. First, the volume of timber harvested has been increasing since 1981 and is fast approaching the allowable cut limit. Equally important is the fact that the volume of forest waste, as well as felling damage to remaining trees, is not included in the annual harvest volumes. The inclusion of these volume losses into the annual harvest data is essential to obtain an accurate assessment of the total annual harvest obtained from the Ghanaian forest as well as the impact of harvest operations on the forest resource base.

3.0. FOREST MANAGEMENT SYSTEMS EMPLOYED IN GHANA

Several forest management systems have been implemented in Ghana over the past 45 years. The forest management systems utilized include: the tropical shelterwood system, enrichment planting, the modified selection system and the girth limit system. Each of these systems will be briefly described below.

The tropical shelterwood system (TSS) was introduced into Ghana in 1946 following its successful development and implementation within the tropical moist forests of Malaysia. In TSS the lower canopy of the forest is raised from about 4.6m to 15.2m by the cutting of lianas, removal of unwanted understory species and poisoning of larger trees of undesirable species in the middle and upper canopies. The objective of the TSS is to encourage the growth of seedlings and saplings of the highly desirable commercial timber species.

An evaluation of TSS after twenty years of implementation yielded disappointing results and the system was discontinued in the mid-1960's. The results indicated that the costs of TSS exceeded the additional revenues produced while regeneration of the prime timber species was found to be less vigorous than that of the competing species, forming only six to ten percent of total regeneration.

A system of enrichment plantings was performed during the same period of time as the TSS was being evaluated. The timber species selected for enrichment planting were primarily indigenous species and included *Khaya ivorensis*, *Entandrophragma utile*, *Entandrophragma angolense*, *Tarrietia utilis*, and *Lovoa trichilioides*. Under this system, lines of forest were cleared and two year-old saplings were planted at intervals of 5m. Periodic clearing of the lines reduced competition from weed species and helped to further open the canopy of the forest.

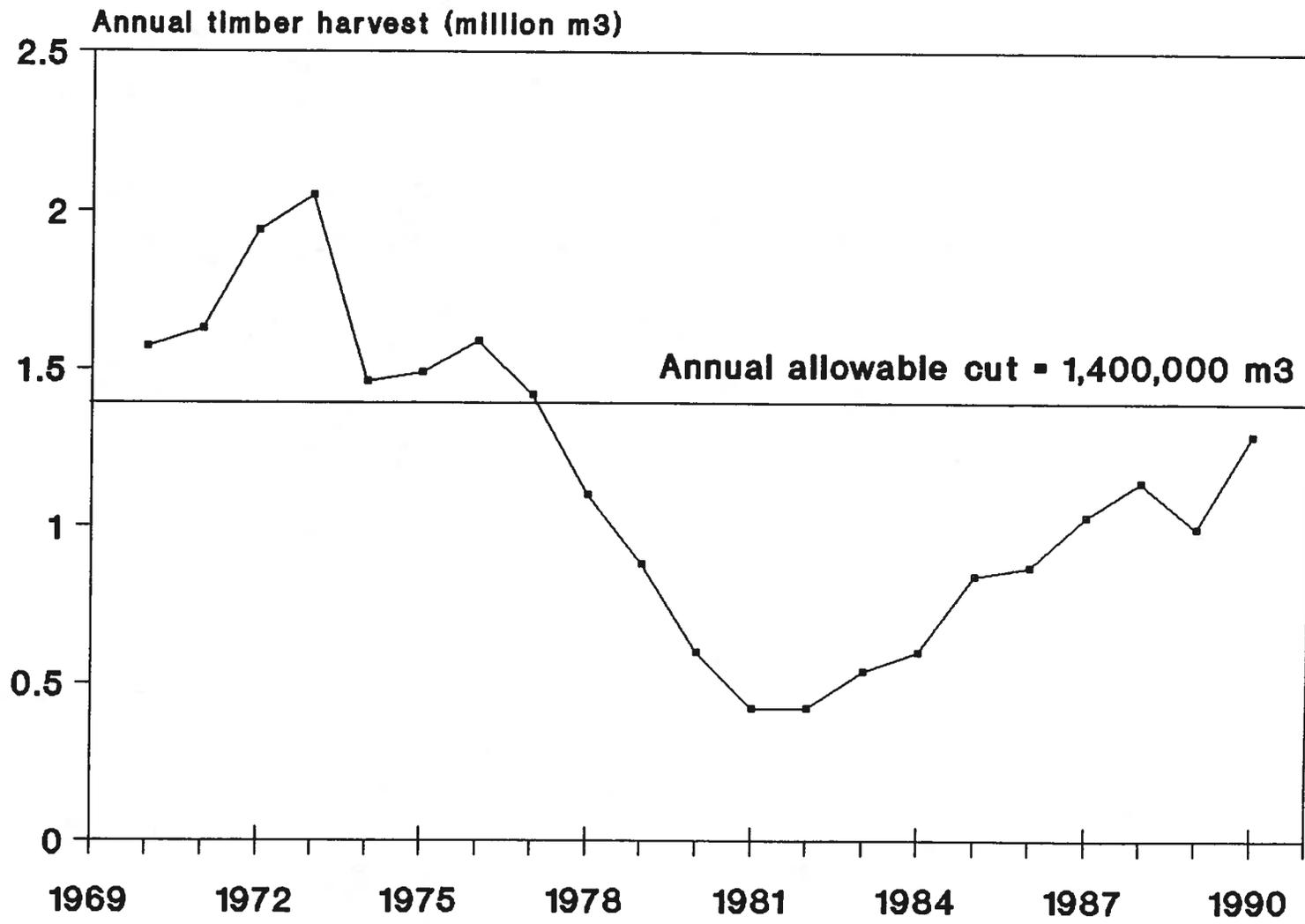


Figure 1. Volume of timber harvested in Ghana, 1970-1990.

Enrichment planting proved to be extremely expensive because of the necessity of keeping the lines cleared of competing vegetation and the system was abandoned in the early 1960's. In addition, nursery costs were found to be higher than expected, further reducing the cost effectiveness of this system.

From 1956 to 1970 the modified selection system (MSS) was employed to manage the Ghanaian forests. Under this system stock maps were developed to identify the location of all trees of the primary timber species with a girth exceeding 2.1m. On the basis of these maps, a thinning exercise was carried out aimed at reducing the competition faced by trees of the primary timber species in the .3m to 1.5m girth class. Lianas and vines were cut while trees of non-commercial species were frill girdled and poisoned with sodium arsenite. The objective of MSS was to help ensure that the commercial species reached maturity as quickly as possible while reducing competition from other less desirable timber species.

Under MSS the forests were managed on the basis of a 25 year rotation. Prescribed yields were established for each forest reserve to ensure the sustainability of the forest resource. The yield of each compartment being harvested was determined by identifying the largest trees and progressively working down in size until the prescribed yield was obtained. Inevitably, many large, mature trees were left in the forest following the removal of the trees felled during the prescribed harvest, resulting in much resistance from the timber industry.

Critics of the MSS management system argued that the bulk of the harvest was obtained from the larger, overmature girth classes (4m and over) and, as a result, many mature trees were not included in the harvest schedule. These critics, primarily members of the timber industry, charged that the mature trees left behind in the forest would become overmature and begin to decay before the next entry were allowed into the compartment. As a result of political pressure applied by the timber industry, the modified selection system was abandoned and a girth limit/salvage system was adopted.

Under the girth limit system the rotation period was reduced from 25 years to 15 years. In addition, minimum girth limits were established for each class of species. All trees within the forests reserves that exceeded these minimum girth limits could be felled. The only condition attached to the industry required that a specific volume of FIP class II and III species (equivalent to 30% of the volume of class I species harvested) had to be harvested before the concessionaire could move into the next compartment. This system was originally scheduled to be implemented for a period of 15 years starting in 1970. At the end of this 15 year period, all overmature trees were expected to have been harvested from the forest and the modified selection system would again be utilized in the management of the forests. However, at the present time the

girth limit system is still being used to manage the forests in Ghana.

4.0. TIMBER CONCESSION POLICY IN GHANA

The awarding of timber concessions in Ghana is administered by both the Forestry Department and the Ministry of Lands and Natural Resources. The process of applying for a concession is extremely time consuming and usually exceeds one year and involves over 12 different steps in the approval process.

In the early 1960's timber concessions were awarded on a 30 to 50 year basis with very few restrictions being applied. However, since 1975 timber concessions have generally been awarded on a 15 year basis and Ghanaian citizenship is a requirement to being awarded a timber concession. The size of timber concessions has also been declining since 1975.

Concession owners are required to pay a variety of royalty and licensing fees to operate their concession. Each concessionaire must pay an annual licensing fee based on the size of his concession. The concessionaire is also required to obtain a property mark which must be placed on each log harvested. In addition the concessionaire is required to pay a royalty fee for each tree harvested from the concession. This fee is applied on a per tree basis rather than on a volumetric basis and a different rate is applied for each species. The royalty fee varies from US\$6.50/tree for a high value species like Afrormosia to US\$1.16/tree for a low value species such as Wawa. Finally, a reforestation fee of US\$1.00/m³ is collected from all forest products exported.

A recent study on the timber concession system observed that no single administrative agency maintained overall supervision of the concession system. As a result, records on timber concessions are maintained by several departments, complicating the administration of timber concessions. In addition, the study noted the following problems:

- 34% of timber concessions were inactive
- 31% of concessionaires had not renewed their property marks
- Third party felling agreements were commonplace
- Over 5,000 km² of concessions were observed to have farming activities occurring over more than 50% of their area
- The average felling cycle had decreased from 35 to 15 years

- 68% of concessions were too small to be managed in a sustainable manner
- Only 14% of timber mills possessed adequate concession holdings
- Many concessions had been awarded to people who did not possess harvesting equipment and, presumably, little harvesting experience.

As a result of this study, and the forest inventory, the government has suspended the awarding of new timber concession until a new concession policy can be developed and implemented.

5.0. TROPICAL TIMBER EXPORTS AND MARKETS

5.1. The Ghanaian Timber Industry

The timber industry consists of 177 logging operations, 92 sawmilling operations and 12 veneer slicing operations in 1991 (FPIB, 1992). The majority of the sawmills and veneer mills are located in and around the city of Kumasi. A second, smaller, group of timber processors are situated around the port city of Takoradi, located in the southwest corner of Ghana.

Firm size within the timber industry (based on value of exports) is very heterogenous, ranging from US\$7.85 million to US\$4,500. In 1991 there were 22 firms with exports exceeding US\$2 million while 58 firms had exports of less than US\$25,000. The timber industry is a primary employer of labor in Ghana. It has been estimated that the timber industry, including furniture manufacturers, provides direct employment to over 250,000 people, while providing indirect support to approximately 2 million people (TEDB, 1988).

Entry and exit barriers within the industry are quite low, particularly for the smaller, less capital intensive operations. As a result, the number of small timber firms operating tends to follow economic trends. For example, following almost a decade of poor economic conditions, the number of log exporters totalled just 95 in 1985 (less than one quarter the number that were operating in 1975), while the number of sawmills totalled just 49 (approximately half the number operating in 1975). As the Ghanaian economy improved and demand for tropical hardwood products increased, the number of logging operations rose to 351 by 1988 before dropping off to 177 in 1991. The number of sawmills increased to 118 in 1990 before dropping to 92 in 1991 (FPIB, 1992).

5.2. Ghanaian Tropical Timber Exports

The Ghanaian timber industry represents an important industrial sector within the domestic economy. In 1991, the timber industry contributed 5% of the gross domestic product. More importantly, foreign exchange earnings from timber exports in 1991 totalled US\$113.4 million, accounting for approximately 12.7% of Ghana's total foreign exchange earnings (FPIB, 1992). The export of forest products ranked third in foreign exchange earnings behind cocoa (US\$320.1 million) and gold exports (US\$300.7 million).

The timber industry is heavily skewed towards the production and export of low value-added products. In 1991 the export of unprocessed logs represented 28% of total exports while lumber and sliced veneer represented 52.8% and 10%, respectively. Exports of higher value, further processed products represented less than 10% of timber exports, while exports of furniture and furniture parts provided just 3.7% of total exports. While these figures indicate a lack of investment in further processing facilities and equipment, they also indicate that the marketing capability of the industry appears to be very underdeveloped.

This conclusion is further supported by the fact that Ghanaian exports of tropical timber products are highly concentrated in a small number of countries, Table 6. Most Ghanaian exporters do not have a relationship with the end-user of their products. Rather, most timber from Ghana is imported into Europe by agents who then distribute these products to end-users. This method of distribution separates the producer from the end-user of his product and restricts his access to market information, reducing his ability to effectively compete in these markets. As a result, Ghanaian producers have been unable to develop a thorough understanding of market conditions and the competitive forces in Europe.

From Appendix A it can be seen that there are over 120 timber species that have the potential for utilization by the timber industry. However, the summary export statistics for the year 1991 indicate that the vast majority of tropical timber exports from Ghana consist of a very small number of species, Table 7. This situation emphasizes the fact that the industry has been unable, for whatever reasons, to effectively promote the large number of lesser-known/lesser-used species that are found in the Ghanaian forest. However, it is essential that these species begin to be utilized in order to reduce the rate of exploitation of the more traditional species and to ensure that the forest is managed in a more sustainable manner.

Table 6. Principal markets for Ghanaian timber exports, 1991.

Product Category	Principal Markets	Volume of Exports (m ³)	Percent of Total Exports
Logs:	Germany	119,876	55.64
	Italy	32,086	14.89
Lumber:	Germany	43,763	23.96
	UK	24,157	13.23
	Holland	20,588	11.27
	Ireland	18,006	9.86
	Burkina Faso	15,013	8.24
Sliced Veneer:	Germany	4,892	37.14
	Italy	4,499	34.16
	UK	2,666	20.24
Furniture/Parts:	UK	1,564	83.15

FPIB Timber Export Report, 1992.

Table 7. Principal species for Ghanaian timber exports, 1991.

Product Category	Principal Species	Volume of Exports (m ³)	Percent of Total Exports
Logs:	Wawa	119,063	55.27
	Koto/Kyere	15,708	7.29
	Otie	12,018	5.58
	Albizzia	11,396	5.29
Lumber:	Wawa	98,506	53.93
	Odum	26,285	14.39
	Mahogany/Khaya	15,077	8.25
Sliced Veneer:	Asanfona	5,980	45.85
	Makore	1,881	14.43
	Koto/Kyere	1,647	12.64
	Sapele	1,365	10.48
Furniture Parts:	Odum	897	45.21
	Mixed Red Woods	495	24.95
	Afrormosia	314	15.83

FPIB Timber Export Report, 1992.

5.3. Export Levies and Restrictions

The Ghanaian government has indicated that the export of unprocessed logs will eventually be banned completely. There is currently a ban on the export of 18 traditional timber species in log form (Appendix B). Four other species are subject to a forest improvement levy that ranges from 40%-50%. The aim of these policies is to encourage the further processing of the traditional timber species while providing an incentive to develop markets for the lesser-known timber species by exporting them in log form. Another policy aimed at promoting further processing is the export retention system for foreign exchange. An exporter may retain only 5% of the FOB value in an offshore account for log exports while this limit is increased to 20% of FOB value for sawnwood exports.

The government has also imposed a 50% forest improvement levy on the export of sawn lumber from several traditional species. These species include Odum, Afrormosia, Utile and Hyedua. All of these species exhibit very low stocking levels due to over-exploitation and the levy is intended to reduce pressure on these species. In addition, the government has announced that the export of green and air-dried lumber will be banned by January, 1994. All lumber exports will need to be kiln-dried after that time. This policy may be difficult to implement considering the fact that the current dry kiln capacity in the country can only handle a small percentage of current sawnwood export volumes.

5.4. Regulatory and Monitoring Agencies for the Timber Industry

The timber industry in Ghana is monitored and regulated by two public entities, the Timber Export and Development Board (TEDB) and the Forest Products Inspection Bureau (FPIB). The Timber Export and Development Board was established in 1985 under PNDC Law 123. TEDB is a public marketing board responsible for overseeing the promotion and export of forest products from Ghana. TEDB has been charged by the government with establishing minimum product prices based on current European prices for similar products produced in neighboring west African countries.

Timber export contracts must be submitted to TEDB for approval of contract prices. Export contracts that do not meet the minimum price levels are returned to the firm and must be renegotiated prior to receiving export approval. TEDB's operational funds are derived through a one percent tax levied on the FOB value of the export contract and payable in foreign currency.

The Forest Products Inspection Bureau (FPIB) was established in 1985 under PNDC Law 117. FPIB has been mandated with monitoring the harvest of logs from the forest reserves. In addition, FPIB is also charged with inspection of all timber shipments to ensure that the product being shipped corresponds to the product specified on the export invoice in both volume and value. FPIB receives its

operating budget from a two percent tax levied on the FOB value of the export contract and payable in the local currency, the cedi.

6.0. CONCLUSIONS AND RECOMMENDATIONS

The Ghanaian government has taken a range of steps in an effort to sustainably manage their tropical forest resource. These steps include the implementation of the forest inventory project, the development of a new timber concession policy, increasing the rotation cycle from 15 years to 40 years and the implementation of policies aimed at promoting the use of the lesser-known timber species. However, despite these steps there are several areas of concern that need to be addressed to ensure that the forests of Ghana can continue to be utilized on a sustainable basis in the long-term.

- Current harvest levels in the Ghanaian forest are very near the annual allowable cut estimated from the forest inventory. Increased demand for raw materials from the forest may result in harvest levels that are not sustainable in the long-term.
- Harvest volumes do not take into account defective logs which are left in the forest and felling damage to adjacent trees during harvest operations. Estimation of this damage is necessary to implement sustainable forest management policies.
- Far too much emphasis is being concentrated on the few traditional timber species. Given current rates of exploitation, the supply of many of these species could be exhausted within the next thirty years. The timber trade should be encouraged to develop markets for the lesser-known timber species.
- Over-emphasis on the traditional timber species has the net result of reducing the genetic diversity of the forest and leads to 'creaming' of the forest. This practice leads to the degradation of large areas of forest and results in excessive numbers of logging roads being constructed. These roads in turn contribute to soil degradation and provide shifting agriculturalists with access into the forest.
- The current practice of charging royalties for logs on a per tree basis is inefficient and difficult to implement. Royalties should rather be based on a per cubic meter basis.
- The new concession policy should be developed as quickly as possible and should take account of the recommendations that resulted from the concession report.

- A new forest management policy should be developed to replace the current girth limit system. A system based on the modified selection system appears to be appropriate for the Ghanaian forest reserves.

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8.0. APPENDIX A.

FIP class 1 species:

Species that have been exported at least once from Ghana since 1973.

Scientific Name	Local Names
<i>Afzelia bella/africana</i>	Papao, Apa, Afzelia
<i>Albizia ferruginea</i>	Awiemfosamina
<i>Albizia zygia</i>	Okoro
<i>Alstonia boonei</i>	Sinuro
<i>Amphimas pterocarpoides</i>	Yaya
<i>Aningeria</i> spp.	Asanfena, Asanfona
<i>Anopyxis klaineana</i>	Kokote
<i>Antiaris toxicaria</i>	Kyen-kyen
<i>Antrocaryon nicraster</i>	Aprokuma
<i>Berlinia</i> spp.	Limbali, Tetekon
<i>Bombax brevicuspe</i>	Onyinakoben
<i>Bombax buonopozense</i>	Akata
<i>Canarium schweinfurthii</i>	Aiele
<i>Ceiba pentandra</i>	Fromager
<i>Celtis mildbraedii/zenkeri</i>	Esa
<i>Chrysophyllum giganteum/subnundum</i>	Akasaa
<i>Copaifera salikounda</i>	Bubinga
<i>Cordia millenii/platythyrsa</i>	Tweneboa
<i>Cylicodiscus gabunensis</i>	Okan
<i>Cynometra ananta</i>	Ananta
<i>Daniellia ogea/thurifera</i>	Hyedua/Faro
<i>Dialium aubrevillei</i>	Duabankye
<i>Diospyros sanza-minika</i>	African ebony
<i>Distemonanthus benthanianus</i>	Movingui
<i>Entandophragma angolense</i>	Edinam, Tiama
<i>Entandophragma cylindricum</i>	Sapele
<i>Entandophragma candollei</i>	Kossipo
<i>Entandophragma utile</i>	Utile, Sipo
<i>Erythrophleum</i> spp.	Tali
<i>Guarea cedrata</i>	Scented guarea
<i>Guarea thompsonii</i>	Black guarea
<i>Guibortia ehie</i>	Ovangol
<i>Heretiera utilis</i>	Niangon
<i>Khaya anthotheca/grandifolia</i>	African mahogany
<i>Khaya ivorensis</i>	African mahogany
<i>Klainedoxa gabonensis</i>	Kroma
<i>Lophira alata</i>	Ekki
<i>Lovoa trichilioides</i>	African Walnut
<i>Mammea africana</i>	Bompagya
<i>Mansonia altissima</i>	Mansonia

Milicia excelsa/regia	Odum, Iroko
Mitragyna ciliata/stipulosa	Abura
Nauclea diderrichii	Kusia, Bilinga
Nesogordonia papaverifera	Danta
Parkia bicolor	Asoma
Pericopsis elata	Afrormosia
Petersianthus macrocarpus	Esia
Piptadeniastrum africanum	Dahoma
Pterygota macrocarpus	Koto
Pycnanthus angolensis	Otie
Sterculia rhinopetala	Wawabima
Strombosia glaucescens	Afena
Terminalia ivorensis	Emire, Framire
Terminalia superba	Ofram
Tieghemella heckelli	Makore
Triplochiton scleroxylon	Wawa, Obeche
Turraeanthus africanus	Avodire

FIP class 2 species:

Species that attain a diameter of at least 70cm and occur in the forest with a density of at least one tree per square kilometer.

Scientific Name	Local Names
<i>Afrosersalisia afzelii</i>	Bakunini
<i>Albizia adianthifolia</i>	Pampena
<i>Albizia glaberrima</i>	Okara-akoa
<i>Aningeria</i> spp.	Asamfena
<i>Balanites wilsoniana</i>	Krobodua
<i>Blighia</i> spp.	Akye
<i>Bussea occidentalis</i>	Kotoprepre
<i>Calpocalyx brevibracteatus</i>	Atotre
<i>Celtis adolfi-friderici</i>	Esakosua
<i>Celtis wightii</i>	Prempresa
<i>Chidlowia sanguinea</i>	Ababima
<i>Chrysophyllum perpulchrum</i>	Ataene
<i>Chrysophyllum pruniforme</i>	Duatadwe
<i>Cleistopholis patens</i>	Ngonenkyene
<i>Cola gigantea</i>	Watapuo
<i>Corynanthe pachyceras</i>	Pampenama
<i>Coula edulis</i>	Bodwue
<i>Dacryodes klaineana</i>	Adwea
<i>Duboscia viridiflora</i>	Akokoragyehini
<i>Erthroxylum manii</i>	Pepeanini
<i>Ficus</i> spp. (non-stranglers)	Domini
<i>Gilbertiodendron</i> spp.	Tetekon
<i>Hannoa klaineana</i>	Fotie
<i>Hexalobus crispiflorus</i>	Duabaha
<i>Holoptelea grandis</i>	Nakwa
<i>Homalium letestui</i>	Esononankoroma
<i>Homalium stipulaceum/dewev.</i>	Owebiribi
<i>Irvingia gabonensis</i>	Abesebuo
<i>Lannea welwitschii</i>	Kumanini
<i>Lonchocarpus sericeus</i>	Sante
<i>Maranthes</i> spp.	Afam
<i>Margaritaria discoidea</i>	Pepea
<i>Morus mesozygia</i>	Wonton
<i>Monodora myristica</i>	Weddeaba
<i>Ongokea gore</i>	Bodwe
<i>Pachyodanthium staudtii</i>	Kumdwie
<i>Panda oleosa</i>	Kokroboba
<i>Parinari excelsa</i>	Afam
<i>Parkia filicoidea</i>	Osoma-Nua
<i>Pentaclethra macrophylla</i>	Ataa
<i>Phyllocasmus africanus</i>	Akokorabeditoa
<i>Protomegabaria stapfiana</i>	Agyahere

<i>Pseudospondias microcarpa</i>	Katawani
<i>Pteleopsis hylodendron</i>	Kwae-Kane
<i>Ricinodendron heudelotii</i>	Wama
<i>Scotellia klaineana</i>	Tiabutuo
<i>Sterculia oblonga</i>	Ohaa
<i>Sterculia tragacantha</i>	Sofu
<i>Stereospermum acuminatissimum</i>	Esona-Tokwakofuo
<i>Tabernaemontana</i> spp.	Obanawa
<i>Talbotiella gentii</i>	Takorowanua
<i>Treculia africana</i>	Brebretim
<i>Trichilia prieuriana</i>	Kakadikuro
<i>Trichilia tessmannii</i>	Tanuronini
<i>Trilepisium madagascariense</i>	Okure
<i>Uapaca guineensis</i>	Kontan
<i>Xylia evansii</i>	Abobabema
<i>Zanthoxylum</i> spp.	Oyaa/Okuo

9.0. APPENDIX B.

Ghanaian timber species which are prohibited from being exported in log form.

Common Name	Scientific Name
Sipo, Utile	Entandrophragma utile
Sapele	Entandrophragma cylindricum
Tiama, Edinam	Entandrophragma angolense
Kosipo, Candollei	Entandrophragma candollei
Odum, Iroko	Chlorophora excelsa
Afrormosia	Afrormosia elata
Mahogany, Acajou	Khaya ivorensis
Makore, Baku	Tieghemella heckelli
Mansonia	Mansonia altissima
Hyedua	Guibourtia ehie
Niangon	Tarrietia utilis
African walnut, Dibetou	Lovoa trichilioides
Avodire	Turreanthus africana
Teak	Tectona grandis
Emire, Framire	Terminalia ivorensis
Asanfona	Aningeria robusta
Ofram, Limba	Terminalia superba
Danta	Nesogordonia papaverifera