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Research Article

A decade and half of Ghana's trade in African Mahogany: A Review

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Abstract
This paper sought to review Ghana's performance with regard to trade in African mahogany from 2001 to 2015. The study assessed the volume, types of product exported, extent of product innovation and export destinations of the species and wood products in general. From the results, the highest export volume was recorded in 2007 (32,149m^3) and the least of 14,082m^3 in 2001. The timber industry was mainly involved in secondary processing of mahogany as veneer, block board, air and kiln dried lumber and plywood. Tertiary processing was comparatively low and products like floorings and furniture parts were rarely exported. The major markets were in Europe, Africa, America, Asia and the Middle East. Considering the depletion of this important timber species in the national forest estate and its attendant loss of revenue, Ghana should vigorously restock degraded areas and incentivize mills engaged in tertiary processing of timber species.

Keywords
African mahogany—wood processing—export—international trade—Ghana

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1. Introduction

African mahogany or Khaya species could be classified as one of the key timber species with a high local and export demand dating as far back as the 18th century, due to its excellent aesthetic and physical properties [1, 2]. Within the West and Central African sub-region, records show that four main species of mahogany from the family Meliaceae are present namely: *Khaya anthotheca, Khaya ivorensis, Khaya grandifoliola and Kyaha senegalensis. Khaya anthotheca* usually occurs in wet or dry semi-deciduous forest though some are present in the transition zone [3]. Likewise, Khaya grandifoliola grows in the semi-deciduous forest, primarily in dry areas and within the savanna zone, and the species could also be found along water courses [4]. On the other hand, *Khaya ivorensis* is most abundant in the evergreen forest whereas *Khaya senegalensis* usually occurs in wet parts of savanna woodland [5, 6].

Over the years, due to similarities in appearance of the four species, they are usually mixed and traded on the global market. On the international scene, the species is used for light flooring, ship construction, musical instruments, vehicles bodies, turnery and toys among others [7, 8]. In Ghana, it is used for the construction of canoes, furniture, doors, window and door frames and panels.

According to Ghana's Timber Industry Development Division (TIDD), African mahogany is usually exported in primary, secondary or tertiary form to major markets in Europe, America, Asia,Oceania, Africa and Middle East [8]. An assessment of past export performance have shown a general decline in volume of all wood products exported since 2001 due to illegal harvesting, illegal mining, poor agricultural practices, increase in domestic demand and strict legality measures from the international market [9, 10, 11, 12]. Until the 1950s for example, timber from mahogany was the most dominant species of Ghana' wood product export accounting for over 100,000m^3 [4, 11]. With such a huge market demand for the species, it presents a clear picture of the need to add value to conserve the remaining tree reserves and to restock degraded areas [13, 14, 15].

It is essential to emphasize that though documentation on trade of the species has focused on lumber and its related products, indeed every part of the tree is useful in Ghana and in many cultures and has some export potential [7]. In Cameroon for instance, whereas the bark is used to treat skin diseases, wounds and depression, the

roots are equally valuable and could be applied against oedema and amenorrhoea [6]. Again, flowers were used to cure syphilis and seed oil rubbed on the skin could cure rheumatism and influenza. Similarly, in Tanzania, roots decoctions provide treatment for anaemia, dysentery and rectal prolapse whereas in DR Congo, chemical extracts from the leaves are used for making arrow poison [3]. Locally, though the medicinal value of the bark of the tree is known to cure colds, pneumonia, stomach pains worm infections, vomiting and gonorrhoea [16, 17, 18] yet, very little has been done to facilitate large scale export of other parts of the tree to the international market. The objective of this paper therefore, is to assess Ghana's performance in trade of the species, from 2001 to 2015, with regard to volume, types of product exported, destinations and the extent of product innovation. The method used was to collate the volume and value of all mahogany products exported within the period from the Timber Industry Development Division's Annual Reports. The time-series data obtained was subsequently analysed with Microsoft Excel 2007 to gain an overview of the export trend of the species.

2. Comparison of volume of mahogany in the overall export volume of wood products

It is important to state that on the average, Ghana exports more than twenty different timber species to the international market yet demand for mahogany alone continues to increase with demand outstripping supply. During the period, the highest export volume for mahogany was recorded in 2007 i.e. 32,149m^3 (Table 1) whereas the highest export value of €22,054,932.29 was gained in 2005 from a volume of 30,741m^3. The least export volume was in 2001 (14,082m^3). The percentage of the species in the overall export volume continued to appreciate from 2001 and by 2012 it constituted 6.96% of the overall export volume (In Table 1, the figure quoted for 2015 is incomplete because at the time of data collection, export values for October, November and December were yet to be released).

Table 1. Percentage (%) of mahogany in the overall export volume

Year	Volume of mahogany (m^3)	Overall volume of timber species (m^3)	Percentage (%)
2001	14,082	476,500	2.95
2002	17,908	472,427	3.79
2003	18,931	444,388	4.26
2004	26,191	455,180	5.75
2005	30,741	466,155	6.59
2006	31,235	451,608	6.91
2007	32,149	528,570	6.08
2008	29,630	545,915	5.04
2009	19,933	426,221	4.68
2010	21,876	403,254	5.42
2011	19,801	319,843	6.19
2012	17,503	251,346	6.96
2013	16,894	271,772	6.22
2014	17,293	356,036	4.86
2015*	10,832	249,846	4.33

*Incomplete data

2.1 Export product composition

From the analysis, African mahogany exports mainly comprised of secondary and tertiary products. Using the Timber Industry Development Division's (TIDD) classification as a bench mark, lumber (air and kiln dried), veneer, block boards, plywood (overland) and kindling are secondary products while dowels, flooring, processed lumber moulding, profile boards and furniture parts could be referred to as tertiary products.

2.2 Secondary products

During the period under review, the list of secondary products exported include; air and kiln dried lumber, veneer, plywood (overland), block board, powdered barks and plywood.

2.2.1 Air and Kiln dried lumber

Comparison of the volume of air and kiln dried lumber exported shows that the latter had a higher export demand and the country earned more than on air dried lumber which was usually sold on the ECOWAS market (Fig. 1). The results also indicate that though the demand for air dried lumber has continued to fall since 2001 yet Ghana has failed to completely stop exporting this product.

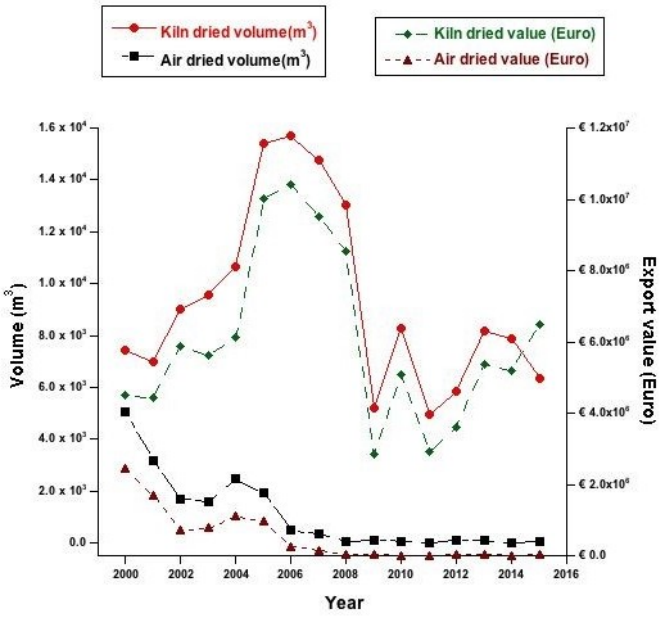

Figure 1. Volume and value of air versus kiln dried lumber

From the huge variations in price of the two products (Fig. 1), the outcome of persistent export of air dried lumber would be a significant loss of revenue to Ghana.

2.2.2 Types of veneer exported

Four types of veneer were produced for the export market (Fig. 2). By and large, sliced veneer accounted for the largest volume and veneer curls were the most priced of the four. In fact in 2014 and 2015 for example, veneer curls was exported at a price of 11,612 and 13,151 Euros per cubic metre respectively. The species was hardly processed as rotary or sawn veneer.

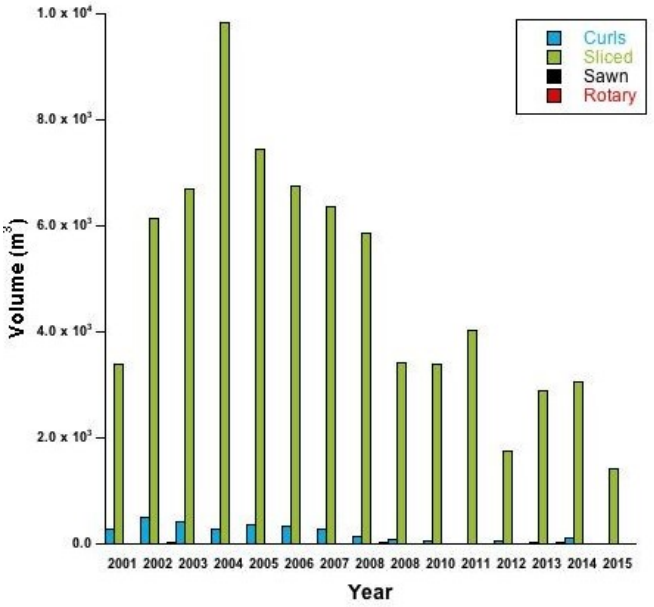

Figure 2. Types of veneer produced

2.2.3 Minor secondary products

The volume of plywood, block board and powdered barks supplied to the global market was insignificant compared with lumber and veneer (Fig. 3) and it appeared that for some years, there was no demand for these products. From these fluctuations, the probable conclusion is either the country cannot meet the demand for some products or very little research is on-going to sustain and expand our niche market. On the other hand, demand for plywood (overland) started to improve from 2004 till 2012 before the volume started to decline.

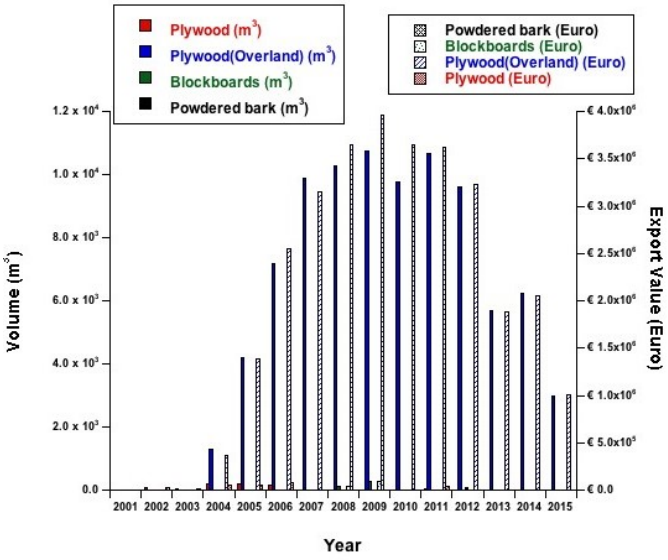

Figure 3. Volume and value of minor secondary exports

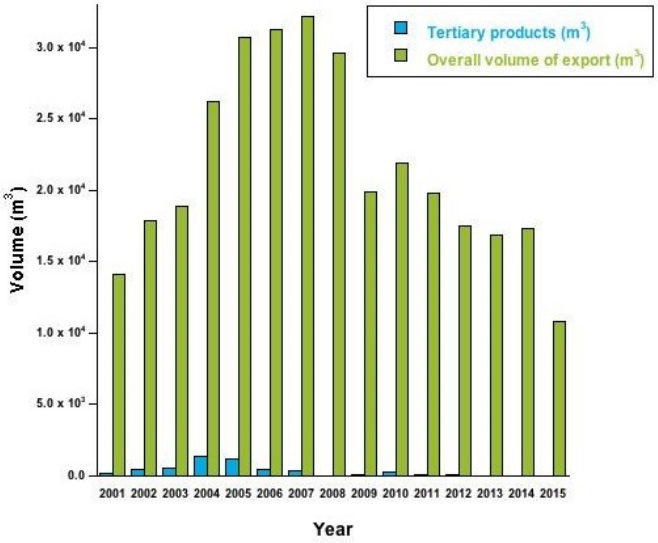

Figure 4. Volume of tertiary products exported

2.3 Tertiary products

Profile boards, flooring, furniture parts processed lumber mouldings and curls board were the only tertiary products sold. Ghana performed abysmally in terms of tertiary processing in comparison to secondary production (Fig. 4). Throughout the sub-region, similar trends have been observed where wood processing is mostly carried out at the primary or secondary level [8, 19]. In Nigeria for instance, low quality standards equally limits local demand for tertiary products causing high imports of furniture by the middle and high income groups [20]. Ghana earned its highest ever export value of €22,054,932 from mahogany in 2005 from a volume 30,741m^3 yet, the highest volume of mahogany products (32,149m^3) was sold in 2007 at a value of €20,122,681. This disparity in volume and value could be explained by the proportion of tertiary products exported in that year alone (Fig. 5). The results also reveal that 2005 was the only year that recorded the highest volume of export of furniture parts (905m^3) whereas the volume recorded in 2007 was 239m^3. It is imperative to state that the decline in exports could be explained by measures enforced by the EU and USA to minimize and completely stop illegal timber imports from destinations which originally supplied tertiary products [9]. It is also equally important to realize that tertiary processing of the species is on the decline and in 2013 and 2014 mahogany was only exported as a secondary product minimizing Ghana's export earnings.

An assessment of types of tertiary products exported shows furniture parts as leading followed by processed mouldings, flooring and profile boards respectively (Fig. 5). Indeed, years with more exports of tertiary products coincide with greater returns. Reports that have studied determinants of export demand for sawn wood, plywood and veneer from Ghana concluded that with the imposition of an export levy on air dried lumber plus a reduction in the annual allowable cut, the export volume of sawn wood reduced whilst plywood and veneer products increased [21, 22]. The focus of government policy should therefore be to apply sanctions to discourage secondary processing.

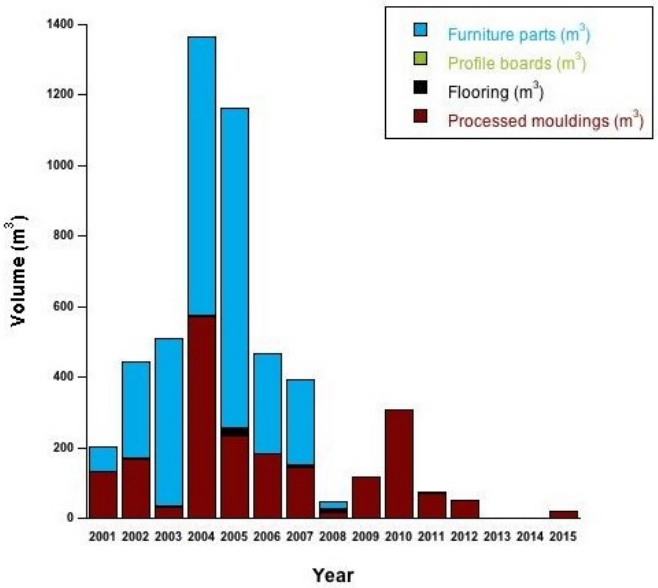

Figure 5. Type of tertiary products exported during the period

2.4 Trend in product innovativeness

Globally, wood processing industries are capitalizing on the adaptability of wood to produce innovative products

like cross laminated timber, nanomaterials and biomaterials. However, composition of exports from African mahogany has remained unchanged. There has been very little effort to use innovation to produce comparatively new products which could appeal to the market. With regard to powdered barks for example, only 1.5m^3 and 90.48m^3 were exported in 2008 and 2009 respectively. Other products that could also be placed in this uncommon export category include curls board and block boards. In the final analysis, it is striking that cumulatively the total volume of these products exported throughout the period, does not exceed 200m^3.

2.5 Direction of exports

Ghana has six major markets for its wood products namely: Europe, Africa, America, Oceania, Middle East and Asia. In terms of product requirement, much of the primary and secondary products such as air dried lumber and plywood (overland) are exported to African and Asian markets whereas demand for tertiary products are higher with regard to Europe and America. Though the global outlook of Ghana's wood export destinations is extensive, the leading countries in terms of volume of imports have been indicated on the map (Fig. 6).

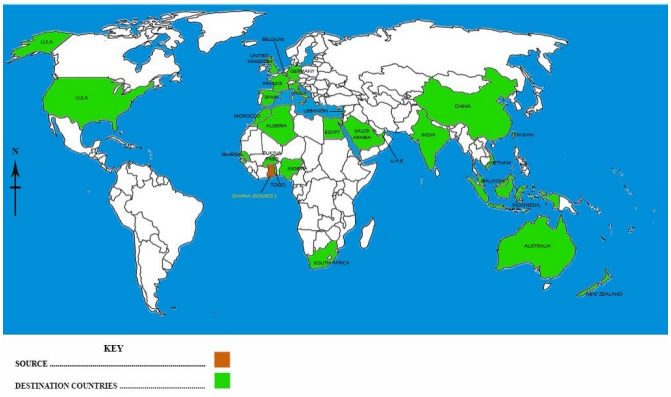

Figure 6. Major export destinations for the species

2.5.1 Demand for wood products in Africa

The statistics show that wood product exports from Ghana to other African countries have significantly increased since 2001 through to 2003 which recorded comparatively lower values of 9.8% and 8.8% respectively of the total volume of export (Fig. 7). By the close of 2006, trade within the region had grown to a little over a quarter of the overall volume and this increment continued until 2012 when the figure was more than half of the export volume (55.8%) with a corresponding decline to major markets in Europe, Asia, Middle East and America. Indeed, some studies have equally confirmed that trade in tropical timber has declined to markets in the EU, America and Australia from 2001 to 2013 whereas volumes exported to China and India have increased due to enforcement of timber legality verification systems [9, 23].

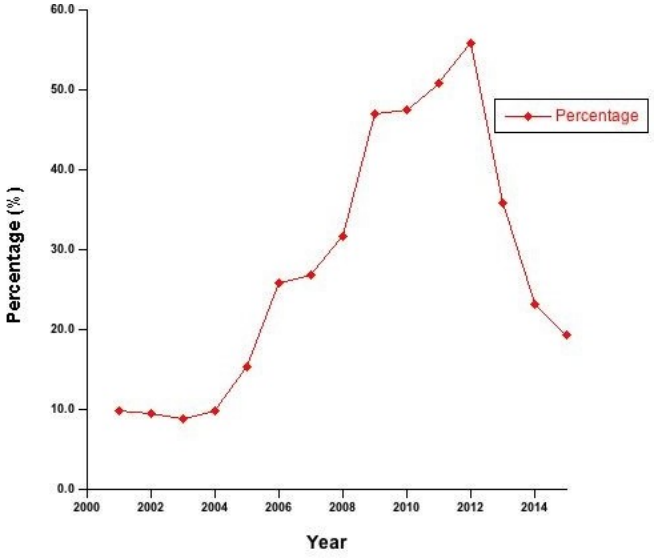

Figure 7. Proportion of wood products exported to other African countries

2.5.2 Demand in the ECOWAS Region

Likewise within the ECOWAS region, the top three destinations for wood products are Nigeria, Senegal and Burkina Faso. Ghana is presently a major supplier of lumber to some wood deficit countries in northern parts of the region as well as its immediate neighbouring countries including Cote D'Ivoire, Togo and Sierra Leone (Fig. 8). Aside these leading importers, records show that trade in wood products from Ghana extends to almost every country within the sub region.

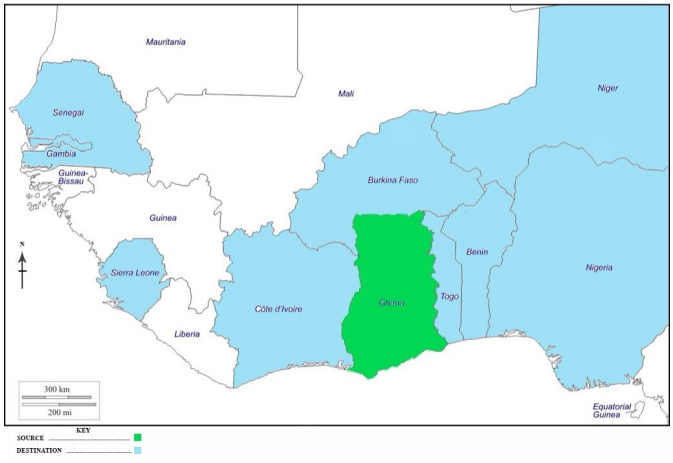

Figure 8. Destinations of wood products within the sub-region

With respect to the overall volume of wood exported to countries within the ECOWAS region, the analysis

illustrates that demand equally grew within the period just as it had for the whole African continent with 2009 recording the highest volume of trade. In 2003 for example, the total volume of air dried lumber exported was 7,330m^3 out of which 2,591m^3 was imported by Senegal (Fig. 9). Likewise in 2004, Senegal was among the largest importers of air dried lumber accounting for 1,718m^3 of the total volume of 9,839m^3. By 2006 through to 2010, the volume of wood products to the ECOWAS region continued to increase with air dried lumber and plywood as the leading export products until 2011 when demand started to decline.

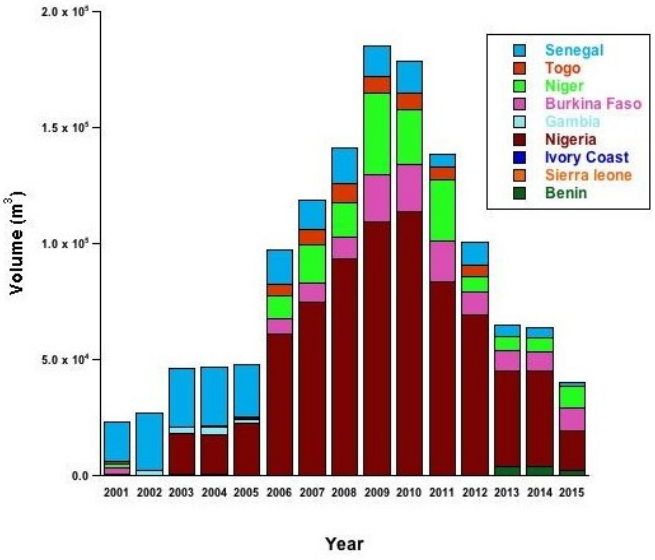

Figure 9. Leading importers of wood in the ECOWAS region

3. Conclusions

African mahogany has a high local and export demand. However, for markets in the US, EU and Asia the country has not been able to continually meet demand during the period under review. The focus of the timber industry has been to produce the same products over and over again without using innovation or researching into emerging products that are on demand by the global market. The nation's comparative advantage in the ECOWAS region for instance has the potential to improve export earnings more than ever before but there is the need to curtail exports of air dried lumber by neighbouring countries which is entirely unsustainable in the 21^{st} century. Ghana should clearly aim towards zero export of air dried lumber to increase returns. It is important to realise that this dominance in the ECOWAS sub region and other markets in Asia with less stringent measures in terms of trade in legal timber could also be a basis for Ghana to assess whether or not it is effectively controlling illegal logging.

On the world scene, though the country's sphere of influence in terms of supply of tropical timber is large, nonetheless repeated production of secondary products has also limited our market value greatly over the past decade. As at now, no attempt has been made to export wood chips for example like other competitors. There is the need to start and upscale production of different types of tertiary products for export. The country is likely to earn twice as much from the latter than from secondary products. In addition, there should be some incentive for mills that venture into production of innovative products in the phase of challenges such as dwindling forest resources, increasing cost of operations, among others.

Without a doubt, mahogany has an extensive market. The main task however is to ensure sustainable use of the resource base through value added processing. The species thrives in all the ecological zones and to meet future demand, Ghana has to vigorously work towards restocking degraded areas to increase tree density through plantation development.

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