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SOCIO-ECONOMIC ANALYSIS OF *Terminalia superba* (Engl. & Diel) SAWN WOOD IN SELECTED PLANK MARKETS IN IBADAN, OYO STATE, NIGERIA

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ABSTRACT

This study evaluated the socio-economic impact and uses of Terminalia superba in selected plank markets in Ibadan, Nigeria. The research was conducted across four purposively selected Local Government Areas (LGAs): Egbeda, Ibadan South-West, Ibadan North-West, and Oluyole. A total of 149 respondents were randomly selected, and well-structured questionnaires were administered to collect primary data. Data analysis was conducted using descriptive statistics and benefit-cost ratio (BCR) analysis. A significant proportion of respondents were middle-aged, with men (57%) being more involved in the business than women (43%). Marital status data indicated that 91.3% of the respondents were married, and the predominant age group engaged in the sawmilling business was between 31 and 40 years. The findings revealed that T. superba is predominantly utilized for roofing, medicinal purposes, furniture, molding, and paper-making in the study areas. The business plays a vital role in providing employment, enhancing local income, improving living standards, and increasing the availability of the product in the local market. The benefit-cost analysis of the T. superba business revealed a favorable BCR of 1.84, indicating

that for every ₦1 invested, an additional ₦0.87 is earned as profit, signifying a profitable venture. However, several constraints were identified, including long distances to the source of saw logs (98.6%), price fluctuations (95.3%), and poor road infrastructure leading to the forest (93.2%), all of which hindered the smooth operation of the business. The study also highlighted that T. superba contributes to sustainable forest management (SFM) by promoting reforestation and enhancing the availability of the product in local markets. Based on these findings, the study recommends that government and policymakers encourage the reafforestation of T. superba while supporting the industry through policies that promote sustainable forest management practices, skills development, and improved market access.

Keywords: *Forest product, Terminalia superba, sawn wood, socio-economic importance.*

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1. INTRODUCTION

Forests are fundamental to socio-economic development, offering essential resources such as timber, fuel, and non-timber products while simultaneously supporting environmental sustainability and community livelihoods. Their economic contributions are far-reaching, supplying wood for industries like construction, furniture, and paper production and playing a significant role in sawmilling and pulp manufacturing (Tymberlee and Nevar, 2024). In Nigeria, forest products contribute significantly to rural household incomes, accounting for approximately 20% -% 30% of the total annual income in

some regions, underscoring their importance in poverty alleviation (Aiyeloja and Ajewole, 2006). Timber, which is one of the forest products, is a vital resource for construction, carpentry, and manufacturing, and has been utilized for thousands of years. Today, wood remains a cornerstone of global forest product consumption, accounting for over half of its total usage. Timber products also contribute significantly to forest-based revenue, with the sawmill industry playing a pivotal role in Nigeria's economy (Fraser, 2019).

In Nigeria, forests are rich in diverse plant and animal species, making them invaluable for timber production. Among the notable timber species, *Terminalia superba* (commonly known as white afara) is highly valued for its wide range of applications, including construction, furniture making, and medicinal use. Its versatility extends to industries such as roofing, furniture production, and paper manufacturing, highlighting its economic importance (Alaoui *et al*., 2022). Additionally, the wood products sector contributes to carbon storage, playing a vital role in mitigating climate change (Wei *et al*., 2023). The economic significance of timber, particularly *T. superba*, is especially pronounced in Nigeria, where the sawmill industry serves as a major contributor to the national economy, generating employment and income opportunities.

T. superba is a large, deciduous tree native to Central and West Africa, including Nigeria, where it is widely used for its timber and medicinal properties. The tree's wood is highly sought after for construction, furniture, and other wood-based products. However, despite its economic importance, the sustainability of *T. superba* is threatened due to over-exploitation and habitat degradation, necessitating conservation efforts. Furthermore,

the socio-economic dynamics surrounding the marketing and distribution of *T. superba* remain poorly understood, especially in urban areas like Ibadan, where its demand is high for construction and other purposes.

In Ibadan, the socio-economic role of *T. superba* in the local sawmill industry has not been fully explored. The sawmill industry in Nigeria plays a vital role in timber production, but the sector is not without challenges, including market fluctuations, environmental concerns, and logistical issues. The study aims to investigate the socio-economic aspects of *T. superba*, focusing on its production, cost-benefit analysis, and the constraints faced by marketers in Ibadan, Oyo State. By examining these factors, this study seeks to provide insights into the economic viability of *T. superba* in the urban market, identify the challenges faced by marketers, and propose strategies for improving the sustainability and profitability of the industry. This research will contribute to a deeper understanding of the economic importance of *T. superba*, inform policy decisions on sustainable forest management, and provide recommendations to enhance the productivity and marketing of this valuable resource in Ibadan and beyond.

2. REVIEW OF LITERATURE

2.1 Introduction to *Terminalia Superba*

Terminalia superba, often referred to as "white mahogany" or "superb terminalia," is a tree species native to West and Central Africa. This highly valued tree is known for its durable and aesthetically appealing wood, which is used in furniture making, construction, and woodcarving. As global demand for African mahogany increases, concerns about its sustainability have

grown, particularly regarding the practices involved in its harvesting and trade. A socio-economic analysis of *T. superba* focuses on its role in local economies, its impact on livelihoods, and its ecological importance.

2.2 Socio-Economic Impacts and Trade of *T. Superba*

Several studies have explored the socio-economic implications of the African mahogany trade. Research by Aweto *et al.* (2015) highlights the employment opportunities created by logging and processing activities, particularly in rural areas. However, these communities often receive limited compensation, and there are calls for a more equitable distribution of benefits. In Ghana, Ogunwolu *et al.* (2018) found that the African mahogany trade significantly contributes to the GDP, with revenues from timber exports comprising a notable portion of the country's exports. However, the study also emphasizes the need for sustainable forest management practices to ensure the long-term viability of this industry.

The international trade of *T. superba* also raises concerns about its sustainability. In Germany, Kehbeis *et al.* (2019) found that importers are concerned with meeting sustainability standards, particularly through certifications like the Forest Stewardship Council (FSC). Similarly, Zhang *et al.* (2020) observed that in China, there is a strong demand for high-quality, affordable mahogany, but consumers are increasingly interested in ensuring that the timber is sourced sustainably. These trends suggest that certification schemes and sustainable sourcing practices will play critical roles in the future of the trade.

2.3 Environmental and Social Considerations

The environmental sustainability of *T. superba* has been a subject of numerous studies, particularly regarding the impacts of overharvesting. Aweto *et al.* (2015) point out that illegal logging and lack of replanting are major contributors to deforestation, while sustainable practices, such as certification and monitoring, are essential for long-term sustainability. Similarly, studies by Mowafaq *et al.* (2018) stress the importance of conservation efforts to combat the risks posed by unsustainable harvesting.

On the social front, issues such as equity in resource distribution remain a challenge. In Nigeria, Adeola *et al.* (2018) highlight the unequal compensation for local communities, leading to conflicts over land use and resource management. This calls for policies that promote a fairer distribution of benefits among stakeholders. Small-scale operators, especially in Ghana, face difficulties accessing credit and resources, further exacerbating inequalities (Kwarteng *et al.*, 2019). Addressing these disparities is key to promoting social equity and ensuring a sustainable and inclusive industry.

In conclusion, the socio-economic analysis of *T. superba* involves balancing its economic benefits with the need for sustainable environmental and social practices. Efforts to promote equitable trade, reduce illegal logging, and ensure sustainability through certification are essential for the continued viability of the species in both local and global markets.

3. RESEARCH METHODOLOGY

This study employed a descriptive survey research design, using a structured questionnaire to gather quantitative data on the socio-economic dynamics of *Terminalia superba* (afara) sawn wood in selected plank markets across Ibadan, Oyo State, Nigeria. This approach was chosen to examine patterns, trends, and economic relationships for trade, profitability, and market structure of *T. superba* sawn wood. The design is particularly useful in evaluating how various constraints shape market participation, pricing mechanisms, and the economic significance of the species. Additionally, the survey method enabled the collection of firsthand information from key stakeholders, including sawmill operators, timber traders, wood users, and other participants in the *T. superba* sawn wood value chain within the study area.

The research was conducted in the Ibadan metropolis, Oyo State, Nigeria, covering an area of 129.65 km^2. Ibadan is located in the southwestern region of Nigeria, with geographical coordinates between latitude 7°30'N and 7°40'N and longitude 3°30'E and 3°40'E. The metropolis is divided into 11 Local Government Areas (LGAs), which include both urban and semi-urban zones. The study focused on four LGAs purposively selected due to the presence of major sawmills and plank markets: Egbeda, Ibadan Northwest, Ibadan Southwest, and Oluyole. These areas were selected for their significant concentration of *T. superba* sellers. The study specifically targeted *T. superba* sellers in these LGAs, as they are engaged in the production and sale of timber derived from the species.

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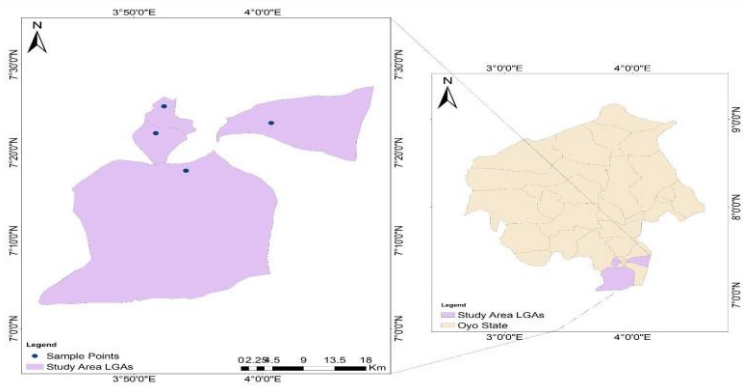

Figure 1. Map of the study area

Data was collected through the administration of 149 structured questionnaires, which were distributed to *Terminalia superba* sellers within the selected LGAs. The questionnaires gathered information on socio-economic characteristics, production activities, cost-benefit data, and challenges faced by the sellers. These questionnaires were administered through face-to-face interviews to ensure accurate responses and effective data collection. The selection of respondents was based on a sampling intensity approach, where 10% of sellers from sawmills with over 500 respondents and 5% from those with 500-1000 respondents were randomly selected. As a result, 149 respondents were chosen across the four LGAs. The sample included 22 respondents from Ibadan Northwest, 47 from Oluyole, 32 from Ibadan Southwest, and 48 from Egbeda.

The sawmills visited during the study include the Temidire Plank Market in Egbeda LGA, Osioyemi, Irepodun, and Crown Plank Markets in Ibadan Southwest LGA, Orisunbare Plank Market in

Ibadan Northwest LGA, and Aiyedade Plank Market in Oluyole LGA. These locations were selected based on their role in the distribution of *T. superba* timber within the metropolis. The data collected was analyzed using descriptive statistics, including frequency distribution and percentages. To assess the economic viability of *T. superba* businesses, financial metrics such as gross margin, total cost, net profit margin, and benefit-cost ratio were calculated as shown in equations 1, 2, 3, and 4. These calculations helped evaluate the profitability of the timber trade in the study area. The results were presented in tables and charts for clear interpretation. Qualitative data was also analyzed thematically to identify key challenges faced by the marketers in the region.

$$GM = GFI - TVC \quad \text{..... (1)}$$

$$Total\ Cost = TVC + TFC \quad \text{..... (2)}$$

$$Net\ Profit\ Margin = \frac{Net\ Income}{Total\ Revenue} \quad \text{..... (3)}$$

$$BCR = \frac{Total\ Revenue}{Total\ Cost} \quad \text{..... (4)}$$

where; GM = Gross Margin, GFI = Gross Farm Income, TVC = Total Variable Cost, TFC = Total Fixed Cost and Net Income = Total Revenue - Total Costs.

4. RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of the Respondents

The survey results present the comprehensive socio-economic characteristics of the respondents across four surveyed areas, namely New Garage, Oke Bola, Bodija, and Temidire. A total of 149 respondents participated in the survey (Table 1), and the

breakdown by gender revealed that 57% were male (85 individuals), while 43% were female (64 individuals), reflecting a male-dominated participation aligns with findings from other studies indicating a similar trend in timber-related industries, where men predominantly engage in occupations like sawmilling (Alawode *et al*., 2024). The age distribution indicates that the majority of respondents were in the 31-40 age range (27.5%), followed closely by those aged 41-50 (23.5%). A significant portion, 16.8%, were under 20 years old, and the remaining respondents were older, with 14.1% being 50 years and above. This suggests that the population involved in the business activities in these areas is largely in the middle-aged demographic aligns with trends of aging business owners in logging Khadka *et al*., 2024, with younger individuals and seniors accounting for a smaller portion. In terms of marital status, the survey revealed that 91.3% of respondents were married (136 individuals), while only a small percentage were single (4%), divorced (2.7%), or widowed (2%). This could indicate the stable family structure within the respondent pool, possibly influencing their involvement in long-term business activities. When examining educational levels, the majority (62.4%) had a secondary education, followed by those with no education (13.4%), primary education (10.8%), and tertiary education (13.4%). This highlights a relatively low level of formal higher education among respondents, which could reflect the practical nature of the work in the sawmilling and plank markets (Nomba *et al*., 2024). Regarding major occupations, sawmilling was the dominant profession, with 73.8% of respondents involved in the industry, followed by farming (12.8%), timber contracting (9.4%), and artisan work (2%). This result suggests that sawmilling is the primary

economic activity within the surveyed areas. The minor occupations also reflect significant engagement in trading (20.8%) and plank market activities (56.4%), indicating a thriving informal sector alongside sawmilling. Household size distribution shows that 53.7% of respondents lived in households of fewer than five people, while 42.9% had households ranging from 6 to 10 members. Larger households of 11 members and above were much less common, accounting for only 3.4%. This could suggest that most respondents are part of smaller, nuclear families.

However, the survey also explored how respondents entered the sawmilling and timber business. The majority (72.5%) entered the business through training, with a smaller portion inheriting their business (22.8%) or entering through other means (4.7%). This indicates that formal training and skill acquisition play a central role in the business, providing insight into the mechanisms of entry into the industry (Ridley-Elli and Sabine, 2006). In terms of work experience, a substantial portion of respondents (40.2%) had over 21 years of experience in their field, followed by 24.2% with 11-15 years of experience. This demonstrates a highly experienced workforce, with a small percentage having less than 10 years of experience. Such extensive experience could contribute to the respondents' expertise in their respective trades (Alawode *et al.*, 2024). Regarding capital sources for their business, the majority of respondents (50.3%) relied on personal savings, while 12.8% benefited from government grants, 9.4% used cooperative loans, and 7.4% accessed bank loans. This suggests a heavy reliance on personal financial resources to fund business operations with limited external support (Khadka *et al.*, 2024).

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Table 1. Socio-economic characteristics of the respondents

Socio-economic characteristics	Frequency N = 149	Percentage
Gender		
Male	85	57
Female	64	43
Age		
Below 20	25	16.8
21-30	27	18.1
31-40	41	27.5
41-50	35	23.5
50 and above	21	14.1
Marital Status		
Single	6	4
Married	136	91.3
Divorced	4	2.7
Widowed	3	2
Educational Status		
No education	20	13.4
Primary	16	10.8
Secondary	93	62.4
Tertiary	20	13.4
Major Occupation		
Farming	19	12.8
Artisan	3	2
Civil servant	3	2
Sawmilling	110	73.8
Timber Contractor	14	9.4

Minor Occupation		
Trading	31	20.8
Farming	14	9.4
Plank market	84	56.4
Others	20	13.4
Household Size		
Below 5	80	53.7
10-Jun	64	42.9
15-Nov	4	2.7
16 and above	1	0.7
How You Entered Business		
Inheritance	34	22.8
Training	108	72.5
Others	7	4.7
Years of Experience		
1-5 years	13	8.7
6-10 years	8	5.4
11-15 years	36	24.2
16-20 years	32	21.5
21 and above	60	40.2
Source of Capital for Business		
Personal Savings	75	50.3
Bank Loans	11	7.4
Cooperative Loans	14	9.4
Grants from Government	19	12.8
Personal Savings and Loans	30	20.1

4.2 Overview of Market Characteristics

The plant market in the surveyed areas is well-established (Table 2), with a significant majority (77.2%) of businesses having been in operation for over 20 years, indicating a long-standing presence and stability in the market (Ntumba *et al*., 2024). Only 6.7% of businesses are relatively new, existing for less than 5 years, suggesting that the sector has a strong foundation and has likely weathered various economic challenges. In terms of ownership, the market is predominantly private, with 94% of respondents indicating private ownership, which underscores the significant role of private individuals or entities in driving the market's activities. Non-governmental organizations own 4.7% of the businesses, and other ownership types account for just 1.3%, which highlights the minimal involvement of government or NGO sectors in the plant market. When it comes to sourcing *T. superba*, the majority of respondents (61.7%) rely on suppliers, with government forest reserves contributing to 29% of the supply and private forests accounting for 6%. This distribution suggests that suppliers play a pivotal role in the market's supply chain, while forest reserves remain an essential source, albeit a smaller portion (Ntumba *et al*., 2024).. Only 3.3% source their supply from other places, indicating limited alternative sources. The market consists of nearly an equal number of retailers (51%) and wholesalers (49%), suggesting that the plant market serves both small-scale and larger-scale businesses, offering a range of products for different buyer needs. In terms of logistics, a large majority (75.2%) of businesses rely on hired vehicles for transportation, which reflects a reliance on external transport services rather than owning vehicles. A smaller proportion of respondents

(10.1%) use owned vehicles, and 14.7% rely on other forms of transportation, indicating a level of flexibility in the movement of goods but also a potential area for improvement in terms of more streamlined logistics. Regarding tax compliance, a notable 81.9% of respondents report paying taxes, demonstrating a relatively high level of adherence to formal tax regulations. However, 18.1% do not pay taxes, suggesting that there may be informal actors in the market who do not fully comply with government tax policies.

Table 2. Market characteristics

Market characteristics	Frequency N = 149	Percentage
How long has the plant market been in existence?		
Less than 5 years	10	6.7
6 - 10 years	2	1.3
11 - 15 years	3	2
16 - 20 years	19	12.8
20 years and above	115	77.2
Means of Ownership		
Private	140	94
Government	0	0
Non-Governmental Organization	7	4.7
Others	2	1.3
Source of *Terminalia superba*		
Government Forest Reserve	43	29
Private Forest	9	6
Supplier	92	61.7
Others	5	3.3

Type of Marketer		
Retailer	76	51
Wholesaler	73	49
Means of Transportation		
Owned Vehicle	15	10.1
Hired Vehicle	112	75.2
Transporter	0	0
Others	22	14.7
Do you pay taxes?		
Yes	122	81.9
No	27	18.1

4.3 Socio-Economic Importance and Contributions of *T. Superba*

The survey results on the socio-economic importance and uses of *T. superba* reveal the substantial contributions of the plant business to the study area (Table 3). A majority of respondents (83.9%) agreed that the plant has a significant impact on the local economy, indicating that it plays an essential role in the study area. *T. superba* serves as a primary source of income for 96.0% of the respondents, similar to findings in rural Ethiopia, highlighting its crucial role in livelihood generation (Chama *et al*., 2023). Furthermore, 98.0% of respondents stated that the business provides employment opportunities, demonstrating the plant's contribution to reducing unemployment in the area, as also reported by Asigbaase *et al*. (2023). The plant's business also plays a pivotal role in improving the standard of living for 94.0% of respondents, as it likely offers better financial security and access to resources (Chama *et al*., 2023). This is further

supported by the 96.0% who agreed that the business contributes to poverty reduction in the study, suggesting that *T. superba* helps uplift the economic conditions of the local population (Ojunga *et al*., 2023). In terms of cultural significance, 75.8% of respondents acknowledged the cultural value of the plant (Kougnimon *et al*., 2015), though a smaller proportion (24.2%) did not perceive it as such. Sustainability is another important aspect, with 91.9% of respondents agreeing that the plant contributes to sustainable forest management, likely through its responsible harvesting and cultivation practices (Asigbaase *et al*., 2023). The local market supply is also heavily reliant on *T. superba*, as indicated by 89.9% of respondents who affirmed its role in meeting local demand for timber and related products.

Table 3. Socio-economic importance contributions of T. superba

Socio-economic importance	Yes	No
Significant impact of the business on the Study Area	125 (83.9)	24 (16.1)
Source of Income	143 (96.0)	6 (4.0)
Employment Opportunities	146 (98.0)	3 (2.0)
Improve Standard of Living	140 (94.0)	9 (6.0)
Poverty Reduction	143 (96.0)	6 (4.0)
Cultural Significance	113 (75.8)	36 (24.2)
Sustainable Forest Management	137 (91.9)	12 (8.1)
Local Market Supply	134 (89.9)	15 (10.1)

Note: Percentage in parenthesis

4.4 Primary Uses of *T. superba* in the Study Area

The results highlight the varied uses of *T. superba* in the study area, with a predominant preference for specific uses (Table 4). Roofing is the most common use of the timber, with 89.9% of respondents indicating they always use the wood for roofing and only 10.1% reporting occasional use. A similarly high frequency is observed for medicinal uses, with 87.9% indicating consistent use and 12.1% using it occasionally. Housing construction is another significant use, with 73.8% of respondents indicating that they always use *T. superba* for this purpose, while 26.2% use it occasionally. Furniture making sees a split, with 46.3% always using the wood, while a higher percentage, 53.7%, uses it occasionally, indicating a more flexible or seasonal demand for furniture construction. Joinery, on the other hand, is less frequently associated with the wood, with only 26.2% indicating it is used frequently for this purpose and 73.8% using it occasionally, which suggests that joinery may be a secondary use of *T. superba*. Moulding is another notable use, where 51.7% always use wood, while 46.3% use it occasionally, and a small proportion (2.0%) does not use it at all. For door posts and panels, 37.6% of respondents use wood always, and 59.7% use it occasionally, with a small percentage (2.7%) indicating they do not use it. Finally, paper-making also shows considerable use, with 67.8% of respondents using it always and 27.5% using it occasionally, but 4.7% do not use wood for paper production. This result indicates the versatility of *T. superba*, being used in several industries such as construction, furniture, and medicinal applications. The consistent use across many categories suggests that the species

plays a vital role in the local economy and daily life in the study area.

The findings highlight the critical role of *T. superba* in local industries, where its versatile applications in furniture, construction, and other wood-based products make it an invaluable resource (Jansen *et al.*, 1995; Adiji *et al.*, 2022; Ikumapayi and Olufemi, 2023).

Table 4. Uses of Terminalia superba

Uses	Always (Frequency)	Occasionally (Frequency)	Not At All (Frequency)
Roofing	134 (89.9)	15 (10.1)	0 (0.0)
Medicines	131 (87.9)	18 (12.1)	0 (0.0)
Housing Construction	110 (73.8)	39 (26.2)	0 (0.0)
Furniture	69 (46.3)	80 (53.7)	0 (0.0)
Joinery	39 (26.2)	110 (73.8)	0 (0.0)
Moulding	77 (51.7)	69 (46.3)	3 (2.0)
Door Post and Panels	56 (37.6)	89 (59.7)	4 (2.7)
Paper Making	101 (67.8)	41 (27.5)	7 (4.7)

Note: Percentage in parenthesis

4.5 Financial Analysis of *T. superba*: Benefit-Cost Overview

The benefit-cost analysis of *T. superba* reveals critical financial aspects of its production process. The variable costs amount to ₦166,453.83, which includes expenses for rent, maintenance, processing, labor, fuel, transportation, and taxes. The highest cost in the variable category is for transportation (₦74,375.00), followed by processing (₦27,500.00), highlighting the

significant operational costs tied to these activities. The total fixed costs, which are the costs incurred regardless of production levels, amount to ₦356,190.05. The most substantial fixed costs come from the machinery used in the production process, with the circular machine (₦152,500.00) and the drummer (₦100,000.00) contributing significantly to this total. The overall total cost, combining both variable and fixed costs, amounts to ₦522,643.88. However, the annual income from *T. superba* production stands at ₦960,000.00, which leads to a net profit of ₦437,356.12 after deducting the total costs. The net profit margin, which is the ratio of net profit to revenue, is 45.56%, suggesting a strong return on investment. Furthermore, the benefit-cost ratio of 1.84 indicates that for every ₦1 invested, ₦1.84 is generated in benefits, making *T. superba* a financially viable business. These results demonstrate that the production and marketing of *T. superba* have a positive financial outcome, with a healthy profit margin and benefit-cost ratio.

However, studies on the timber industry in Nigeria have consistently highlighted the profitability of timber production and sales. For instance, Adewumi and Akinyemi (2020) found a benefit-cost ratio of 1.11 in Ibadan, indicating that for every ₦1 invested, ₦1.11 is generated in benefits. Similarly, Ademola and Oladipo (2016) reported a higher benefit-cost ratio of 3.32, suggesting that each ₦1 invested 3.32 in benefits. Ogunwusi and Odebiyi (2021) further emphasized the economic viability of the timber industry, confirming that the sector demonstrates a positive benefit-cost ratio, thereby supporting its profitability. These findings collectively underscore the financial

sustainability of the timber business in Nigeria, with returns consistently surpassing initial investments.

Table 5. Benefit cost ratio of T. superba

Cost	*T. superba* (₦)
A. Variable Cost	
Rent	48,970.00
Maintenance	4,475.00
Processing	27,500.00
Labor	4,893.18
Fuel	3,497.06
Transportation	74,375.00
Taxes	2,743.59
B. Total Variable Cost (TVC)	166,453.83
Fixed Cost	
Chairs	6,071.00
Tables	7,619.05
Circular Machine	152,500.00
Drummer	100,000.00
Planner Machine	90,000.00
C. Total Fixed Cost	356,190.05
D. Total Cost (A + B)	522,643.88
E. Annual Income (Benefit)	960,000.00
F. Net Profit (E - D)	437,356.12
G. Net Profit Margin	45.56
H. Benefit-Cost Ratio	1.84

4.6 Constraints Affecting *T. Superba* Business Operations in the Study Area

The *T. superba* business in the study area faces numerous challenges that significantly impact its operations and profitability, with the distance of the source of sawlogs being one of the most severe constraints, as it increases transportation costs and delays production, with 98.6% of respondents acknowledging its critical impact (Mydlarz and Wieruszewski, 2020); similarly, irregular supply of logs is a major concern, as 85.2% of respondents report it as a severe issue that creates supply gaps, affecting market consistency and revenue generation, while price fluctuations (reported as a severe constraint by 95.3% of respondents) further complicate the business environment, making it difficult for operators to maintain stable pricing and profit margins amidst unstable market conditions; poor road infrastructure, highlighted by 93.2% of respondents as a severe constraint, exacerbates transportation difficulties, leading to delays and higher costs, while log deterioration (Akay *et al*., 2023), although considered a mild constraint by the majority (77.2%), remains a significant concern for maintaining the quality and marketability of products; storage and seasoning of wood (Mydlarz and Wieruszewski, 2020), with 28.9% considering it a severe constraint, adds another layer of complexity in maintaining wood quality, and despite high log costs (75.2% of respondents reporting it as a severe constraint), businesses are forced to navigate the increasing price of raw materials, impacting their overall profitability; additionally, high labor costs, reported by 85.2% as a severe issue, further strain business operations, particularly in labor-intensive sectors like processing and

transportation (Hernandez *et al*., 2022), while the cost of fuel and diesel for processing, cited by 91.3% of respondents as a significant constraint, directly increases operating expenses, alongside high transportation costs (81.2%), which, coupled with fuel price hikes, create a compounded financial burden on the sector; issues such as difficulty in meeting buyer needs, scarcity of the species, high maintenance costs, and deforestation, though reported as mild or moderate constraints, collectively pose further challenges to sustainability and growth, underscoring the need for efficient management strategies and long-term solutions to these persistent problems.

Table 6. Constraints affecting T. superba business operations

Constraints	Severe	Mild	Not A Constraint
Distance of Source of Saw Log	147 (98.6)	1 (0.7)	1 (0.7)
Irregular Supply of Log	127 (85.2)	22 (14.8)	0 (0.0)
Price Fluctuation	142 (95.3)	7 (4.7)	0 (0.0)
Bad Road Leading to the Forest	139 (93.2)	5 (3.4)	5 (3.4)
Log Deterioration	27 (18.1)	115 (77.2)	7 (4.7)
Storage/Seasoning of Woods	43 (28.9)	58 (38.9)	48 (32.2)
High Cost of Log from Forest	112 (75.2)	19 (12.8)	18 (12.0)
High Cost of Labor	127 (85.2)	19 (12.8)	3 (2.0)
Cost of Fuel and Diesel Processing	136 (91.3)	9 (6.0)	4 (2.7)
High Cost of Transportation	121 (81.2)	23 (15.4)	5 (3.4)
Not Meeting the Need of the Buyer	22 (14.8)	119 (79.9)	8 (5.3)
Scarcity of the Species	23 (15.4)	105 (70.5)	21 (14.1)
High Cost of Maintenance	107 (71.8)	39 (26.2)	3 (2.0)

Deforestation	95 (63.7)	49 (32.9)	5 (3.4)

5. CONCLUSION

In conclusion, this study provides a comprehensive analysis of the *T. superba* business in the study area, highlighting its significant socio-economic importance and various challenges. The findings demonstrate that the *T. superba* business plays a crucial role in the local economy by generating income, creating employment opportunities, and contributing to the improvement of living standards. The use of *T. superba* for a wide range of applications, including roofing, medicinal purposes, furniture, and construction, is vital to the community's livelihood and cultural practices, with its availability contributing to sustainable forest management and local market supply. The *T. superba* business is profitable and vital to the local economy, but challenges such as high costs, inconsistent supply, poor infrastructure, and deforestation must be addressed through collaborative efforts to ensure its growth, sustainability, and contribution to livelihoods and environmental conservation.

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