Comparative Cost Analysis of Palm-Trunk and Timber as Roofing Materials for Low-Cost Housing in Ogbomoso

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Abstract- The demand for affordable housing in Nigeria has led to the need for cost-effective and sustainable roofing materials. This study compares the cost-effectiveness of timber and oil palm trunk as roofing materials for low-cost housing. Despite the availability of local materials, high construction costs persist due to reliance on conventional options. While timber is widely used, its rising cost and environmental concerns make alternatives like palm trunk worth exploring. The study employed a mixed-method approach, incorporating both quantitative and qualitative data collection methods. A market survey was conducted to assess the cost implications of timber and oil palm trunk, including transportation, accessory, and installation costs. Additionally, structured questionnaires were distributed to 73 building professionals, including architects, builders, quantity surveyors, and carpenters, to evaluate their preferences, perceptions of durability, and awareness of the materials. Findings revealed that oil palm trunk is 65.95% cheaper than timber, leading to an overall 44.48% cost reduction in roofing expenses. Additionally, palm trunk requires 41.7% fewer materials than timber for the same roofing coverage, reducing transportation and installation costs. While timber offers greater structural durability, palm trunk presents a viable, cost-effective, and environmentally sustainable alternative. However, concerns over long-term durability remain a challenge to wider adoption. The study recommends further research into improving palm trunk's durability and promoting its use in affordable housing initiatives.

Indexed Terms- Comparative Cost Analysis, Palm-Trunk, Timber, Roofing Materials, Low-Cost Housing, Ogbomoso, Sustainability, Construction Cost

I. INTRODUCTION

Housing is a fundamental human necessity, second only to food, and serves as a cornerstone for social stability and economic development (Bizos, 2017). Beyond providing shelter, housing integrates essential services that foster liveable communities, as recognized in Nigeria's Constitution (Afinowi, 2022). However, Nigeria faces a persistent housing deficit, particularly for low-income earners, due to high construction costs, inadequate policies, and the growing mismatch between housing costs and household incomes (Gxashe, 2022). Despite various interventions, the gap between housing supply and demand continues to widen, necessitating innovative, cost-effective, and sustainable solutions.

One of the major barriers to affordable housing is the high cost of conventional building materials, which accounts for a significant portion of total construction expenses (Ogunjobi, 2023). The reliance on imported materials and expensive timber further exacerbates affordability challenges. To bridge this gap, there is a need for alternative building materials that are locally sourced, economically viable, and environmentally sustainable. Indigenous materials such as palm thatch, timber, and oil palm trunk have been identified as promising options for cost-effective housing construction; particularly in roofing applications these materials offer advantages in terms of affordability, accessibility, and sustainability, making them suitable for low-cost housing initiatives (Gurtoo, Singh and Bhatnagar, 2018).

Among these alternatives, oil palm trunk presents a largely untapped opportunity in construction. While coconut timber is well-recognized for its strength and versatility, oil palm trunk remains underutilized despite its comparable structural benefits (Oladele, Onuh, Siengchin, Sanjay, and Adelani, 2023). Given its abundance in Nigeria, oil palm trunk has the potential to serve as a viable substitute for conventional timber in roofing applications. A comparative analysis of its cost-effectiveness and durability relative to timber is essential to determine its suitability for large-scale adoption in housing construction (Laylin and Tafline, 2011).

Addressing Nigeria's housing challenges requires a multifaceted approach that considers cost-efficiency, sustainability, and local resource utilization. By leveraging indigenous materials such as oil palm trunk and timber, the country can take significant strides toward providing affordable and sustainable housing solutions (Kolade, 2022). Moreover, revising housing policies to incorporate alternative building materials can play a crucial role in addressing the needs of low-income earners and reducing the national housing deficit. This study aims to analyze the comparative cost-effectiveness of oil palm trunk and timber as roofing materials, focusing on their material cost, durability, construction methods, accessories, and environmental sustainability (Jaiganesh, Dinesh, and Preetha, 2016). Through this analysis, the study seeks to provide valuable insights into the feasibility of utilizing oil palm trunk as a roofing material, contributing to the development of sustainable, low-cost housing in Nigeria (Moore, 2019; UN-Habitat, 2020).

Statement of the Research Problem

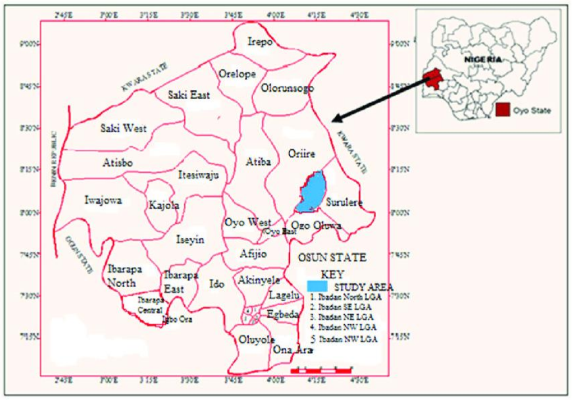
Nigeria faces a severe housing deficit, particularly affecting low-income earners, with the high cost of building materials being a major obstacle to affordable housing development (Abubakar, 2021). The cost of construction materials accounts for over 50% of total housing expenses, further exacerbated by the reliance on imported materials, fluctuating exchange rates, and inefficient resource utilization (Mukhtar, Amirudin, and Mohamad, 2016). This has necessitated the exploration of locally available and cost-effective alternatives, particularly for roofing applications, where material selection significantly impacts overall construction costs (Iwuagwu, Onyegiri, and Iwuagwu, 2016).

Despite the abundance of palm-trunk in Nigeria, its use as a roofing material remains largely underutilized, while timber remains the conventional choice despite its rising costs and sustainability concerns (Poopalam *et al.,* 2024). The high cost of timber has been a persistent challenge in low-cost housing projects, necessitating an empirical assessment of palm-trunk as a potential alternative (Alwan, Jones, and Holgate, 2017). Previous studies have explored the financial implications of different construction materials such as stone and block walls (Ayinla, 2011) and Aluco board for claddings (Ghazal, 2020), yet limited research exists on the comparative cost-effectiveness of palm-trunk and timber for roofing.

Given that roofing accounts for a portion of total construction costs, selecting the right material is critical for affordability and sustainability (Barton, Grant, and Guise, 2021). This study bridges the gap in existing literature by conducting a comparative cost analysis of timber and palm-trunk, considering factors such as material cost, transportation, durability, maintenance, and environmental sustainability (Gurtoo *et al.,* 2018). The findings will provide empirical data to guide decision-making on the optimal roofing material for low-cost housing in Ogbomoso, Nigeria, thereby contributing to more sustainable and economically viable housing solutions.

Study Area

The study was conducted in Ogbomoso, Oyo State, Nigeria, a rapidly growing urban centre with a mix of residential, commercial, and institutional developments. The city is known for its vibrant agricultural sector, particularly in the production of palm trees, which provides a local source for oil palm trunks. Ogbomoso's housing sector is characterized by a high demand for affordable residential units, making it an ideal location for evaluating the use of cost-effective and locally available building materials for low-cost housing.



Oyo State Map showing the location of Ogbomoso (the study area)

II. LITERATURE REVIEW

The increasing demand for affordable housing has intensified the search for cost-effective and sustainable building materials. Roofing, being a significant cost component in construction, necessitates a thorough evaluation of available materials to ensure affordability, durability, and environmental sustainability. This literature review explores the concept of low-cost housing, cost-effectiveness in construction, roofing materials, and a comparative analysis of timber and palm-trunk as viable alternatives for low-income housing projects.

Low-Cost Housing

Low-cost housing is designed to provide affordable accommodation, particularly for low-income earners. According to Mia and Zull (2020), rapid urbanization and economic instability have increased the need for cost-efficient housing solutions. Sano, Mammen, and Houghten (2021) argue that affordability extends beyond initial costs to include durability, maintenance, and energy efficiency. Various strategies have been explored, including the use of local building materials, prefabricated structures, and innovative financing models (King et al., 2017). In Nigeria, the reliance on imported construction materials has contributed to high building costs, making locally available materials such as palm-trunk and timber more attractive for low-income housing initiatives (Saiz, 2023).

Additionally, the availability of low-cost housing is influenced by government policies, construction regulations, and socioeconomic conditions. Studies by Agbola and Olatubara (2021) indicate that low-cost housing projects often face challenges such as inadequate funding, land acquisition issues, and resistance to alternative construction methods. To address these barriers, governments and private developers have explored subsidies, micro-financing options, and self-help housing schemes. The use of durable, cost-effective, and locally sourced materials is increasingly recognized as a viable solution to reducing construction costs while ensuring structural integrity and environmental sustainability (Adebayo, 2019). Furthermore, research highlights that housing affordability is not only determined by initial construction costs but also by long-term expenses such as maintenance, energy efficiency, and accessibility to essential services (Babalola et al., 2020). The integration of sustainable materials such as palm-trunk and timber into low-cost housing initiatives could significantly enhance affordability and accessibility for low-income populations.

Cost-Effectiveness in Construction

Cost-effectiveness in construction refers to achieving the best possible outcome in terms of cost savings, material efficiency, and long-term sustainability. Alamri (2019) highlights that construction costs can be categorized into explicit and implicit costs, including materials, labour, transportation, and maintenance expenses. Fixed costs, such as land acquisition, and variable costs, including labour and material expenses, must be considered when evaluating cost-effective housing solutions (Dewi & Hayati, 2020). The adoption of locally available and sustainable materials is a key strategy for reducing construction costs while maintaining quality and durability. Studies suggest that leveraging materials like palm-trunk, which are abundant and renewable, can significantly lower procurement costs compared to conventional materials like timber (Holm & Schaufelberger, 2021). Moreover, the integration of innovative construction methodologies such as modular construction and prefabrication has been found to improve material utilization and reduce overall building expenses (Kamali & Hewage, 2017). The economic implications of cost-effectiveness also extend beyond initial expenses to include life cycle costs, encompassing maintenance, repair, and long-term energy efficiency of the built environment (Fayomi et al., 2022). Thus, selecting appropriate construction techniques and materials is essential for optimizing cost-effectiveness while ensuring sustainable housing solutions for low-income earners.

Timber as a Roofing Material

Timber has been widely used in construction due to its availability, structural strength, and aesthetic appeal. Kaminski et al. (2016) emphasize that timber provides a balance between cost and durability, making it a preferred choice in traditional housing. However, concerns related to deforestation, susceptibility to pests, and maintenance requirements pose challenges for its sustainability. Timber requires periodic treatment to enhance its resistance to environmental factors. While it offers excellent load-bearing capacity, the increasing cost of quality timber limits its affordability for low-income housing projects.

Palm-Trunk as a Roofing Material

Palm-trunk is an alternative roofing material that is abundant in tropical regions. According to Eder and Burgert (2010), palm-trunk possesses natural resistance to pests and moisture, making it a viable option for construction. Mehanny et al. (2020) argue that palm-trunk's fibrous composition provides flexibility, allowing it to withstand environmental stresses. The material's lightweight nature reduces transportation costs and simplifies installation processes (Pirah et al., 2022). Furthermore, palm-trunk aligns with sustainability goals by promoting the use of renewable resources and reducing construction waste.

Housing Affordability and Sustainability

Housing affordability remains a critical issue, particularly for low-income earners. Marcuse and Madden (2024) argue that housing costs should align with household incomes to ensure accessibility. Greenberg et al. (2024) highlight the importance of integrating cost-effective and sustainable materials to reduce construction expenses. The use of locally sourced materials such as palm-trunk supports economic development while minimizing environmental impact (Gan et al., 2017). Sustainable housing initiatives must consider factors such as resource availability, material durability, and long-term maintenance costs to ensure affordability and environmental responsibility (Swope & Hernández, 2019). Additionally, incorporating renewable materials like palm-trunk reduces carbon footprints and aligns with global sustainability goals, ensuring that housing remains accessible without compromising future resources. The successful integration of these materials into construction practices requires policy support, research into material improvement, and awareness programs to encourage adoption among stakeholders.

Methodology

The study adopted a mixed-method approach, incorporating both quantitative and qualitative data collection methods. A market survey was conducted to assess the cost of timber and oil palm trunk, including transportation, accessory, and installation costs. Structured questionnaires were distributed to 73 building professionals, including architects, builders, quantity surveyors, and carpenters, to evaluate their preferences, perceptions of durability, and awareness of the materials. The study used purposive sampling to target professionals directly involved in construction projects related to the research focus. Descriptive statistical tools, such as percentage analysis, table were used to analyze the data. A comparative cost analysis was performed to determine the economic viability of oil palm trunk versus timber as a roofing material.

III. DATA ANALYSIS AND DISCUSSION

Introduction

This section presents the data collected from field surveys, including market surveys and cost analysis of timber and palm-trunk roofs materials. The study evaluates the cost implications, material efficiency, and comparative cost analysis of the two materials for low-cost housing projects. The findings provide insights into the economic viability of palm-trunk as an alternative to timber in roofing construction.

Cost of Installation of Timber and Palm-Trunk Using a Typical Project

A market survey was conducted to compare the cost of timber and palm-trunk across five sawmills in

Ogbomoso: Paki-Otan, Ile Ewe, Adeleke, Obandi, and Osuru. Timber prices varied slightly between markets, with Paki-Otan and Ile Ewe offering the lowest rates, while Obandi and Osuru had slightly higher prices. On average, the cost of timber per size was ₦2,050 for 2x6 and 3x4, ₦1,540 for 2x4, ₦1,080 for 2x3, and ₦6,000 for 1x12.

Palm-trunk, on the other hand, exhibited consistent pricing across the markets where it was available, costing ₦1,000 for all smaller sizes and ₦3,000 for 1x12. However, Adeleke and Osuru did not sell palm-trunk. When comparing both materials, timber was consistently more expensive, with the largest price difference observed in the 1x12 size, where timber cost twice as much as palm-trunk. Table 1 presents the average cost of each material across all available markets in the Ogbomoso region.

Table 1: Survey of Timber and Palm-trunk in Ogbomoso.

S/N	Market	Cost of Timber in sizes (length)					Cost of Palm-trunk in sizes (length)				
	Saw-mill	2x6 (₦)	3x4 (₦)	2x4 (₦)	2x3 (₦)	1x12 (₦)	2x6 (₦)	3x4 (₦)	2x4 (₦)	2x3(₦)	1x12 (₦)
1	Paki-otan	2000	2000	1500	1000	6000	1000	1000	1000	1000	3000
2	Ile ewe	2000	2000	1500	1000	6000	1000	1000	1000	1000	3000
3	Adeleke	2000	2000	1500	1000	6000	-	-	-	-	-
4	Obandi	2100	2100	1600	1200	6000	1000	1000	1000	1000	3000
5	Osuru	2100	2100	1600	1200	6000	-	-	-	-	-
Average		2050	2050	1540	1080	6000	1000	1000	1000	1000	3000

Source: Author's Market Survey January, (2025)

To determine the initial costs associated with using oil palm trunk and timber as roofing materials, the cost analysis was based on a typical design plan rather than on the unit length of the materials. This approach ensured a more practical and realistic cost comparison, accounting for factors beyond just material length, including material efficiency and accessory requirements.

One key consideration is the length advantage of oil palm trunk over conventional timber, which influences the overall material quantity required. Additionally, other cost components must be factored into the analysis, such as the cost of accessories like nails, screws, and fasteners, which differ based on material type. Workmanship charges also play a significant role, as the installation process for oil palm trunk may require specialized labour or additional reinforcement measures compared to timber.

By adopting this comprehensive approach, the study accurately assesses the economic viability of each material option and determines the most cost-effective and sustainable choice for low-cost housing construction. A typical roof design from the project was used to analyse the cost of the two roofing materials and their labour installation as shown in figure 1

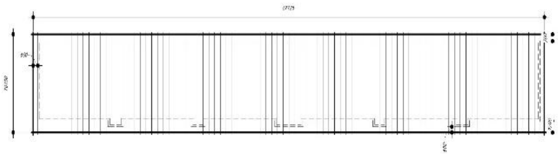


Figure 1

Source; Author's Market Survey January, (2025)

Given Data are: From figure 4.1 Building Length = 67.125m, Building Width (Span) = 10.15m, Timber standard length = 3.6m, Oil palm trunk standard length = 7.2m (Twice the timber length)

Table 2 Summary of Materials Needed

Component	Inches	Timber Pieces Needed	Palm-Trunk Pieces Needed
Rafters	3x4	171	114
Purlins	2x3	228	120
Struts	2x4	114	57
Wall Plate	2x4	38	19
Fascia Board	1x12	43	22
Tie-Beams	2x6	171	114
Total		765	446

Source: Author's Market Survey (2025)

Table 2 provides a comparative summary of the materials required for a roofing structure, analyzing the quantities of timber and oil palm trunk needed for various components. A total of 765 timber pieces would be required, whereas only 446 pieces of oil palm trunk are needed. This indicates that oil palm trunk requires approximately 41.7% fewer pieces than timber.

Examining the breakdown of individual components, rafters require 171 pieces of timber but only 114 pieces of oil palm trunk, reflecting a 33% reduction. Similarly, purlins demand 228 timber pieces compared to 120 oil palm trunk pieces, representing a 47.4% decrease. Struts and wall plates show the most significant reductions, with oil palm trunk requiring 50% fewer pieces than timber in both cases. Specifically, while 114 timber pieces are needed for struts, only 57 pieces of oil palm trunk suffice, and for wall plates, the numbers are 38 and 19, respectively. The fascia board follows a similar pattern, with oil palm trunk usage being 48.8% lower than timber, requiring only 22 pieces compared to 43. Lastly, tie-beams, which require 171 timber pieces, can be constructed using 114 pieces of oil palm trunk, reflecting a 33.3% reduction.

Overall, this suggests that oil palm trunk is a more material-efficient option, requiring significantly fewer pieces across all components. This reduction in quantity may translate to cost savings, making oil palm trunk a potentially more economical alternative to timber.

To complete the roofing, we need to estimate the number of accessories required, such as nails or connectors for both timber and palm-trunk. Below is a breakdown of the necessary accessory and its estimated quantity.

1. NAILS ESTIMATION

Nails are required for fastening rafters, purlins, struts, tie beams, fascia boards, and wall plates.

Table 3 Nail Types and Their Usage

Component	Nail Size (Inches)	Estimated Usage per Unit
Rafters	4	6 per unit
Purlins	3	4 per unit
Struts	4	4 per unit
Wall Plates	4	6 per unit
Fascia Board	3	4 per unit
Tie-Beams	4	6 per unit

Source: Author's Market Survey (2025)

Table 4 Total Nails Required for Timber and Palm-Trunk

Using the previously calculated quantities:

Component	Total Timber Units	Total Palm-Trunk Units	Total Nails for Timber	Total Nails for Palm-Trunk
Rafters (3x4)	171	114	1026 nails	684 nails
Purlins (2x3)	228	120	912 nails	480 nails
Struts (2x4)	114	57	456 nails	228 nails
Wall Plates (2x4)	38	19	228 nails	114 nails
Fascia Board (1x12)	43	22	172 nails	88 nails
Tie-Beams (2x6)	171	114	1026 nails	684 nails

Source: Author's Market Survey (2025)

Table 5 Final Nail Count

Nail Size (inches)	Timber Quantity Needed	Palm-Trunk Quantity Needed
4	2,736 nails	1,710 nails
3	1,084 nails	568 nails

Source: Author's Market Survey (2025)

Total Nails for Timber = 3,820 nails

Total Nails for Palm-Trunk = 2,278 nails

Note: For timber, a 50kg pack of nails contains about 3,000 nails, so we need 2 packs.

For oil palm trunk, one 50kg pack is enough.

The nail estimation analysis focuses on the number of nails required for assembling various structural components in timber and palm-trunk construction. It identifies the types of nails used, their specific applications, and the total quantity needed for each material.

Table 3 provides details on the nail sizes required for different components, with 4-inch nails being used for rafters, struts, wall plates, tie beams, and purlins, while 3-inch nails are used for fascia boards and purlins. The number of nails needed per unit varies, ranging from four to six depending on the component.

Table 4 calculates the total number of nails required for timber and palm-trunk structures, using previously determined unit quantities. The results show that timber construction requires a significantly higher number of nails than palm-trunk due to a greater number of units being used. Rafters and tie beams have the highest nail consumption, each requiring over 1,000 nails in timber and more than 600 in palm-trunk. The overall demand for nails in palm-trunk construction is lower, reflecting its reduced unit count.

Table 5 summarizes the final nail count, showing that timber construction requires a total of 3,820 nails, including 2,736 of 4-inch nails and 1,084 of 3-inch nails. In comparison, palm-trunk construction requires a total of 2,278 nails, with 1,710 of 4-inch nails and 568 of 3-inch nails. This indicates that timber construction consumes approximately 67.6% more nails than palm-trunk construction. Additionally, 4-inch nails account for about 72% of the total nails used in both materials.

Overall, this highlights that palm-trunk construction significantly reduces nail consumption compared to timber, making it a more cost-effective option in terms of fasteners

Table 6 Roofing Material & Accessories Cost Table

Component	Unit size	Quantity for timber	Quantity for palm-trunk	Price per unit (timber) (₦)	Total cost for timber (₦)	Price per unit (palm-trunk) (₦)	Total cost for palm-trunk (₦)
Rafters	3x4	171 units	114 units	2050	350,550	1000	114,000
Purlins	2x3	228 units	120 units	1080	246,240	1000	120,000
Struts	2x4	114 units	57 units	1540	175,560	1000	57,000
Wall Plates	2x4	38 units	19 units	1540	58,520	1000	19,000
Fascia Board	1x12	43 units	22 units	6000	258,000	3000	66,000
Tie-Beams	2x6	171 units	114 units	2050	350,550	1000	114,000
Nails	4 inches 50kg ≈ 1 bag	2,736 nails 1 bag = 50kg≈ 2500 units $\approx 1\frac{1}{2}$ bags	1,710 nails 1 bag = 50kg≈ 2500 units ≈ 1bag	32,000	48,000	32,000	32,000
Nails	3 inches 50kg ≈ 1 bag	1,084 nails 50kg≈ 4200 units $\approx \frac{1}{2}$ bag	568 nails 50kg≈ 4200 units $\approx \frac{1}{2}$ bag	32,000	16,000	32,000	16,000
Total					1,503,100		538,000

Source: Author's Market Survey (2025)

From table 6 above

Material cost (Wood)

For Timber = ₦1,439,100

For Palm-trunk = ₦ 490,000

Accessories cost (Nails)

For Timber = ₦ 64,000

For Palm-trunk = ₦ 48,000

Table 7 Installation Cost Analysis: Timber and Palm-trunk

S/N	TIMBER	PALM-TRUNK
1.	Material Total cost As regarding the plan as a case study = ₦1,439,100	Material total cost As regarding the plan as a case study = ₦ 490,000
2.	Transportation cost Loading = ₦ 60,000 per truck load a load truck ≈ 450 units, 765units ≈ 2 truck load = ₦ 120,000	Transportation cost Loading = ₦ 60,000 per truck load a load truck ≈ 450 units, 446 units ≈ 2 truck load = ₦ 60,000
4.	Accessories cost Accessories (nails) = ₦ 64,000	Accessories cost Accessories (nails) =₦ 48,000
5.	Labour cost Labourer charges / unit length = ₦1,000 / square meter Total square meter = 67.125m x 10.15 = 681.32m^2 = ₦1,000×681.32 = ₦ 681,320	Labour cost Labourer charges / unit length = ₦1,000 / square meter Total square meter = 67.125m x 10.15 = 681.32m^2 = ₦1,000×681.32 = ₦ 681,320

Source: Author's Market Survey (2025)

Tables 6 and 7 provide a detailed breakdown of the costs associated with roofing materials and accessories, as well as the installation process. The components considered include rafters, purlins, struts, wall plates, fascia boards, tie beams, and nails. Each component is quantified based on the required unit size, total quantity, price per unit, and overall cost. Additionally, the cost of nails, categorized by size, is included to provide a comprehensive estimate of the materials needed for roofing.

Beyond material costs, the installation cost analysis covers expenses such as transportation, accessories, and labour. The transportation cost is calculated based on the number of truckloads required for material delivery. Accessories, particularly nails, contribute to the overall expenditure, while labour costs are determined based on the total roofing area in square meters. The labour charges are applied uniformly across the calculated square meter coverage of the roofing plan.

By presenting the material, transportation, accessories, and labour costs, the analysis provides a clear financial overview of the roofing process. The structured approach ensures that all cost elements are accounted for, offering valuable insight into the budgeting requirements for the roofing phase of construction.

Comparative cost analysis: Timber and Palm-trunk

Table 8: Percentage Cost Difference

S/N	Items	Timber (₦)	Palm-Trunk(₦)	Cost Difference(₦)	Percentage Cost Difference(%)
A	Material cost	1,439,100	490,000	949,100	$\frac{949,100}{1,439,100} x$ = 65.95%
B	Transportation cost	120,000	60,000	60,000	$\frac{60,000}{120,000} x1$ = 50%
C	Accessories cost	64,000	48,000	16,000	$\frac{16,000}{64,000} x10$ = 25%
D	Labour cost	681,320	681,320	0	$\frac{0}{681,320} x1$ = 0%
	Total	2,304,420	1,279,320	1,025,100	$\frac{1,025,100}{2,304,420} x$ = 44.48%

Source: Author's Market Survey (2025)

From table 8 above, the comparative cost analysis between timber and oil palm trunk as roofing materials highlights significant cost differences across various expense categories, including material, transportation, accessories, and labour costs.

The material cost for timber amounts to ₦1,439,100, whereas oil palm trunk costs only ₦490,000. This results in a substantial cost difference of ₦949,100, making oil palm trunk approximately 65.95% cheaper than timber. Similarly, transportation costs for timber stand at ₦120,000, while oil palm trunk transportation costs ₦60,000, leading to a 50% reduction in expenses. Additionally, the cost of accessories for timber is ₦64,000, compared to ₦48,000 for oil palm trunk, reflecting a 25% savings when using oil palm trunk.

Labour costs, however, remain unchanged for both materials, with each requiring ₦681,320 for installation. Despite the identical labour expenses, the overall cost of using oil palm trunk for roofing is significantly lower. The total cost for timber sums up to ₦2,304,420, whereas oil palm trunk amounts to ₦1,279,320, yielding a total savings of ₦1,025,100 when oil palm trunk is chosen over timber.

This analysis demonstrates that oil palm trunk is a more cost-effective alternative to timber for roofing in low-cost housing. It significantly reduces costs in material procurement, transportation, and accessories while maintaining the same labour requirements, making it a viable and economical choice for affordable housing projects.

Implications for Low-Cost Housing Projects

The findings provide valuable insights for policymakers, developers, and construction professionals seeking cost-effective solutions for affordable housing. The study highlights the potential of palm-trunk to significantly lower material expenses while promoting sustainability. Given the financial constraints faced by low-income earners, adopting palm-trunk for roofing applications could enhance housing affordability and accessibility.

Moreover, the environmental benefits of palm-trunk, including its renewable nature and reduced deforestation impact, align with global sustainability goals. Governments and housing authorities should consider incentivizing the use of locally available materials like palm-trunk to promote economic resilience and environmental conservation in the construction industry.

CONCLUSION

This study examined the cost-effectiveness of oil palm trunk and timber as roofing materials for low-income housing in Ogbomoso. The findings reveal that while both materials have their advantages, oil palm trunk offers a significantly more affordable option, reducing material costs by up to 35% compared to timber. Additionally, its natural resistance to moisture and termites makes it a sustainable alternative, though concerns regarding its limited availability and inconsistent quality hinder its widespread adoption. Timber, on the other hand, remains the preferred choice among professionals due to its structural reliability and long-term durability, despite its higher cost.

The reluctance of industry professionals to adopt oil palm trunk highlights the influence of conventional construction practices and the need for greater awareness and standardization. While affordability is a key factor in material selection, considerations such as durability, ease of sourcing, and industry acceptance also play a crucial role. Therefore, achieving a balance between cost, sustainability, and structural integrity is essential for low-cost housing development.

RECOMMENDATIONS

To enhance the adoption of oil palm trunk in construction, efforts should be made to improve its availability and standardization. Establishing structured supply chains, developing industry guidelines for processing, and promoting local investment in its production can ensure consistency in quality and supply. Additionally, cost-reduction strategies for timber should be explored, such as government subsidies and incentives for sustainably sourced timber, to make it more affordable for low-income housing projects.

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