Utilization and Marketing of Bamboo (Bambusa Vulgaris) in Ado-Ekiti Local Government Area of Ekiti State, Nigeria

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ABSTRACT

The study was carried out to determine the utilization and marketing gross margin of *Bambusa vulgaris,* while examining the constraints militating against its marketing. This is with a view to determining its economic values in Ekiti State, Nigeria, and providing baseline information for increased profit generation. Data were collected through the administration of a semi-structured questionnaire and interviews of 45 marketers of bamboo selected using the snowball sampling technique in the study area. The data collected were analyzed using descriptive statistics and Gross Margin (GM). The majority (37.8%) of the marketers were between 41 and 50 years, while the least percentage of 6.7% were above 70 years of age. For gender, 95.6% of the respondents involved in the bamboo marketing were male, while the percentage of females was 4.4%. The highest percentage (57.8%) of respondents had secondary school education, followed by primary school education, with 28.9%, and the least was tertiary education with 13.3%. Skills acquisition is through informal training, with 100%. Bamboo was mostly utilized for building construction (scaffolding, pillar support, decking, roofing, frame for doors and windows) with 100%, followed by yam staking with 46.7%, and the least utilization was for ladders with 33.3%. Marketing channel revealed five stages of marketers, from the farmers to the final consumers, while the categories of bamboo marketers are grouped into middlemen, wholesalers, and retailers**.** Non-availability ranked highest with 100% as the factor influencing bamboo price in the study area, followed by demand with 88.9%, while the least was cost of production with 22.2%. The Average Gross Margin per annum for each marketer was ₦613,604.89. It was thereby suggested that there is a need to engage in massive plantation of bamboo to ensure its availability all year round. Furthermore, there is a need for a central market for bamboo to reduce the involvement of middlemen at all stages and increase its profitability.

Keywords: Bamboo (*Bambusa vulgaris*), Marketing, Utilization

INTRODUCTION

Background of the study

Bamboo is a drought-tolerant, evergreen, perennial woody plant that belongs to the grass family, Poaceae. It is an important non-timber forest product (NTFP) which occurs in a wide variety of climatic and edaphic conditions. It is one of the fastest-growing plant species in the world, which can be raised easily, quickly, and substantially harvested in a three to five-year cycle (Mishra, 2015). It is a highly versatile plant that has been utilized for various purposes in many cultures and countries around the world. Bamboo species are considered a good alternative to wood, owing to their superior physical and mechanical strength properties (Li, 2004). The bamboo plant appears to be very important among plant species. In consonance with the Food and Agriculture Organization - FAO (2005), bamboo is rated to be one of the most important non-wood forest products, which is popularly known as '*the poor man's timber'* in India.

In China, according to FAO (2005), bamboo remains one of the valuable raw materials for the booming bamboo industry. Bamboo has a diverse, wide range of anatomical, structural, and chemical properties. In terms of technology and commercial viability, not only can bamboo substitute wood, but also plastics, steel, cement, and composite materials in structural and product applications. Scientific and engineering skills have

improved bamboo use in many ways. It also plays a key role in the hydrological cycle, soil conservation, and preservation of biodiversity (Smith *et al.,* 2015).

Bamboo plants can remain green for up to 75 years, and are available in large quantities in natural vegetation in Nigeria. Virtually most states, especially the southern and middle belt, can produce bamboo in commercial quantity through bamboo farming since most species of Bamboo thrive in soils that are unsuitable for crop production (Durga *et al.,* 2019). According to Ogunwusi and Onwualu 2013), up to five indigenous species of bamboos can be found in Nigeria, the most common among them is *Bambusa vulgaris*. Other species in Nigeria include *Bambusa arundinacea, Bambusa tulda, Dendrocalamus giganteus,* and *Oxynanthera abyssinica.* Bamboo has enormous potential for national and international trade, as well as for environmental and economic growth. It offers significant advantages to low-income rural communities with little access to investment capital or technology and alleviates poverty (Phimmachanh *et al.,* 2015). It is envisaged that bamboo can be a significant means for sustainable and widespread development, augmenting economic opportunities, income, and employment, especially in relatively underdeveloped areas of the world.

Bamboo is exceptionally valuable and has often been substituted for wood, bamboo-based panels, and boards, and may successfully substitute for hardwood products (Li, 2004; FAO, 2005). However, the use of bamboo in Nigeria has been limited due to a lack of infrastructure and support for bamboo cultivation, limiting its all-year-round availability, which has posed challenges to its marketing and utilization. Access to adequate resources, such as land, water, and appropriate technology, has also hindered the ability of farmers to successfully cultivate bamboo (Sanni-Anibire and Oluwajobi, 2022). Consequently, its marketing and utilization are therefore faced with non-availability throughout the year (Ogunwusi and Onwualu, 2013). According to Sahoo *et al.,* (2018), the effective market strategies for bamboo products are also hindered by insufficient market research and data on consumer preferences and trends.

Hence, it is imperative to carry out research on the marketing of bamboo, including its potential uses, to promote bamboo marketability and bring about government policies and programs that support its utilization and marketing. Therefore, this study was conducted to: i. identify the uses of bamboo, ii. determine the marketing channel of bamboo, iii. examine the factors influencing the price of bamboo, and iv. evaluate the profitability of bamboo marketing in the study area. Hence, conducting comprehensive market studies and gathering relevant data can guide bamboo marketers in aligning their products with market demands (Sahoo *et al.*, 2018).

METHODOLOGY

Study Area

This study was carried out in Ado-Ekiti Local Government Area (LGA) of Ekiti State. Ekiti State is one of the thirty-six states in Nigeria. The State is situated in the rain forest zone of the South Western part of the country on a latitude 705' and 805' North of the equator and longitude 4°5'and 5°5' East of the Greenwich Meridian. The state is bounded in the north by Kwara State, in the northeast by Kogi State, in the west by Osun State, and in the south and southeast by Ondo State. Ekiti State has sixteen local government areas (Oluwatade *et al.,* 2023) and covers an area of 6353 km2. The vegetation pattern across the state varies with the climate and rainfall. The state enjoys a tropical climate with two distinct seasons: the rainy season (April-October) and the dry season (November-March). Temperature ranges from 21 °C to 34 °C throughout the year, with an average relative humidity of 60% - 85%. The mean annual rainfall in the southern part of the state ranges from 1500 mm to 1800 mm, and in the northern part from 1200 mm to 1400 mm. Tropical rainforest exists in the south of the state, while guinea savannah predominates in the northern peripheries. This study was carried out in Ado-Ekiti Local Government Area (LGA) of Ekiti State. Ekiti State is one of the thirty-six states in Nigeria. The State is situated in the rain forest zone of the South Western part of the country on a latitude 705' and 805' North of the equator and longitude 4°5'and 5°5' East of the Greenwich Meridian. The state is bounded in the north by Kwara State, in the northeast by Kogi State, in the west by Osun State, and in the south and southeast by Ondo State. Ekiti State has sixteen local government areas (Oluwatade *et al.,* 2023) and covers an area of 6353 km2. The vegetation pattern across the state varies with the climate and rainfall. The state enjoys a tropical climate with two distinct seasons: the rainy season (April-October) and the dry season (November-

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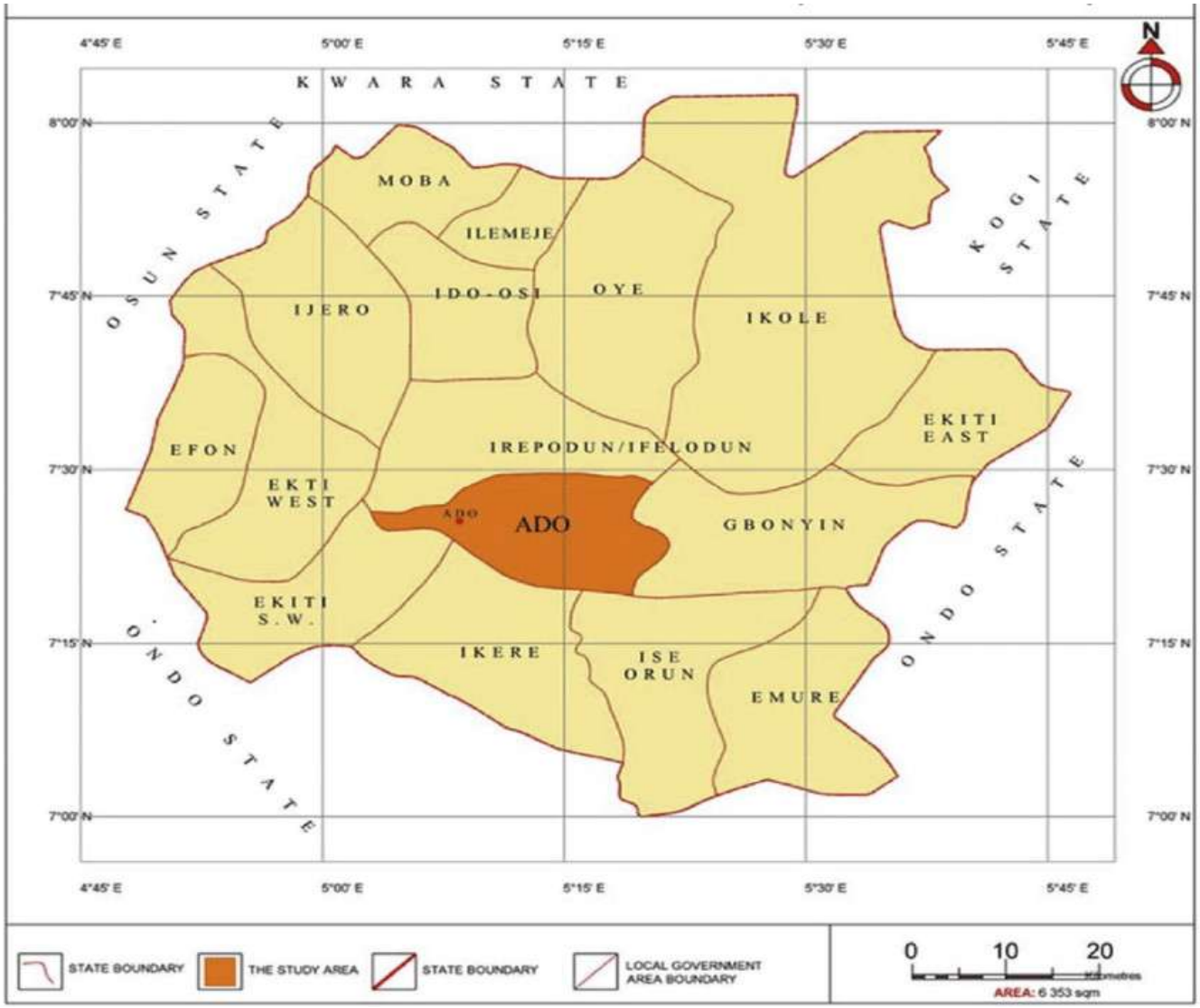

Figure 1: Map of Ekiti State, Nigeria, showing the study area.

Sampling Procedure

The snowball sampling procedure was used to select marketers of bamboo in the study area. This is because the marketers of bamboo do not have an association or a central market where bamboo is sold in Ekiti State. The use of the snowball method is such that a marketer of bamboo introduces another marketer in the LGA studied. Thus, a total of 45 bamboo marketers were sampled for the study.

Data Collection and Analysis

Data were collected through the use of a semi-structured questionnaire and interview. Data were collected on respondents' demographic characteristics. Marketing information such as sources of bamboo, quantity sold, cost of purchase and selling price, sources of investment fund, factors affecting the profitability of bamboo, and problems militating against the marketing of bamboo were also collected.

Data Analysis

The data collected were analyzed using descriptive statistics, option ranking and gross margin.

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Gross Margin and Gross Margin Ratio (GMR).

The profitability of bamboo marketing was determined using Gross Margin and Gross Margin Ratio (GMR). GMR is the ratio of gross profit to revenue. It is a marketing profitability ratio measuring the proportion of market revenue that is converted into gross profit (Lento and Sayed, 2015). The formula for Market GMR is expressed below:

$$GMR = TR - TVC/TR \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (i)$$

$$TR = P * Q$$

$$TVC = P * X1 + P * X2 + \ldots P * Xn$$

$$GMR = P * Q - \frac{(P * X1 + P * X2 + \ldots P * Xn)}{P * Q}$$

Where: GMR = Gross margin ratios

TR = Total revenue

TVC = Total variable cost

P = Price

Q = Quantity sold;

X = Marketing inputs (transportation, storage, packaging)

Percentage mention.

The percentage mention as used by Arowosoge (2017) was used to rank factors affecting the price of bamboo in the study area

% mention is as stated below:

$$\frac{NTVM}{NIC} X \frac{100}{1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (ii)$$

Where: NTVM = No of times a variable was mentioned

NIC = No of interviews conducted

Option Ranking of Constraints Militating against the Marketing of Bamboo

The problems hindering the marketing of bamboo were identified using option ranking. The number of respondents for each constraint was multiplied by its assigned weight, and this was expressed as a percentage of the maximum possible score. For the six constraint options, respondents rated each constraint from 1 to 6 in order of increasing importance, and zero for a non-applicable constraint.

The analysis of the ranking involves summing the product of the number of respondents for each constraint by the weight given, and this was expressed as a percentage of the maximum score points. The maximum score point is calculated as the product of the number of respondents and the highest possible points a constraint can attain. The constraint with the highest percentage score is regarded as the primary problem, rather than those with lower percentages. This approach, used by Arowosoge and Tee (2010), was adapted from Popoola and Galaudu (2000) and is outlined as follows:

Option ranking =

$$\sum_{k=0}^{n} \frac{FSi}{nSM} X \frac{100}{1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (iv)$$

Where F = Frequency of respondents with the same score for a constraint

Si = Respondent's score for a constraint, and it ranges from 1 to 6

nSM = Product of the number of respondents interviewed and the maximum score point of a constraint

RESULTS

Socio-economic characteristics of the Bamboo marketers in the study area

The socio-economic characteristics of the respondents are presented in Table 1. The highest percentage (37.8%) of the respondents were 41-50 years of age, followed by those between 51-60 years (22.2%), while the least (6.7%) were above 70 years. The results showed that the majority (88.9%) of the marketers were male, while 11.1% were female; 86.7% were married, and 13.3 % were widowed. The study also revealed that the majority (57.8%) of the respondents had secondary education, followed by marketers who had primary education with 28.9 %; those with tertiary education are 13.33%. The skills acquisition revealed that the majority (100%) of the marketers had informal training.

For experience in bamboo marketing, the majority (68.9%) of the marketers had 6-10 years of experience in bamboo marketing, while others (31.1%) had experience of between 1-5 years (Figure 2). Furthermore, the majority (62.3%) of the marketers in the study area had household size between 6-10, followed by marketers who had household size of 1-5, with 33.3% while the least (4.4%) had household size that was between 11-15 (Figure 3).

Table 1: Socio-economic characteristics of the Bamboo marketers in the study area

Variable	Frequency (n=45)	Percentage (%)
Age (years)		
Below 30	4	8.9
31 – 40	5	11.1
41 – 50	17	37.8
51 – 60	10	22.2
61 – 70	6	13.3
Above 70	3	6.7
Gender		
Male	40	88.9
Female	5	11.1
Marital Status		
Married	39	86.7
Widowed	6	13.3
Level of Education		
Primary	13	28.9
Secondary	26	57.8
Tertiary	6	13.3
Skill Acquisition		
Informal	45	100
Formal	-	-

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n = number of respondents interviewed

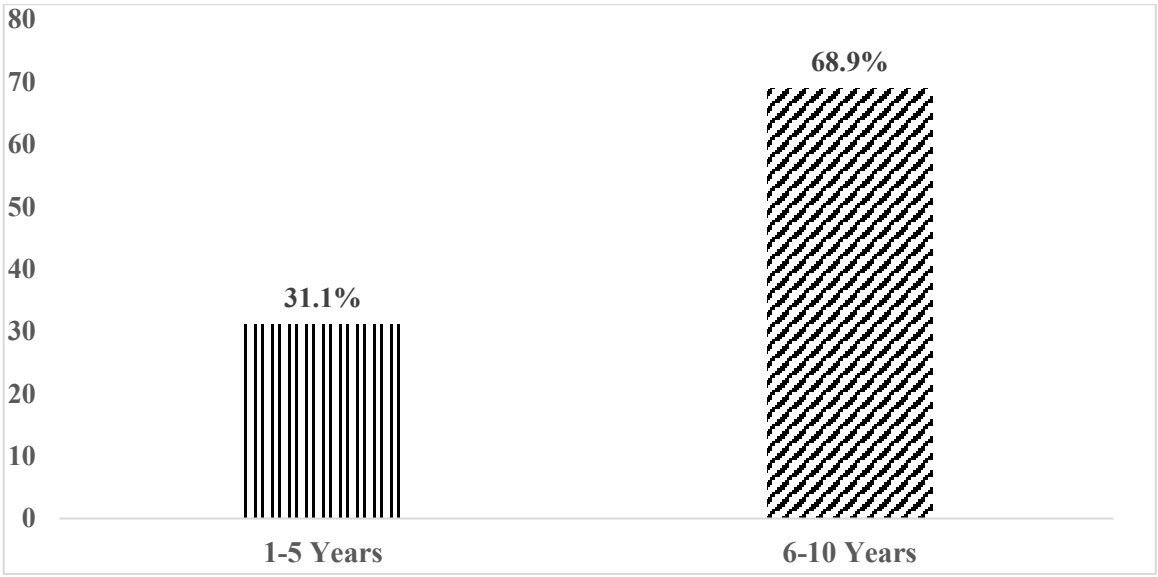

Figure 2: Respondents' Years of Experience in the Study Area

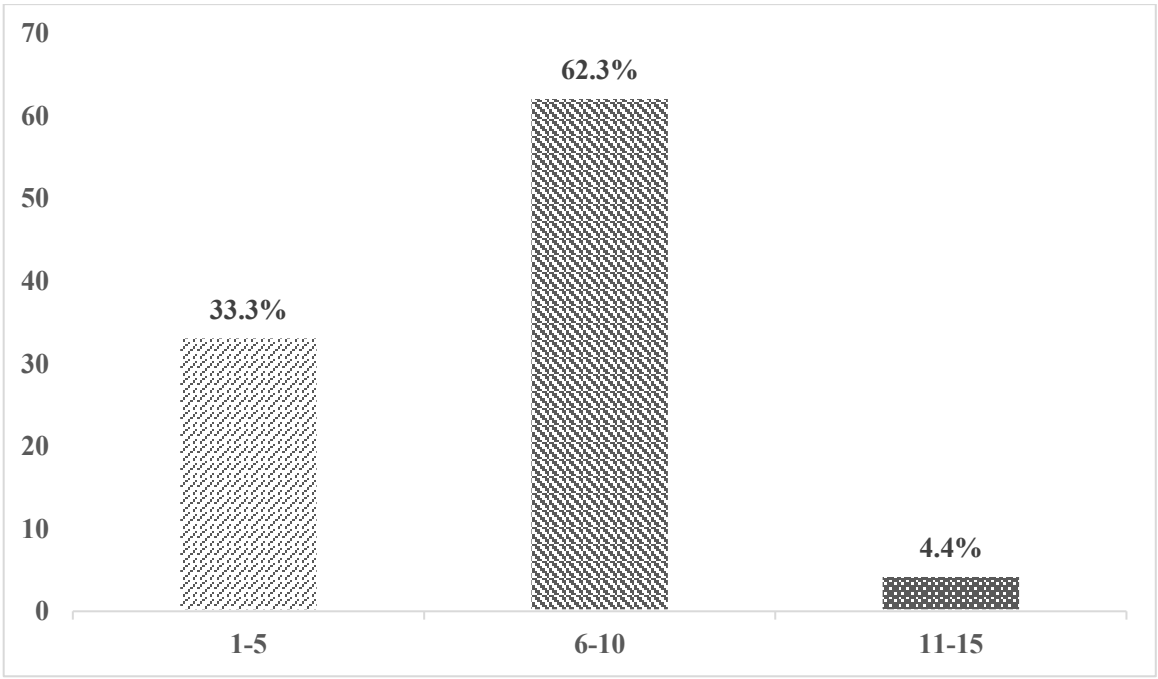

Figure 3: Respondents' Household Size

The Utilization of bamboo in the study area

The uses of bamboo show that bamboo was mostly (100%) used for building construction, as it ranked 1st, followed by yam staking (46.7%), while the least, (ladders), ranked 3rd with 33.3% (Table 2).

Table 2: Utilization of bamboo in the study area

Variables	No of Times Mentioned	%Mention	Rank
Building construction (Scaffolding, Decking, Pillar support, Roofing, Frame for Doors and windows)	45(45)	100	1st
Yam Staking	21(45)	46.7	2nd
Ladder	15(45)	33.3	3rd

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Note: Numbers in the brackets are the number of respondents interviewed.

Stages of involvement in Bamboo and other businesses, respondents are engaged in

The stages at which the respondents were involved in bamboo marketing are presented in Table 3. In the study area, marketing of bamboo was 100% mentioned by all the respondents, while 6.7% of the respondents were into planting and marketing of bamboo. The species planted was *Bambusa vulgaris.*

Other Businesses engaged in by the respondents in the study area showed that agricultural Farming ranked 1st with 88.9%, while general trading ranked 2nd with 66.7% and civil servants ranked 3rd with 4.4%

Table 3: **Stages of involvement and other businesses engaged in by respondents**

Variables/ Categories	No of Times Mentioned	% Mention	Rank
1. Stages of involvement			
Marketing	45(45)	100	1st
Planting and Marketing	3(45)	6.7	2nd
2. Other Business			
Agricultural Farming	40(45)	88.9	1st
General Trading	30(40)	66.7	3rd
Civil Servant	2(45)	4.4	3rd

Note: Figures in the brackets are the number of people interviewed

Marketing Channels and Categories of Bamboo Marketers in the Study Area

There are five main stages in the marketing of bamboo from the farmer to the final consumer, while the categories of bamboo marketers are grouped into Middlemen, Wholesalers, and Retailers (Figure 3)**.** These categories of marketers, however, sell at variance to different buyers. The first category consists of middlemen who source bamboo from farmers within Ekiti state, harvest it, and sell it in bulk to wholesalers and other buyers. The second category is the wholesalers, who are intermediaries between the middlemen and the retailers. They buy from the middlemen and sell in bits to the retailer, and may also sell to the consumers. While the final category is the retailers who finally sell to the consumers.

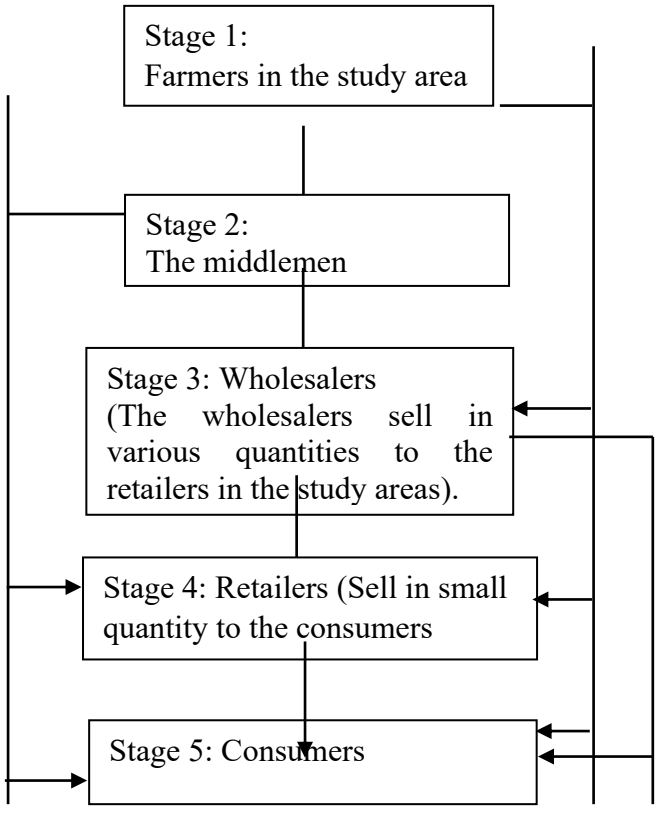

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Figure 3: Marketing channel for bamboo in the study area

Cost and Revenue Estimation from the Marketing of Bamboo in the Study Area.

Cost components for the marketing of Bamboo.

The cost components used in estimating the market gross margin ratio for the marketing of bamboo were the variable costs. These include the cost of bamboo stands, transportation, storage, labour, and tax. (Table 4).

Estimated Revenue

The revenue was calculated as the Price bought multiplied by the quantity sold. The revenue obtained from the marketing of Bamboo in the study area was ₦622,496,160 (Table 4). The quantities of bamboo sold were 1,029,600 stands, while the average selling price was ₦604.60 per stand.

Gross Margin (GM).

The estimated GM that was used to determine the profitability of bamboo is presented in Table 4. The gross margin per marketer in a year was ₦613,604.89. The calculated Gross Margin Ratio (GMR) for bamboo in the study area was 4.44.

Table 4: Cost, Revenue and Gross Margin Ratio per Annum

Here is the cleanly converted and properly structured table, suitable for a thesis, dissertation, or journal article:

Variable	Amount (N)
The Study Area	
A. Revenue	
Quantity sold	1,029,600
Selling price	604.60
Total Revenue (TR)	622,496,160.00
B. Cost	
Bamboo stands	547,168,000.00
Storage	540,000.00
Transportation	30,888,000.00
Labour	10,200,000.00
Tax	198,000.00
Sub-total	588,994,000.00
1% contingency	5,889,940.00
Total Cost (TC)	594,883,940.00
Gross Margin (TR − TC)	27,612,220.00
Gross margin per marketer (GM/45)	613,604.89
Gross margin ratio (GM/TR)	4.44

Factors affecting the price of bamboo

The factors affecting the price of bamboo are presented in Table 5. Season/availability ranked 1st with 100%. Demand ranked 2nd with 88.9% while cost of production ranked 3rd with 22.2%

Table 5: Factors affecting the price of bamboo in the study area

Variable	No of times mentioned	% mention	Rank
Season/Availability	45(45)	100	1st
Demand	40(45)	88.9	2nd
Cost of Production	10(45)	22.2	3rd

Price set by the Association	-	-	-

Note: Figures in the brackets are the number of people interviewed

Sources of investment funds for bamboo marketers.

The sources of investment funds are represented in Table 6. The respondents whose sources of investment were from a contract arrangement with buyers were 80%. This was followed by loans from cooperatives with 40% and borrowing from friends and families with 33.3% and personal savings from previous business with 22.2%

Table 6: Sources of investment funds for bamboo marketers

Variable	No of times mentioned	% mention	Rank
Contract arrangement with the buyers	36(45)	80.0	1st
Loan from Cooperatives	18(45)	40.0	2nd
Borrowing from friends and families	15(45)	33.3	3rd
Personal savings from previous business	10(45)	22.2	4th

Note: Figures in the brackets are the number of people interviewed

The major problems militating against the marketing of bamboo in the study area.

The major problems militating against the marketing of bamboo are presented in Table 7. Non-availability during the dry season ranked highest with 83.3% in the study area, followed by Transportation with 67.8% while the least (33%) was storage.

Table 7: The Major problems militating against the marketing of bamboo in the study area

Variables	TS	NSM	RV%
Non-availability	187	225(45)	83.3
Transportation	153	225(45)	67.8
Poor marketing structure	105	225(45)	46.3
Price fluctuation	94	225(45)	41.5
Storage	74	225(45)	33.0

TS= Total score, NSM= Maximum scorable point, RV= Rank value %

DISCUSSION

Socio-economic characteristics of Bamboo marketers in the study area

The socio-economic characteristics of the respondents in the study area revealed that the majority of marketers of bamboo in the study area were middle-aged. This is in collaboration with previous findings that marketing activities tend to be concentrated among individuals within the middle-aged bracket, who often possess the physical strength, experience, and economic motivation required for such ventures (Shane, 2008).

With respect to gender, the results revealed a skew towards male marketers. This pattern is expected, considering that bamboo marketing typically involves labour-intensive tasks such as harvesting, cutting, bundling, and transporting bamboo stems. These strenuous activities have also been noted by Salam (2008) and Brush (2012).

The educational profile of respondents further showed that most bamboo marketers possessed some level of formal education. This is advantageous for enterprise management, as formal education enhances the ability to keep financial records, understand market trends, and access relevant business information. This finding

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supports the assertion of Fischer (2011), who emphasized that education is a key determinant of successful entrepreneurial activity because it improves managerial competence and information-gathering skills.

In addition, the marital status of respondents revealed a high proportion of married individuals. This agrees with earlier studies by Taphonne (2009) and Arowosoge (2017), who reported that the marketing of most non-timber forest products (NTFPs) is dominated by married people. Married marketers may be more involved in such economic activities because they rely on the income from NTFPs to support household needs and meet family responsibilities.

The Utilization of bamboo in the study area

This study revealed that bamboo is a versatile resource with multiple uses among the respondents. The most prominent use identified was in building construction, where bamboo serves functions such as scaffolding, decking, pillar support, roofing, and providing frames for doors and windows. This aligns with the report of Chaowana *et al.,* (2021), who noted that bamboo possesses high tensile strength, making it suitable for various building and structural applications.

Ogunwusi and Onwualu (2013) further emphasized that bamboo is an exceptionally valuable and often superior alternative to wood. It was observed that bamboo-based panels and boards are hard, durable, and capable of effectively substituting for many hardwood products, thereby expanding their relevance in construction and furniture-making industries.

Furthermore, the durability of bamboo has been reported. Nwaihu *et al.,* (2015) reported that bamboo is extensively used in producing fences around ponds to reduce evaporation, crafting wooden gongs, making stakes for yam cultivation, decking upstairs buildings, and supporting lodging banana and plantain houses. These diverse uses underscore bamboo's importance not only as a construction material but also as a key resource in agricultural and domestic activities.

Marketing Channel of bamboo in the study area

The marketing channel for bamboo in the study area consists of five major stages: farmers, middlemen, wholesalers, retailers, and consumers. Within this chain, the categories of marketers identified include middlemen, wholesalers, and retailers. The results showed that a large number of middlemen operate between farmers and end-users. This structure leads to a situation in which farmers, middlemen, and wholesalers sell bamboo at varying prices to consumers.

The involvement of multiple middlemen represents a deviation from an efficient marketing channel. In such cases, wholesalers are compelled to increase their selling prices to cover not only transportation costs but also the margins claimed by the numerous middlemen. This ultimately places consumers at a disadvantage, as they bear the burden of inflated prices. Sudhir and Datta (2009) also observed that dynamic pricing strategies often emerge in markets with multiple intermediaries, resulting in each category of marketer selling to different buyers at varying prices.

It was observed during this study that this abnormal marketing structure has a negative influence on the overall profitability of bamboo in the area. Adegeye and Dittoh (1985) also reported this abnormal marketing channel and reported that in Nigeria's marketing system, multiple classes of middlemen are often found between producers and wholesalers in Agricultural marketing. These include farm-gate middlemen, commissioned agents, non-commissioned agents, and cooperative marketing agencies, many of whom perform overlapping functions. Their involvement increases transaction costs and reduces the profit margin available to both producers and wholesalers.

The profitability of bamboo in the study area

The profitability of bamboo production in the study area revealed an estimated Gross margin of ₦613,604.89 per annum for a marketer with a gross margin ratio of 4.44. This indicated a profit of ₦51,133.75 per month per marketer, while the gross margin ratio showed that a greater proportion of the revenue is used to cover the

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total cost of operation. This finding is therefore in line with the research reports that NTFPs trade has been providing income for its marketers in many countries of the world (Mishra, 2015; Nwaihu *et al.,* 2015).

However, the estimated monthly profit of ₦51,133.75 (US$35.24) per marketer falls below the current national minimum wage of ₦75,000 (US$51.69) per month (exchange rate of ₦1.450.96 to US$1). This could be attributed to the inefficient and abnormal marketing channel observed in the study area, where multiple middlemen operate between the producers and the consumers. The presence of excessive intermediaries increases transaction costs, reduces marketers' profit margins, and ultimately limits the financial viability of the marketing of bamboo.

Limitations of the Study

Despite the insights this study offers, it is essential to acknowledge some methodological limitations when evaluating the results, as there is no centralized market for bamboo sellers in the study area. The study used a snowball sampling technique because participants are more inclined to recommend people within their own business network. This method is intrinsically prone to selection bias, even though it was successful in locating otherwise difficult-to-reach responders. As a result, it is possible that some groups of bamboo marketers were underrepresented.

In addition, the relatively small sample size (n = 45) limits the statistical power of the analysis and constrains the generalizability of the results beyond Ado-Ekiti Local Government Area. The findings should therefore be regarded as context-specific and indicative rather than representative of bamboo marketing systems across Ekiti State or southwestern Nigeria.

Future studies could address these limitations by adopting probabilistic sampling techniques, such as stratified or cluster sampling. Thus, expanding the sample size and extending coverage to multiple local government areas or states would improve representativeness, enhance analytical robustness, and support stronger generalization of findings on bamboo utilization and marketing.

CONCLUSION

Bamboo marketing generated income for its marketers in Ekiti State. The enterprise, which is gender-specific for men, provided livelihood support for the marketers. The non-availability of bamboo during the off-season was a major challenge in the marketing of bamboo in the study area, and it was also a major factor that influenced the price of bamboo. Bamboo was mainly used for building construction in areas such as scaffolding, decking, pillar support, roofing, frames for doors and windows. Furthermore, several middlemen were involved in the marketing channels between the farmers and the wholesalers. This had a negative influence on the profit generated by wholesalers, while the consumers were at the receiving end of the higher prices.

Based on the findings of this study, the following recommendations are made to improve the marketing of bamboo in the study area. There is a need to:

1. improve the efficiency of the marketing channel and have a central market for the marketing of bamboo. This will go a long way in reducing the number of middlemen and keeping prices down, and thus enhancing a normal marketing channel with even distribution of bamboo profits.
2. promote large-scale bamboo cultivation to guarantee year-round availability, support continuous supply, and improve the economic viability of the enterprise.
3. involve extension workers and Non-Governmental Organizations (NGOs) in awareness programmes to sensitise marketers on the economic and environmental benefits of bamboo cultivation, including income generation and reduced pressure on timber resources.

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