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ECONOMIC ANALYSIS OF VITELLARIA PARADOXA C.F. GAERTN AND PARKIA BIGLOBOSA (JACQ.) R.BR.EX G.DON. IN IWAJOWA LOCAL GOVERNMENT AREA, OYO STATE, NIGERIA

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ABSTRACT

This study evaluates the economic analysis of Vitellaria paradoxa (shea butter) and Parkia biglobosa (locust beans) in the Iwajowa Local Government Area. The research focused on four purposively selected communities: Iwere Ile, Ilaji Ile, Ayetoro Ile, and Ijio. A total of 138 questionnaires were administered to gather primary data, and the data were analyzed using descriptive and inferential statistics, including budgetary analysis and logit regression analysis. The results showed that the majority of respondents were female (97.7%), with 69.9% married, 47.8% aged between 40 and 49, and 40.6% having primary education. Most respondents had household sizes between 1 and 5 (67.4%) and were primarily engaged in marketing (69.9%) or production (30.4%) of V. paradoxa and P. biglobosa. The study revealed that these NTFPs serve as vital sources of food, income, medicine, and employment, with 100% of respondents acknowledging their importance. The business of V. paradoxa and P. biglobosa. was found to be profitable, with monthly net profits of ₦16,064.33 and ₦14,976.93, respectively,

and benefit-cost ratios of 1.65 and 1.49. The major constraints identified were high transportation costs (β = 27.52), over-utilization of NTFPs (β = 15.22), urbanization (β = 5.30), deforestation (β = 5.12), and availability of the plant (β = 3.41). In conclusion, the study highlighted significant challenges faced by producers and marketers, including poor transport networks and a lack of market information. It is recommended that the government improve the performance of producers and marketers by addressing transportation issues and enhancing market access.

Keywords: *Vitellaria paradoxa*, *Parkia biglobosa*, *Economic analysis*, *non-timber forest products*, *Profitability*.

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1. INTRODUCTION

Non-timber forest products (NTFPs) play a vital role in the socio-economic development of rural communities, offering an alternative source of livelihood that contributes significantly to poverty alleviation and economic sustainability. NTFPs are natural resources derived from forests that do not involve timber extraction, encompassing a wide range of products such as fruits, nuts, medicinal plants, resins, and essential oils, which serve various purposes for local consumption, trade, and cultural practices (Shackleton and Pandey, 2014; Olawuyi *et al*., 2019). In many rural areas, particularly in sub-Saharan Africa, NTFPs represent a crucial source of income, especially where agricultural activities are limited or seasonal. These products provide raw materials for food, medicine, construction, and energy and have the potential to be sustainably managed

without the need for extensive environmental degradation. They offer an essential means of diversification in rural economies, ensuring economic resilience and food security.

Among the many NTFPs harvested in Africa, *Vitellaria paradoxa* (commonly known as the Shea tree) and *Parkia biglobosa* (African locust bean) stand out for their significant economic, medicinal, and cultural importance. *V. paradoxa*, primarily known for its edible Shea nuts, is a vital tree species in West and Central Africa, contributing to the livelihood of millions, especially women. The tree's most renowned product, Shea butter, is derived from nuts and is used widely in cooking, cosmetics, and pharmaceuticals. Shea butter production is a crucial activity that empowers women, providing them with a significant source of income. It is estimated that more than two million women across West Africa are involved in the harvesting, processing, and marketing of Shea nuts and butter (Hall et al., 1996). The Shea tree also plays a key role in rural economies by providing other valuable products such as medicinal bark, roots, and leaves, which are used to treat ailments like fever and diarrhea and, in some cases, as natural pesticides (Adeokun *et al*., 2002). Furthermore, the pulp of the Shea fruit is a valuable food source that sustains communities during the early months of the rainy season when other food supplies may be scarce. Despite its importance, the Shea industry faces significant challenges that limit its potential, including poor quality control, reliance on traditional and labor-intensive processing techniques, and inadequate storage and marketing facilities. The global demand for Shea butter, which is valued at approximately $10 billion and projected to exceed $30 billion by 2020, far outstrips current production levels,

resulting in a gap that offers a huge opportunity for local producers to improve quality, increase productivity, and enhance their economic returns (Carette *et al*., 2009). However, despite the significant economic potential, the full benefits of the Shea industry are not being realized, as many producers still face barriers such as limited access to modern technology, inadequate funding, and poor infrastructure. Additionally, the lack of robust information on the economic value of Shea trees in national and international markets has hindered the industry's growth and its contribution to national gross domestic product (GDP).

Similarly, *P. biglobosa*, also known as the African locust bean tree, is an indigenous multipurpose tree that provides numerous benefits, including timber, fodder, and medicinal products. The seeds *of P. biglobosa*, commonly known as locust beans, are a highly valued food resource in West Africa, where they are processed into a fermented condiment known as "iru" in Yoruba, "dawadawa" in Hausa, and "ogiri" in Igbo. This condiment is a staple in many African cuisines, prized for its flavor and nutritional content, including high levels of protein, vitamins A and C, and essential minerals (Sadiku, 2010; Emmanuel *et al*., 2014). The locust beans also serve as livestock feed, and the tree's bark and leaves are used in traditional medicine to treat various ailments. Beyond its culinary and medicinal uses, *P. biglobosa* has ecological benefits, including soil fertilization, drought resistance, and its role in environmental stabilization, especially in degraded areas (Sadiku, 2010). This tree is also an important source of shade and fuelwood, adding to its multifunctionality. Despite these benefits, the full economic potential of *P. biglobosa* has not been

fully exploited. The production and marketing of locust beans remain largely traditional, with challenges such as poor processing methods, lack of storage facilities, and inadequate market access limiting the expansion of its commercial value. Moreover, there is limited research on the economic analysis of locust bean production and its role in income generation in rural communities. However, its adaptability to the harsh Sahelian and Sudanian climates and its wide range of applications in both rural and urban economies make it an important resource for livelihood diversification and rural development.

In the Iwajowa Local Government Area, Oyo State, Nigeria, the economic contributions of both *V. paradoxa* and *P. biglobosa* as NTFPs remain under-explored, despite their significant roles in rural economies. There is limited information on the profitability of Shea butter production and locust bean processing in the area, which hampers efforts to improve the sustainability and scalability of these industries. While NTFPs, in general, contribute to household income and food security in rural Nigeria, there is a need for detailed economic analysis to assess the profitability and market dynamics of these specific products. Understanding the economic potential of *V. paradoxa* and *P. biglobosa* in Iwajowa will provide valuable insights into the challenges and opportunities within the NTFP sector. This study, therefore, seeks to fill the knowledge gap by estimating the economic viability of these NTFPs in the study area, identifying the socio-economic benefits to local communities, and offering recommendations for improving the marketability, sustainability, and conservation of these valuable resources.

2. REVIEW OF LITERATURE

2.1 Definition and Concepts of Non-Timber Forest Products (NTFPs)

Forests provide a wide range of products that serve the needs of people in both developed and developing countries. Traditionally, forest products are divided into two major categories: timber and non-timber forest products (NTFPs). NTFPs refer to all forest-based products that do not include timber, covering a vast array of biological materials extracted from forests, woodlands, and managed plantations. These products may be used for household consumption, sold in markets, or hold social, cultural, or religious significance (Belcher, 2015). According to Peters (2016), NTFPs can be categorized into three major groups based on the type of plant tissue or compound exploited: reproductive propagules (e.g., fruits, seeds), plant exudates (e.g., latex, resin), and vegetative structures (e.g., fibers, leaves). Parratt (2016) further classifies NTFPs into five broad categories: food, medicines, bioactive products, extractive products, and animal products. Forest-dwelling communities rely heavily on NTFPs for sustenance and income, emphasizing their importance in rural economies and livelihoods (Ros-Tonen and Wiersum, 2013).

2.2 Utilization of Non-Timber Forest Products in Nigeria

NTFPs have been integral to human livelihoods for centuries, especially in regions where forests are closely intertwined with human settlements. Emery et al. (2001) suggest that NTFPs have historically been crucial for survival, as people have foraged for food, medicine, and materials for tools and clothing long before the advent of timber-based industries. While timber

has traditionally been the primary forest product, NTFPs have often been overlooked due to their lower perceived economic value. According to Arnold and Ruiz (2015), this historical focus on timber production, especially in tropical forests, resulted in NTFPs being regarded as "minor forest products" until recently. Despite this, there is growing recognition of the significant economic, social, and ecological value of NTFPs. The exploitation of NTFPs is generally less ecologically destructive than timber harvesting, making it an essential component of sustainable forest management. In Nigeria, NTFPs contribute significantly to rural economies, providing a diverse range of products such as medicinal plants, fruits, and fibers, which support both subsistence needs and income generation (Adebayo et al., 2017).

2.3 NTFPs as a Source of Livelihoods and Their Contribution

NTFPs play a critical role in the livelihoods of rural communities, particularly in developing countries. Shackleton *et al.* (2021) highlight that the most common use of NTFPs involves subsistence gathering, where people collect forest products for food, medicine, shelter, and energy. These products also serve as safety nets during times of crisis, such as crop failure or economic hardship. In addition, NTFPs contribute to regular cash income by being sold in local markets. The role of NTFPs in rural livelihoods is particularly pronounced in forested areas, where they fulfill essential household needs and provide income, especially in times of economic uncertainty. NTFPs are increasingly recognized for their role in income generation and local economies, and their commercial value is rising in many parts of the world (Adebayo *et al.*, 2017). The sale of NTFPs not

only supports household economies but also contributes to the broader economic activities of the communities.

2.4 Specific Examples of NTFPS and Their Contributions

Several specific NTFPs are of particular importance to local economies and rural livelihoods: Coffee (*Coffea arabica*): Native to the forests of southwest Ethiopia, coffee is a key NTFP with both economic and sociocultural significance. Coffee beans and leaves are consumed, and the dried branches and leaves are used as firewood. Beyond its consumptive use, coffee holds medicinal value and plays a role in social gatherings, particularly in traditional coffee ceremonies.

Shea Butter (V. paradoxa): The shea tree is highly valued in West Africa, especially for its edible and cosmetic oil extracted from its seeds. Shea butter is an important commodity, contributing to the livelihoods of many in countries like Nigeria and Ghana. The tree's role in agroforestry systems and its resilience make it a critical component of sustainable land use practices (Zougmoré *et al*., 2016).

African Locust Bean (Parkia biglobosa): The African locust bean tree is valued for its seeds, which are used in food preparation, and its timber, which serves various construction purposes. The tree also contributes to soil fertility in agroforestry systems. Its seeds and other parts of the tree are integral to local diets and economies (Ndongson *et al*., 2017).

Honey: Beekeeping in Nigeria is a traditional practice, with honey being a valuable NTFP in rural areas. Honey is produced from the nectar of various plants in forested and woodland areas, and it serves both as a source of income and a vital food

product. Honey is also used for medicinal purposes and has cultural significance (Fayera *et al*., 2015).

Gum and Resin: Gum and resin derived from tree species like Acacia and Boswellia are valuable NTFPs in dry forest regions. They provide cash income and seasonal employment opportunities, as the collection and processing of these products require significant labor. In some regions, gum and resin contribute significantly to household incomes (World Bank, 2016).

Spices and Condiments: Spices like *Aframomum corrorima* (Korrorima) and condiments like *Rhamnus prinoides* (Gesho) are important NTFPs in many African communities. These products are not only used for food flavoring but also for medicinal purposes. They play a key role in local economies, both for consumption and for sale (Barua *et al*., 2019).

Energy (Firewood and Charcoal): In rural areas where alternative energy sources are limited, NTFPs like firewood and charcoal are crucial for meeting energy needs. These products are not only vital for cooking and heating but also serve as a significant source of income. Firewood remains the primary energy source for both rural and urban households in many parts of Nigeria (Bale eco-region study).

Grazing (Fodder): In areas where livestock farming is dominant, forests provide an essential source of feed for animals. Grass and woody plants from forests are used year-round to support livestock, contributing to the livelihoods of pastoral communities (Dagim *et al*., 2016).

These examples illustrate the diverse and vital contributions of NTFPs to the livelihoods of rural communities in Nigeria and other parts of Africa. NTFPs support household subsistence, provide cash income, and contribute to cultural practices, making them essential for sustainable rural development.

3. RESEARCH METHODOLOGY

This study adopted a descriptive survey research design, utilizing a structured questionnaire to collect quantitative data on the economic aspects of *Vitellaria paradoxa* (shea tree) and *Parkia biglobosa* (African locust bean) in Iwajowa Local Government Area, Oyo State, Nigeria. The descriptive approach was employed to identify patterns, trends, and relationships between key economic variables, providing more information into the contributions, profitability, and market dynamics of these species. This design is particularly effective in assessing the extent to which various factors influence their economic viability. Furthermore, the survey method facilitated the collection of firsthand information from harvesters, processors, and traders involved in the value chain of *V. paradoxa* and *P. biglobosa* within the study area.

The study was conducted in Iwajowa Local Government, which is bounded to the north by Itesiwaju Local Government, to the south by Ibarapa North Local Government, to the east by Kajola Local Government, and to the west by the Republic of Benin. The local government covers an area of 2,529 km² and has a population of 152,281, with the majority of inhabitants being Yoruba, alongside other ethnic groups such as Fulani, Hausa, Tiv, and Egede. These groups primarily engage in cattle rearing,

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large-scale farming, and hunting, which results in the availability of food and cash crops at relatively low prices.

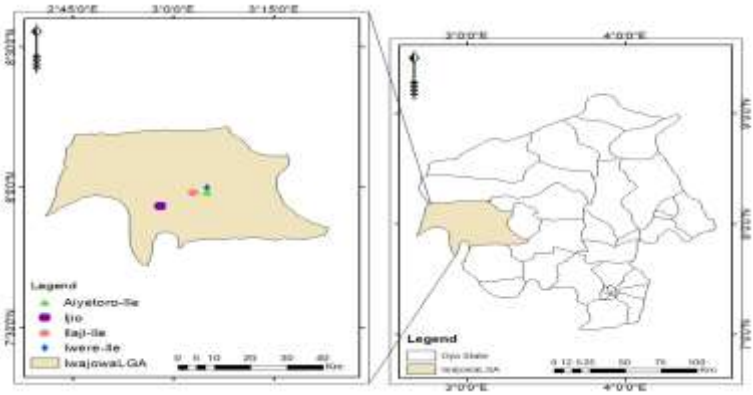

Figure 1. Map of the Study Area

The sampling procedure involved a preliminary survey to familiarize with the communities in the local government, followed by the identification of seventeen communities with estimated populations: Iwere Ile (1690), Iganna (520), Ijio (1690), Itasa (920), Ayetoro-Ile (1098), Idiko-Ago (1120), Ilaji-Ile (1280), Idiko-Ile (740), Ayegun (598), Elekokan (820), Agbaruru (1420), Gbedu (648), Samo (720), Karmu (820), Tudi (1245), Ofegun (1045), and Olokunola (960). From these, four communities were purposively selected due to their active markets: Iwere-Ile (1475), Ilaji-Ile (1280), Ayetoro-Ile (1098), and Ijio (1690). Respondents were then selected using a sampling intensity method adapted from Diaw et al. (2002), which indicated that 10% sampling intensity was used for populations below 500, 5% for populations between 500 and 1000, and 2.5% for populations above 1000. Based on this

method, 42 respondents were randomly selected from Ijio, 37 from Iwere-Ile, 32 from Ilaji-Ile, and 27 from Ayetoro-Ile, resulting in a total of 138 respondents.

Data for this study was collected from both primary and secondary sources. Primary data was gathered through structured questionnaires, while secondary data was obtained from relevant documents, journals, and articles to supplement and validate the primary data. For data analysis, descriptive statistics were used to assess the socio-economic importance of the selected NTFPs. Profitability was analyzed using budgetary analysis, where net income or profit was calculated with the formula n = R – (VC + FC), with R representing gross revenue, VC as variable costs, and FC as fixed costs. The gross margin (GM) was determined as GM = R – VC, and total costs (TC) were also computed. Marketability challenges were analyzed using logistic regression, with the logit regression equation: $P1 = b_0 + b_1x_1 + b_2x_2 + \ldots + b_8x_8$, where the dependent variable (P1) represents constraints faced by producers and marketers. The independent variables included factors such as deforestation, poor harvesting and processing, inadequate finance, lack of marketing information, insufficient awareness creation, over-utilization of NTFPs, high transportation costs, bad road conditions, urbanization, plant availability, and lack of value addition.

4. RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of the Respondents

The results of the study reveal key socio-demographic characteristics of the respondents (Table 1), with a notable

majority (97.8%) of the respondents being female, which highlights the dominant role of women in the collection and marketing of non-timber forest products (NTFPs) in the area corroborating with the findings of Babatunde (2008) which stated that most people in the rural communities are married, however only 2.2% are male. In terms of marital status, 69.6% of respondents are married, followed by 17.4% divorced, 11.6% widowed, and 1.4% single, suggesting a stable family structure, which may influence socio-economic dynamics related to NTFP activities. The age distribution shows that the largest proportion of respondents (47.8%) are in the 40-49 age group, with 26.1% aged 50-59, 16.7% in the 30-39 range, and only a small percentage in the younger age groups, indicating that NTFP activities are more common among older individuals who likely possess traditional knowledge and experience in the trade. Regarding educational levels, 40.6% of respondents have completed primary education, 24.6% secondary education, 11.6% tertiary education, and 23.2% have no formal education, highlighting a relatively low level of formal education among the participants, which may affect their access to modern business practices and information. The majority of respondents (67.4%) belong to small households with 1-5 members, and 29.7% to medium-sized households with 6-10 members, while only 2.9% come from larger households, suggesting that most respondents come from smaller family units, which may influence their need for supplementary income through NTFPs. Occupation-wise, 62.3% of respondents are traders, 30.4% are farmers, and a small percentage are artisans (1.4%), loggers (0.7%), or civil servants (5.1%), with no respondents identified as NTFP collectors, indicating that the NTFP trade is primarily driven by trading rather than direct collection. In terms of

experience, 52.9% of respondents have been involved in the business for 5-10 years, with 23.2% having less than 5 years, 11.6% between 11-15 years, and 12.3% above 15 years, reflecting a mix of relatively new and experienced participants in the NTFP market. Finally, the most common NTFPs identified were locust beans, collected by 69.6% of respondents, followed by shea butter, collected by 30.4%, indicating that locust beans are the predominant product in the NTFP trade in the study area due to its high demand and economic value.

Table 1. Socio-demographic Characteristics of Respondents in The Study Area

Variables	Frequency	Percentage (%)
Gender		
Male	3	2.2
Female	135	97.8
Total	138	100
Marital Status		
Single	2	1.4
Married	96	69.6
Divorced	24	17.4
Widow	16	11.6
Total	138	100
Age		
20 – 29	1	0.7
30 – 39	23	16.7
40 – 49	66	47.8
50 – 59	36	26.1
60 – 69	10	7.2
70 and above	2	1.4
Total	138	100
Educational Level		
No formal Education	32	23.2

Primary Education	56	40.6
Secondary Education	34	24.6
Tertiary Education	16	11.6
Total	138	100
Household size		
1 – 5	93	67.4
6 – 10	41	29.7
Above 10	4	2.9
Total	138	100
Occupation		
Farmer	42	30.4
Artisan	2	1.4
Loggers	1	0.7
NTFPs collectors	0	0
Civil servants	7	5.1
Trading	86	62.3
Total	138	100
Years in the business		
Less than 5yrs	32	23.2
5 - 10yrs	73	52.9
11 - 15 yrs	16	11.6
Above 15 years	17	12.3
Total	138	100
Products		
Locust beans	96	69.6
Shea butter	42	30.4
Total	138	100

4.2 Importance of the Selected NTFPs in the Study Area

The results indicate that selected non-timber forest products (NTFPs) are of paramount importance in the study area (Table 2), with respondents overwhelmingly acknowledging their significance as a source of food, income, and medicinal use, each receiving a perfect score of 1.00, reflecting unanimous agreement that these NTFPs play crucial roles in daily survival and health, ranking them as the most important benefits. The ability of these products to contribute to poverty alleviation was recognized by 89.9% of respondents, yielding a mean of 1.15 and ranking second, highlighting the critical role that NTFPs play in supporting livelihoods and alleviating poverty in rural households. In contrast, foreign exchange earnings and economic development were viewed as less directly impacted by NTFPs, as evidenced by a mean score of 2.00 for both, with no respondents identifying foreign exchange earnings as a benefit and the majority perceiving economic development as a broader, more distant outcome of NTFP use, ranking these factors fifth. Provision of shelter, recognized by only 13.8% of respondents, was considered a lesser benefit, reflected in a mean score of 1.88 and ranking third, while rural development was also viewed as a less significant outcome, with only 9.4% of respondents acknowledging its role, resulting in a mean score of 1.91 and ranking fourth. This suggests that while NTFPs are primarily valued for their direct contributions to food security, income generation, and health, their role in broader economic development and rural infrastructure is perceived as more indirect.

Marshall *et al.* (2006) and Shackleton *et al.* (2007) emphasized the importance of non-timber forest products (NTFPs) in

supporting local livelihoods, noting that their trade provides significant opportunities for economic development. In many cases, the marketing of NTFPs yields substantial returns and forms an integral component of diversified livelihood strategies in rural communities across the tropics. This is particularly true in regions with favorable economic conditions where products are effectively marketed, as observed in the study area.

Building on this existing literature, studies have consistently highlighted the socio-economic significance of NTFPs in enhancing rural livelihoods and promoting sustainable resource management. For instance, Olawuyi and Odeyale (2019) demonstrated the role of agroforestry practices integrating NTFPs in improving household income in Odeda Local Government Area, Ogun State, while Olawuyi et al. (2019) emphasized the substantial contribution of NTFPs to rural household income in Osho Forest Reserve, Oyo State, showcasing their potential to alleviate poverty and foster economic resilience. Similarly, Odeyale and Olawuyi (2018) reported that income from NTFPs significantly supports sustainable forest management in the Gambari Forest Reserve, Oyo State.

Table 2. Importance of Selected NTFPs

Selected NTFPs	Yes	No	Mean	Rank
Source of Food	138 (100)	0(0.0)	1.00	1st
Source of Income	138 (100)	0(0.0)	1.00	1st
Poverty Alleviation	124 (89.9)	14(10.1)	1.15	2nd

Foreign Exchange Earning	0(0.00)	138(100)	2.00	5th
Economic Development	138 (100)	0(0.0)	2.00	5th
Medicinal Use	138 (100)	0(0.0)	1.00	1st
Provision of Shelter	19 (13.8)	119(86.2)	1.88	3rd
Job Opportunity	138 (100)	0(0.0)	1.00	1st
Rural Development	13 (9.4)	125(90.6)	1.91	4th

4.3 Profitability of the Selected NTFPs in the Study Area

In Table 3, the financial analysis for *Vitellaria paradoxa* and *Parkia biglobosa* reveals interesting insights into the profitability and cost structure of these two non-timber forest products (NTFPs). For both species, the total variable costs (TVC) were significant, with *V. paradoxa* incurring a TVC of ₦32,604.39 and *P. biglobosa* a slightly higher TVC of ₦44,365.85. These variable costs include expenses for price collection, labor, transportation, shop rent, and dues, which are essential for the processing and marketing of these products. In terms of fixed costs, *V. paradoxa* had a total of ₦5,280.91, while *P. biglobosa* incurred higher fixed costs at ₦6,914.32, mainly due to higher costs for tools such as cutlasses, pots, baskets, and containers. The total cost (TFC + TVC) for *V. paradoxa* was ₦37,885.30, while for *P. biglobosa*, it amounted to ₦51,280.17. Despite the higher costs for *P. biglobosa*, the total revenue (TR) from sales for *V. paradoxa* (₦53,949.63) was lower than for *P. biglobosa* (₦66,257.10). This resulted in a slightly higher gross margin for *P. biglobosa* (₦21,891.3) compared to Vitellaria paradoxa (₦21,345.24). However, after accounting for total costs, the net

profit for *V. paradoxa* (₦16,064.33) exceeded that of *P. biglobosa* (₦14,976.93), indicating a higher profitability for *V. paradoxa* despite its lower revenue. The benefit-cost ratio, which reflects the efficiency of investment, was also higher for *V. paradoxa* at 1.65 compared to 1.49 for *P. biglobosa*, suggesting that relative to the costs incurred, *V. paradoxa* offers a better return on investment. This analysis highlights the profitability of both NTFPs but reveals that, in this case, *V. paradoxa* may provide a more cost-effective option for producers and marketers in the study area.

Research conducted in Ibadan revealed that processing 700 kg of *P. biglobosa* seeds incurred a total cost of ₦49,990, yielding a rate of return of 840.1% and a return on investment of 7.4, indicating substantial profitability in locust bean seed processing (Adekunle *et al*., 2023). Similarly, the traditional processing of African locust bean seeds has been reported to yield a net profit margin of ₦28,990.80 per respondent per month, highlighting its economic viability (Edeh and Agbaje, 2022). Additionally, studies in Oyo State have shown that income from *P. biglobosa* and *V. paradoxa* significantly supports rural household finances, with *P. biglobosa* contributing 38% and *V. paradoxa* contributing 23% to annual harvester income (Oluwole *et al*., 2021).

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Table 3. Profitability for Marketers

Cost	*Vitalleria Paradoxa*	*Parkia Biglobosa*
VC		
Price Collection	25111.11	35596.49
Labour	2776.79	2776.79
Transportation	3092.59	3630.77
Shop Rent	716.49	716.49
Dues	907.41	1645.31
TVC	32604.39	44365.85
Fixed Cost		
Cutlass/Knife	285.00	303.95
Pot	1366.67	1627.87
Basket	742.10	431.14
Tray	390.00	389.69
Calabash	696.43	474.64
Sack	115.39	103.33
Container	410.32	823.70
Table	1275.00	1260
Firewood	0.00	1500
Total Fixed Cost (TFC)	5280.91	6914.32
Total Cost (A+B)	37885.30	51280.17
TR (Price * Qty)	53949.63	66257.1
Gross Margin (TR-TVC)	21345.24	21891.3
Net Profit (D-C)	16064.33	14976.93
Benefit Cost Ratio	1.65	1.49

4.4 Logit Regression Model for Constraints Encountered by Producers of Selected NTFPs

The logit regression model for constraints faced by producers of selected non-timber forest products (NTFPs) presents key factors that influence their operations and marketing challenges. The model is expressed as:

CFP = -16.348 + 1.633DF – 0.821PHPS + 1.728IFLCP + 0.093LMI – 0.56IACN + 2.723OUN + 3.315HCT – 0.145BR + 3.918UR + 1.226AP – 1.689LVA

Where: CFP represents the constraints faced by producers; DF is deforestation of selected NTFPs; PHPS refers to poor harvesting and processing; IFLCP stands for inadequate finance and lack of capital; LMI is the lack of marketing information; IACN is inadequate awareness creation; OUN refers to over-utilization of NTFPs; HCT is the high cost of transportation; BR is bad roads; UR stands for urbanization; AP is the availability of the plant, and LVA represents the lack of value addition.

The odds-ratio values are also provided for unit changes in each independent variable. Notably, deforestation (DF), inadequate finance and lack of capital (IFLCP), over-utilization of NTFPs (OUN), high cost of transportation (HCT), urbanization (UR), and availability of the plant (AP) all have significant positive effects on the constraints encountered by producers, with odds-ratios greater than 1 (Table 4). For example, the odds ratio for deforestation (DF) is 5.121, indicating that deforestation significantly increases the likelihood of encountering constraints. The variables PHPS, IACN, and LVA have negative coefficients, suggesting that poor harvesting and processing,

inadequate awareness creation, and lack of value addition reduce the constraints, though these are not statistically significant as indicated by their odds ratios (less than 1). The Chi-square value of 86.019 with 11 degrees of freedom and a p-value of 0.00 shows that the model is statistically significant, indicating that the independent variables included in the model have a strong relationship with the constraints faced by NTFP producers. In summary, the results highlight key constraints such as deforestation, inadequate finance, over-utilization, high transportation costs, urbanization, and plant availability as the major factors influencing the challenges encountered by NTFP producers. These constraints need to be addressed to enhance the productivity and sustainability of NTFP businesses.

Several studies have identified key constraints faced by non-timber forest product (NTFP) producers in Nigeria, aligning with the challenges highlighted in the provided analysis. Aderounmu and Adejumo (2019) reported that climate change, lack of finance, and price fluctuations significantly impede NTFP supply in the Ago-Owu Forest Reserve, with odds ratios of 9.87, 5.66, and 1.92, respectively. Similarly, Babalola (2009) found that NTFP producers in Southwest Nigeria face marketing challenges, including a lack of storage facilities, poor transportation, price fluctuation, and deforestation, which adversely affect their operations. Additionally, Ndulue *et al.* (2023) emphasized that inadequate finance and lack of capital are major constraints for NTFP farmers, hindering their productivity and sustainability.

Table 4. Constraints Encountered by Producers of Selected NTFPs

Variables	Co-efficient	Odds-ratio
DF	1.633	5.121*
PHPS	-0.821	0.44
IFLCP	1.728	5.63*
LMI	0.093	1.097
IACNHV	-0.56	0.571
OUN	2.723	15.22*
HCT	3.315	27.517*
BR	-0.145	0.865
UR	1.658	5.298*
AP	1.226	3.409*
LVA	-1.689	0.185
Chi-square = 86.019; df = 11	P = 0.00	

5. CONCLUSION

In conclusion, the study highlights the significant socio-economic importance of *P. biglobosa*, especially in the local economy, though its processing and marketing remain underdeveloped and primarily at a local level. The research also showed that the production of *V. paradoxa* in the Iwajowa Local Government Area is minimal and seasonal due to the limited availability of shea nuts. Traditional production methods dominate, primarily because of the low educational levels and the high cost of modern technology. Consequently, the local

sector requires more attention, particularly in production, processing, packaging, and marketing. There is a pressing need for initiatives and technology that can enhance the products. Furthermore, the study found that producers and marketers face several challenges, such as poor transportation networks and a lack of market information. The cost of labor and consumables were also identified as significant factor affecting the technical efficiency of NTFP production in the region.

Based on these findings, it is recommended that marketers be supported by providing easier access to credit facilities and modern processing techniques to boost their production and marketability. The government should focus on improving rural infrastructure, particularly feeder roads, to connect rural production areas with urban markets and address transportation issues. Policymakers must also enforce laws to prevent the indiscriminate felling of *V. paradoxa* and *P. biglobosa* to protect the sustainability of these valuable resources. Producers and marketers should be encouraged to form strong associations and cooperatives, which could facilitate access to credit for acquiring modern tools and improving production capacity. Lastly, producers and marketers should be educated on good hygiene practices to improve product quality and marketability.

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