

Sustainable management and livelihood contributions of non-timber forest products in Onigambari Forest Reserve, Oyo State, Nigeria

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Paper history:

Received 12 April 2026

Accepted in revised form

26 May 2026

Keywords

NTFPs; sustainable,
management;
livelihoods;
conservation;
Onigambari

Abstract

Non-timber forest products (NTFPs) play a significant role in sustaining rural livelihoods and supporting forest conservation in tropical regions. This study assessed the utilization patterns, socio-economic contributions, harvesting frequency, and sustainability challenges of NTFPs in Onigambari Forest Reserve, Oyo State, Nigeria. A total of 150 respondents were purposively selected from communities surrounding the reserve. Data were collected using structured questionnaires, key informant interviews, and field observations, and analyzed using descriptive statistics and thematic approaches. The results revealed that a high proportion of respondents depend on NTFPs for multiple purposes, including fuelwood (80%), fruits (75%), edible plants (68%), and medicinal plants (52%). NTFPs contribute substantially to household livelihoods, with 61% of households involved in collection and 68% deriving income from their use. Women play a dominant role in NTFP marketing (63%), highlighting the gender dimension of forest-based livelihoods. Harvesting frequency varied across product categories, with edible plants and fruits collected more frequently than medicinal plants, indicating differential resource pressure. However, sustainability is threatened by key challenges such as overharvesting (62%), weak policy enforcement (48%), low awareness of sustainable practices (41%), and limited alternative livelihood opportunities (37%). The study concludes that while NTFPs are indispensable for livelihood support and food security, their long-term sustainability depends on effective management strategies, including community participation, policy enforcement, and livelihood diversification. Strengthening these measures is essential for balancing resource use with conservation goals in the study area.

1.0 Introduction

Non-timber forest products (NTFPs), broadly defined as biological resources derived from forests other than timber, constitute a vital component of rural livelihood systems in many developing countries. In Nigeria, where a large proportion of rural populations reside in close proximity to forest ecosystems, NTFPs provide essential goods such as food, medicinal materials, fuelwood, and income-generating products. These resources serve as critical safety nets, particularly for low-income households, by enhancing food security, supporting primary healthcare, and supplementing household incomes (Olaniyi et al., 2013; Jimoh and Haruna, 2007). Within forest reserves such as Onigambari Forest Reserve in Oyo State, the importance of NTFPs is especially pronounced. Forest-adjacent communities depend heavily on these resources for daily subsistence and economic activities. Despite their significance, NTFPs have historically received limited attention in forest management policies, which have largely prioritized timber extraction and commercial forestry. This imbalance has resulted in inadequate integration of NTFPs into sustainable forest management frameworks, thereby constraining their potential contributions to both conservation and rural development (Adaaja et al., 2024).

Empirical evidence from various parts of Nigeria underscores the socio-economic value of NTFPs. For instance, studies have shown that rural households particularly women derive substantial nutritional and financial benefits from the collection and utilization of wild vegetables, fruits, fuelwood, and medicinal plants (Olaniyi et al., 2013). In addition, earlier research has established a significant relationship between NTFP utilization and household food security, indicating that these resources play a crucial role in mitigating hunger and poverty (Odebode, 2000). More broadly, NTFPs function as coping mechanisms during periods of economic hardship or agricultural shortfalls, thereby enhancing household resilience (Jimoh, 2006; Jimoh and Haruna, 2007).

However, the increasing reliance on NTFPs raises important concerns regarding sustainability. Evidence from forest reserves in Nigeria suggests that NTFPs can contribute substantially to household income sometimes accounting for a significant share of total earnings yet their extraction is often unregulated and poorly monitored (Ekpo et al., 2017). Furthermore, several socio-institutional constraints, including weak policy enforcement, limited value addition, gender disparities in access to resources, and low awareness of sustainable harvesting practices, continue to undermine both conservation efforts and livelihood benefits (Azeez and Aiyedun, 1999; Forest and Forest Products Society, 2021). In the case of Onigambari Forest Reserve, there remains a paucity of comprehensive, site-specific studies examining the patterns of NTFP utilization, their contributions to livelihoods, and the challenges affecting their sustainable management. Addressing this gap is essential for informing evidence-based forest governance and promoting the sustainable use of forest resources.

Against this background, this study assesses the major types of NTFPs harvested in Onigambari Forest Reserve, evaluates their contributions to household income and food security, examines harvesting patterns and associated pressures, and identifies key challenges affecting their sustainability. The study further provides insights into practical strategies for enhancing

sustainable management, with the aim of balancing livelihood needs with long-term forest conservation objectives.

1.1. Conceptual Framework

This study was guided by the Sustainable Livelihood Framework (SLF), which explains how rural households utilize available natural, financial, human, and social resources to sustain their livelihoods (Timire et al. 2023). Within this framework, non-timber forest products (NTFPs) serve as important livelihood assets that contribute to household income, food security, healthcare, and socio-economic survival, particularly among forest-dependent communities. The framework further recognizes that livelihood strategies and patterns of resource utilization are influenced by socioeconomic conditions, institutional support, and environmental sustainability factors (Yang et al. 2026).

The application of the Sustainable Livelihood Framework in this study provides a basis for understanding the relationship between household dependence on NTFPs and the sustainability of forest resources within the Onigambari Forest Reserve. Similar frameworks have been widely applied in studies relating to rural livelihoods, forest-resource dependence, and community-based natural resource management (Bera and Nag, 2025; Bisui et al. 2023).

2.0 Materials and Methods

Study Area

The study was carried out in the Onigambari Forest Reserve (OFR), situated in Oluyole Local Government Area of Oyo State, southwestern Nigeria (Figure 1). The reserve covers an estimated land area of approximately 13,932 ha and lies within the transitional ecological zone between lowland semi-deciduous rainforest and derived savanna. This ecotonal setting supports a diverse assemblage of flora and fauna, including economically valuable non-timber forest product (NTFP) species. The reserve comprises both natural forest stands and plantation compartments, reflecting a history of forest management interventions. Surrounding the reserve are several rural communities whose livelihoods are closely linked to forest resources. These communities depend on the forest for food, medicinal products, fuelwood, and income generation, making the area suitable for assessing the dynamics of NTFP utilization and sustainable management (Adekunle et al., 2013; FAO, 2010).

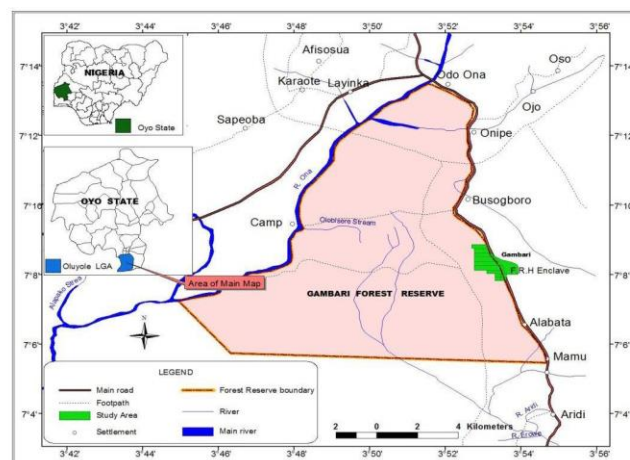


Figure 1: The Map of Onigambari Forest Reserve, Oyo State, Nigeria

Study Population and Sampling Design

The study targeted households and individuals actively involved in the collection, utilization, and management of non-timber forest products (NTFPs) within communities surrounding the Onigambari Forest Reserve. Respondents were selected based on their direct dependence on forest resources for livelihood and household sustenance. A purposive sampling technique was initially used to identify communities with active NTFP activities, after which respondents were selected proportionately across the study communities to ensure adequate representation, ensuring that only respondents with relevant knowledge and experience in NTFP activities were included in the study (Tongco, 2007). A total of 150 respondents were selected from five communities located around the reserve. This sample size was considered adequate to capture variability in NTFP utilization patterns, socio-economic characteristics, and management practices within the study area.

Information on respondents' socioeconomic characteristics, including gender, age, educational status, occupation, household size, and livelihood activities, was also collected to provide insight into household dependence on forest resources and patterns of NTFP utilization. The inclusion of respondents from different demographic and occupational backgrounds improved the representativeness of the study and enhanced understanding of variations in livelihood dependence and resource-use behaviour across the study area.

Data Collection

Data for the study were obtained through a combination of primary data collection methods, including structured questionnaires, key informant interviews, and direct field observations. Structured questionnaires were administered to households and NTFP traders to obtain quantitative information on the types of NTFPs harvested, frequency and seasonality of collection, and their primary uses, including food, medicinal purposes, and energy (fuelwood). The questionnaire also captured data on the contribution of NTFPs to household income, as well as respondents' socio-economic characteristics such as age, gender, and educational status. Key informant interviews were conducted with selected stakeholders, including community leaders, forestry officials, and leaders of local NTFP associations. These interviews provided in-depth qualitative insights into existing forest management practices, regulatory frameworks governing resource use, levels of community participation, and constraints affecting sustainable NTFP exploitation. Field observations were carried out to validate information obtained from respondents and to document on-ground realities. Observations focused on harvesting techniques, ecological conditions of the forest, species availability, and visible indicators of resource pressure such as overharvesting and habitat disturbance.

Data Analysis

Quantitative data obtained from the questionnaires were analyzed using descriptive statistical tools, including frequencies, percentages, and tabular presentations. These methods were used to summarize patterns of NTFP utilization, assess their contribution to household livelihoods, and identify key constraints associated with their exploitation (Creswell, 2014).

Qualitative data derived from key informant interviews and field observations were analyzed using thematic analysis. This involved coding and categorizing responses to identify recurring themes related to sustainable management practices, institutional arrangements, and community perceptions of NTFP use. The integration of quantitative and qualitative approaches enabled a comprehensive assessment of NTFP utilization and management, providing a more robust understanding of the socio-economic and ecological dimensions of forest resource use in the study area. In addition, chi-square (χ^2) analysis was used to determine the association between selected socioeconomic characteristics of respondents and their dependence on non-timber forest products at a 5% level of significance.

3.0 Results and Discussions

Table 1 presents the socioeconomic characteristics of respondents involved in the utilization of non-timber forest products (NTFPs) in communities surrounding the Onigambari Forest Reserve. Male respondents constituted the majority of participants, reflecting the dominant involvement of men in forest-based livelihood activities, particularly in resource harvesting and collection. This agrees with the findings of Chiwaya and Mzuza, (2022) who reported that men are active in forestry management than women

Most respondents were within the economically active age group of 31–50 years, indicating that NTFP-related activities are largely driven by individuals in their productive years. This suggests that forest resources remain an important source of livelihood and household support within the study area (Killian and Hyle, 2020). The educational profile showed that a considerable proportion of respondents had primary or secondary education, which may positively influence awareness of sustainable forest management practices and conservation initiatives (Jana et al. 2014; Lestari et al. 2015).

Farming and forest-product collection were the major occupations among respondents, emphasizing the strong dependence of rural households on forest ecosystems for subsistence and income generation. The predominance of medium to large household sizes further suggests increased reliance on forest resources to meet household needs, particularly for fuelwood, food, and medicinal products (Tenge, et al. 2004).

Table 1: Socioeconomic Characteristics of Respondents

Variable	Category	Frequency	Percentage (%)
Gender	Male	96	64.0
	Female	54	36.0
Age	21–30	18	12.0
	31–40	39	26.0
	41–50	52	34.7
	Above 50	41	27.3
	No formal education	22	14.7
Education	Primary	31	20.7
	Secondary	57	38.0
	Tertiary	40	26.6
	Farming	61	40.7
Occupation			

	Trading	34	22.7
	Forest product collection	39	26.0
	Civil service	16	10.6
Household Size	1–4	37	24.7
	5–8	71	47.3
	Above 8	42	28.0

The distribution of respondents across major non-timber forest product (NTFP) categories in Onigambari Forest Reserve (Table 2) reveals a high level of dependence on forest resources for both subsistence and income generation. Among the identified categories, fuelwood recorded the highest level of utilization (80%), indicating its dominant role as the primary source of household energy in the study area. This finding reflects the limited availability and affordability of alternative energy sources in rural communities and is consistent with reports that fuelwood remains the most widely used form of biomass energy across sub-Saharan Africa (Dalu et al. 2021). Fruits were utilized by 75% of respondents, highlighting their dual importance as both a dietary component and a source of income. Forest fruits such as *Irvingia gabonensis* and *Chrysophyllum albidum* are commonly traded in local markets, providing households with accessible cash income. This supports existing literature that emphasizes the role of forest fruits as economic safety nets and livelihood diversification options for rural populations (Botomia et al. 2026).

Edible plants were used by 68% of respondents, underscoring their contribution to household nutrition and food security. These plants, often consumed as vegetables or snacks, play a significant role in enhancing dietary diversity, particularly during periods of food shortage. Similar observations have been made in other forest-dependent communities where wild edible plants supplement staple diets and improve nutritional outcomes (Shackleton and Shackleton, 2004). Medicinal plants, although utilized by a comparatively lower proportion of respondents (52%), remain an important component of traditional healthcare systems. The continued reliance on species such as *Alstonia boonei* and *Nauclea latifolia* reflects both the cultural significance of indigenous knowledge and the limited access to formal healthcare services in rural areas (Rafiu et al. 2025).

The pattern of NTFP utilization indicates a multifaceted dependence on forest resources, with energy, food, and income emerging as key drivers. However, the high level of reliance on fuelwood and commercially valuable species raises concerns regarding sustainability. Without effective management strategies, such as regulated harvesting and community-based conservation approaches, continued exploitation may lead to resource depletion and forest degradation (Pandey et al. 2016).

The dominance of certain NTFPs within the study area may be associated with their high market demand, ease of accessibility, and importance in household livelihood support. Products such as fuelwood, medicinal plants, and edible forest resources are frequently utilized due to their direct economic and domestic value to rural households. In addition, weak enforcement of forest regulations and limited alternative livelihood opportunities may further encourage unsustainable extraction practices among local

communities. These findings suggest that both socioeconomic pressures and institutional limitations influence forest-use behaviour and resource dependence within the study area.

Table 2: Major Non-Timber Forest Products (NTFPs), Their Uses, and Proportion of Respondents in Onigambari Forest Reserve

NTFP Category	Representative Species	Primary Uses	Respondents (%)
Edible plants	<i>Vernonia amygdalina</i> , <i>Piper umbellatum</i>	Food, vegetables, snacks	68.0
Fruits	<i>Chrysophyllum albidum</i> , <i>Irvingia gabonensis</i>	Food, income generation	75.0
Fuelwood	<i>Prosopis africana</i> , <i>Anogeissus</i> spp.	Cooking, household energy	80.0
Medicinal plants	<i>Alstonia boonei</i> , <i>Nauclea latifolia</i>	Traditional medicine	52.0

Note: Percentages represent the proportion of respondents involved in the collection and/or utilization of each NTFP category (n = 150).

The results presented in Table 3 provide further insight into the socio-economic significance of non-timber forest products (NTFPs) in the study area, particularly in relation to household livelihoods, income generation, gender roles, and food security. A substantial proportion of households (61%) reported active involvement in the collection of NTFPs, indicating that forest resource extraction is a common livelihood activity among communities surrounding the Onigambari Forest Reserve. This level of participation reflects the accessibility of forest resources and their importance in supplementing rural livelihoods. Similar findings have been reported in forest-dependent communities across sub-Saharan Africa, where NTFP harvesting constitutes a key livelihood strategy (Qureshi and Kumar, 1998; Shackleton et al. 2008; Babulo et al. 2009; Chakona and Shackleton, 2017).

NTFPs contributed to the monthly income of 68% of respondents, underscoring their economic importance. This suggests that beyond subsistence use, NTFPs serve as a significant source of cash income, supporting household expenditures such as food, education, and healthcare. The role of NTFPs as income buffers during periods of economic instability has been widely documented, particularly among low-income rural households (Dalu et al. 2021). Gender participation analysis reveals that 63% of NTFP marketers are female, highlighting the prominent role of women in the processing and commercialization of forest products. This aligns with existing literature which identifies women as key actors in NTFP value chains, particularly in activities such as collection, processing, and local trade. The involvement of women in NTFP marketing not only contributes to household income but also enhances their economic empowerment and decision-making capacity within the household (Murray, 2002; Mukadasi and Nabalegwa, 2007; Mukoni, 2015).

The findings further indicate that NTFPs constitute an important source of livelihood support among households within the study area. Respondents relied on forest products for income generation, food supply, medicinal purposes, and household energy needs. Although detailed household income valuation was beyond the scope of this study, the high level of dependence observed suggests that NTFPs contribute substantially to rural livelihood sustenance and socioeconomic survival. Similar studies in sub-Saharan Africa have shown that forest products serve as important safety nets for low-income households, particularly in rural communities with limited livelihood alternatives (Kaoma and Shackleton, 2015; Suleiman et al. 2017).

In terms of food security, 45% of respondents reported incorporating forest-sourced vegetables into their meals. Although this proportion is lower compared to other indicators, it still reflects a meaningful contribution of NTFPs to dietary diversity and nutrition. Forest foods are known to provide essential micronutrients and serve as important supplements to staple diets, particularly in rural communities (Dalu et al. 2021). Overall, the findings demonstrate that NTFPs play a multifaceted role in supporting livelihoods in the study area, contributing to income generation, gender inclusion, and food security. However, the reliance on forest resources for both subsistence and economic purposes underscores the need for sustainable management practices. Without appropriate regulation and community-based governance systems, increasing exploitation could threaten the long-term availability of these resources and the livelihoods that depend on them (Makhado, 2008; Pandey et al. 2016; Dalu et al. 2021).

Table 3: NTFP Harvesting, Utilization, and Contribution to Household Livelihoods in Onigambari Forest Reserve

Parameter	Proportion of Respondents (%)
Households involved in NTFP collection	61.0
Contribution of NTFPs to monthly income	68.0
Female participation in NTFP marketing	63.0
Meals including forest-sourced vegetables	45.0

Note: Percentages represent the proportion of respondents reporting each livelihood indicator (n = 150).

The frequency of non-timber forest product (NTFP) collection in the study area (Table 4) reveals distinct patterns of resource dependence and utilization intensity across different product categories. These patterns provide important insight into the pressure exerted on forest resources and the socio-economic drivers of harvesting behavior. Edible plants exhibited the highest daily collection rate (54.6%), indicating their immediate importance in household consumption. This high frequency suggests that edible forest plants are not only supplementary food sources but are also integrated into daily diets. Such reliance reflects the role of wild edible plants in enhancing household food security and dietary diversity, particularly in rural and forest-dependent communities (Pandey, et al., 2016). The relatively lower weekly and monthly collection frequencies further

emphasize their routine use and perishability, which necessitates frequent harvesting.

Fruit species were also collected frequently, with 46.2% of respondents reporting daily collection and 35.4% weekly collection. This pattern reflects both subsistence use and commercial harvesting behavior. The high frequency of collection is associated with seasonal fruiting cycles and market demand for economically valuable species such as *Irvingia gabonensis* and *Chrysophyllum albidum*. Similar trends have been observed in other tropical forest systems where wild fruits serve as both nutritional and income-generating resources (Pandey and Shackleton, 2012). Fuelwood collection showed a relatively balanced distribution between daily (39.7%) and weekly (41.5%) activities, indicating its consistent role in household energy supply. The sustained demand for fuelwood reflects limited access to alternative energy sources in rural communities. This pattern aligns with findings that biomass energy remains the dominant cooking fuel in many developing regions, particularly in sub-Saharan Africa (Tietema et al. 1991; Mashabane et al, 2001; Makhado, 2008; Dalu et al. 2021). The moderate monthly collection rate (18.8%) may reflect bulk harvesting practices or storage strategies in some households. Medicinal plants were the least frequently collected on a daily basis (21.4%) but showed the highest weekly (49.6%) and monthly (29.0%) collection rates. This indicates that medicinal plant harvesting is largely need-based rather than routine. The episodic nature of collection reflects their use in response to illness rather than daily consumption. This finding is consistent with studies showing that traditional medicinal plant use is often demand-driven and embedded in indigenous healthcare systems (Rafiu et al. 2025).

The results demonstrate varying intensities of pressure on different NTFP categories, with edible plants and fruits experiencing higher harvesting frequency compared to medicinal plants. These patterns have important implications for sustainable forest management, as frequently harvested resources are more vulnerable to overexploitation. Therefore, there is a need for regulated harvesting practices and community-based management strategies to ensure the long-term sustainability of these resources (Crane et al. 2017; Manju and Ahad, 2021).

Table 4: Frequency of Non-Timber Forest Product (NTFP) Collection in Onigambari Forest Reserve

NTFP Type	Daily (%)	Weekly (%)	Monthly (%)
Edible plants	54.6	28.3	17.1
Fruits	46.2	35.4	18.4
Fuelwood	39.7	41.5	18.8
Medicinal plants	21.4	49.6	29.0

The findings presented in Table 5 highlight key challenges undermining the sustainable management of non-timber forest products (NTFPs) in the Onigambari Forest Reserve. These constraints reflect both ecological pressures and institutional weaknesses that collectively threaten the long-term availability of forest resources. Overharvesting was identified as the most significant challenge, reported by 62% of respondents. This suggests that the high dependence on NTFPs for subsistence and income, evident in earlier results has translated into increased

extraction pressure on forest resources. Frequent harvesting, particularly of edible plants and fuelwood, may exceed natural regeneration rates, thereby contributing to resource depletion and forest degradation. Similar concerns have been documented in tropical forest systems where unregulated exploitation of NTFPs leads to declining species populations and ecosystem instability Akindele et al. 2021; Kumar et al. 2021; Imarhiagbe et al. 2020).

Weak enforcement of forest policies was reported by 48% of respondents, indicating gaps in institutional capacity and governance. Ineffective monitoring and limited implementation of existing regulations can encourage unsustainable harvesting practices, as resource users may exploit forest products without adherence to conservation guidelines. This finding aligns with studies emphasizing that weak governance structures are a major barrier to sustainable forest resource management in many developing countries (Areki and Cunningham, 2010). Low awareness of sustainable harvesting practices (41%) further exacerbates the problem, suggesting that many resource users lack adequate knowledge of conservation principles such as selective harvesting, rotational use, and species protection. This highlights the need for targeted extension services and environmental education programs to promote sustainable resource use among local communities (Antwi-Agyei and Stringer, 2021).

Additionally, 37% of respondents identified limited alternative livelihood opportunities as a constraint. This indicates that heavy reliance on forest resources is partly driven by a lack of viable income alternatives. In such contexts, communities are more likely to intensify resource extraction to meet their economic needs, increasing the risk of overexploitation. Previous studies have shown that livelihood diversification is essential for reducing pressure on forest ecosystems and enhancing sustainability (Jimoh et al. 2026; Kimengsi et al. 2019). The challenges identified are interrelated and reinforce one another. For instance, limited livelihood options and low awareness can intensify overharvesting, while weak policy enforcement allows such practices to persist unchecked. Addressing these issues requires an integrated approach that combines effective governance, community participation, capacity building, and livelihood diversification strategies. Without such interventions, the sustainability of NTFPs in the Onigambari Forest Reserve may be significantly compromised.

The sustainability of non-timber forest products within the study area may be threatened by increasing harvesting pressure, weak enforcement of forest management regulations, and limited awareness of sustainable harvesting practices among local resource users. Continuous dependence on forest resources without adequate conservation measures could lead to gradual depletion of valuable plant species and reduced forest productivity over time. This finding underscores the need for community-based forest management strategies, environmental education, and improved policy implementation to ensure the sustainable utilization of forest resources. Similar concerns regarding unsustainable harvesting and weak governance have been reported in tropical forest ecosystems across sub-Saharan Africa (Dehmel et al. 2022).

Table 5: Reported Challenges Affecting the Sustainability of Non-Timber Forest Products in Onigambari Forest Reserve

Challenge	Respondents (%)
Overharvesting	62.0
Weak enforcement of forest policies	48.0
Low awareness of sustainable practices	41.0
Limited alternative livelihood opportunities	37.0

Note: Percentages represent the proportion of respondents identifying each factor as a constraint to sustainable NTFP management (n = 150).

The chi-square analysis revealed that selected socioeconomic variables significantly influenced respondents' dependence on non-timber forest products within the study area (Table 6). Gender, educational status, and household size showed significant associations with NTFP dependence ($p < 0.05$), suggesting that household characteristics play important roles in shaping patterns of forest resource utilization. Larger households and respondents with lower educational attainment were more likely to depend heavily on forest products for livelihood support. Similar findings have been reported in previous rural livelihood and forest-dependence studies in sub-Saharan Africa (Jana et al. 2014; Lestari et al. 2015).

Table 6: Association between socioeconomic variables and dependence on NTFPs

Variable	χ^2 Value	p-value	Decision
Gender	5.62	0.018	Significant
Education Level	8.14	0.043	Significant
Household Size	7.31	0.026	Significant

The Livelihood Dependence Index revealed that a substantial proportion of households within the study area exhibited moderate to high dependence on non-timber forest products for livelihood sustenance (Table 7). This highlights the important contribution of forest resources to household income, food security, and rural survival. The high level of dependence observed may be attributed to limited livelihood alternatives and the accessibility of forest resources within the surrounding communities. Similar findings have been reported in previous studies on rural forest dependence in sub-Saharan Africa (Wale et al. 2022; Lee et al 2017; Sharma, 2019).

Table 7: Livelihood Dependence on NTFPs

Dependence Category	Frequency	Percentage (%)
High dependence	72	48
Moderate dependence	51	34
Low dependence	27	18

Increasing dependence on non-timber forest products may expose valuable forest species to continuous harvesting pressure, particularly where conservation measures and monitoring systems are weak. Unsustainable harvesting practices, seasonal exploitation of highly demanded products, and inadequate enforcement of forest regulations could contribute to gradual depletion of vulnerable species within the forest ecosystem. This

highlights the importance of strengthening community-based conservation practices, environmental awareness, and sustainable harvesting strategies to ensure long-term availability of forest resources for future generations.

4.0 Conclusions

This study demonstrates that non-timber forest products (NTFPs) constitute a critical component of rural livelihoods in communities surrounding the Onigambari Forest Reserve, Oyo State, Nigeria. The findings reveal a high level of dependence on diverse NTFP categories for household energy, food, income generation, and healthcare. Fuelwood and forest fruits emerged as the most widely utilized resources, reflecting their central role in meeting daily subsistence and economic needs, while edible and medicinal plants contribute significantly to dietary diversity and traditional health systems. The patterns of utilization and harvesting frequency indicate varying degrees of pressure on forest resources, with frequently harvested products such as edible plants and fuelwood being particularly vulnerable to overexploitation. Although NTFPs provide substantial socio-economic benefits, their sustainability is increasingly threatened by challenges such as overharvesting, weak enforcement of forest regulations, limited awareness of sustainable practices, and inadequate alternative livelihood opportunities. These findings underscore the urgent need for integrated and community-centered management approaches that balance livelihood needs with conservation objectives. Strengthening institutional frameworks, promoting environmental education, and enhancing access to alternative income sources are essential for reducing pressure on forest resources. Furthermore, encouraging participatory forest management and the adoption of sustainable harvesting techniques can help ensure the long-term availability of NTFPs. Therefore, sustainable management of NTFPs in the Onigambari Forest Reserve is not only vital for conserving forest biodiversity but also for safeguarding the livelihoods and well-being of forest-dependent communities.

Acknowledgements

The authors would like to express their gratitude to the Management of Forestry Research Institute of Nigeria for the support provided while carrying out this research.

Declaration of conflict of interest

The authors have collectively contributed to the conceptualization, design, and execution of this journal. They have worked on drafting and critically revising the article to include significant intellectual content. This manuscript has not been previously submitted or reviewed by any other journal or publishing platform. Additionally, the authors do not have any affiliation with any organization that has a direct or indirect financial stake in the subject matter discussed in this manuscript.

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