HOUSEHOLD DEPENDENCE ON FOREST RESOURCES IN RURAL ENCLAVE OF AGO-OWU, OSUN STATE, NIGERIA

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Abstract
Forest ecosystems remain vital to rural households; however, growing socio-economic pressures and weak enforcement of conservation policies have intensified resource depletion in Nigeria. This study assessed household dependence on forest resources in Ago-Owu, Osun State, focusing on utilization patterns, socio-economic drivers, and conservation awareness. Data were obtained from 120 households using structured questionnaire, and analyzed using descriptive statistics, Chi-square, and Pearson correlation tests. The results indicated active participation of both men (n = 68) and women (n = 52) in forest-related activities, with most respondents (43%) being middle-aged (31-50 years). Educational attainment was generally low, as 62% had no formal education or only primary schooling. Most (76%) households earned between ₦200 000 and ₦400 000 (USD$ 130-270) annually. In addition, bush meat (n= 44) and fuel wood (n= 38) were the most utilized forest products, primarily for household needs (61%) such as cooking fuel, food, and shelter. Household size (r = 0.42, p < 0.05) correlated positively with forest dependence, while income (χ^2= 34.612, p= 0.001) and education level (χ^2= 9.434; p= 0.001) were significant determinants of resource reliance. Although, general awareness of conservation laws was moderate (58%), adoption of sustainable practices was low, with only 23% of respondents involved in tree planting and/or selective harvesting. The findings highlight the socio-economic importance of forest resources in sustaining rural households and emphasizes the need for livelihood diversification, improved forest governance, and enhanced environmental education in Ago-Owu and/or similar contexts.

Keywords: Forest, households, reliance, rural, socio-economic factors, sustainable practices

Introduction

Forests are among the most essential ecosystems on Earth, providing vital ecological services and supporting the livelihoods of an estimated 1.6 billion people globally (World Bank, 2022). For many rural communities, particularly in developing countries, forest resources such as fuel wood, wild foods, timber, and medicinal plants are indispensable for subsistence and income generation (FAO, 2020; Angelsen *et al*., 2024). In sub-Saharan Africa, where poverty, limited infrastructure, and unemployment persists, forests often serve as a major source of livelihood security and resilience during periods of economic or agricultural stress (Cavendish, 2020).

Nigeria, one of West Africa's largest countries by forest cover, depends heavily on its forest resources for rural welfare and

economic stability (Shackleton *et al*., 2017). Forest products contribute substantially to the daily needs of rural households, providing energy, food, and income through the harvesting and sale of non-timber products such as bush meat, fuel wood, herbs, and poles (Arowosoge and Popoola, 2016; Babulo *et al*., 2019). For many poor households, forest-derived income serves as a crucial supplement to farming, especially during lean agricultural seasons (Malla *et al*., 2013). Fuel wood, in particular, remains the dominant energy source for cooking in rural Nigeria, with more than 70% of households depending on it (NPC & ICF, 2019). Studies by Adewuyi and Olofinbiyi, (2018) and Ajewole *et al.* (2021) confirm that this dependence persists due to poverty, high energy costs, and limited access to modern alternatives such as liquefied petroleum gas or electricity.

Despite the economic and ecological significance, Nigeria's forests face rapid degradation. The country is ranked among the top globally in deforestation rates, losing about 3.7% of its forest cover annually due to agricultural expansion, illegal logging, and fuel wood extraction (Global Forest Watch, 2020; Nasi *et al*., 2021). Although several policies such as the Forestry Act of 1956 and the National Forest Policy of 2006 were developed to regulate forest exploitation, their implementation remains weak (FME, 2016; NBS, 2020). Many forest reserves are underfunded, poorly monitored, and suffer from encroachment, while local communities often lack awareness or incentives for conservation (Chao, 2022; Onyekwelu *et al*., 2023).

Another constraint is the limited availability of viable livelihood alternatives in rural areas (Ellis, 2020). With a majority of households relying on forest products, pressure on forest resources has intensified (Ogunjinmi *et al*., 2023; Olagunjui *et al*., 2022). Scholars such as Oladeji *et al*. (2021) and Ajibade and Adebayo (2020) argue that forest conservation in Nigeria can only succeed when local livelihoods are integrated into sustainable resource management strategies. Programs promoting the use of improved cook stoves, small-scale agroforestry, or non-forest based income diversification can reduce dependency and foster conservation compliance (Scoones, 2018; Ojo *et al.*, 2020).

Given these challenges, understanding how rural households depend on forest resources and the socio-economic factors influencing their use is essential. Therefore, this study examined household dependence on forest resources in Ago-Owu, Osun State, Nigeria, an ecologically significant area where forest exploitation remains a key livelihood source. The research employs the Sustainable Livelihoods Framework (SLF) to explore how households mobilize different forms of capital, i.e. natural→ human → financial → social → physical to sustain their lives within an environment of ecological vulnerability (Figure 1; DFID, 2009). This approach links the socio-economic factors with resource dependence, and conservation awareness, providing context-specific insights for policy and community-based management.

Therefore, this study aims to respond to a gap in knowledge by assessing the types and purposes of forest resource use among rural households, analyzing socio-economic factors influencing dependence, and evaluating local awareness of forest conservation practices in Ago-Owu, Osun state, Nigeria. To address these, the following research questions were raised (1) What types of forest resources are used by rural households in Ago Owu? (2) What is the purpose of household dependence on these forest products? (3) What socio-economic factors influence forest resource use among households? (4) What level of awareness exists among households regarding forest conservation and sustainability? By shedding light on the socio-economic realities of forest use, the study is expected to inform more inclusive and locally grounded approaches to sustainable forest management in Ago-Owu, Nigeria and/or similar forest-dependent communities elsewhere.

Methodology

Study Area

The study was conducted in Ago-Owu community, located within the Ago-Owu Forest Reserve in Osun State, southwestern Nigeria (Figure 2). The reserve is one of the largest forest areas in the state and forms part of Nigeria's moist lowland rainforest ecosystem. Geographically, the area is located between latitude 7°15′N and 7°45′N and longitude 4°00′E and 4°30′E. The area experiences a tropical climate with two distinct seasons: a wet season from April to October and a dry season from November to March. Annual rainfall averages between 1 200 mm and 1 500 mm, while mean annual temperatures range from 25°C to 28°C (Ogunjinmi *et al*., 2023). The communities around Ago-Owu rely heavily on the forest for their livelihoods, with common activities including farming, fuelwood collection, hunting, and gathering of medicinal plants and poles. Subsistence farming of crops like cassava, yam, maize, and vegetables is complemented by seasonal forest harvesting, which serves as both a source of income and a coping mechanism during agricultural off-seasons. The proximity of these communities to the forest reserve means households have direct and relatively easy access to forest resources, although access is regulated by the State Forestry Department (OSG, 2021).

Sampling Procedure

A multi-stage sampling technique was employed to select respondents for the study. In the first stage, Ago-Owu was purposively chosen due to its proximity to the forest reserve and the large number of households engaged in forest-related activities. In the second stage, four (4) villages were randomly selected from settlements surrounding the reserve to capture variations in household access and forest dependence.

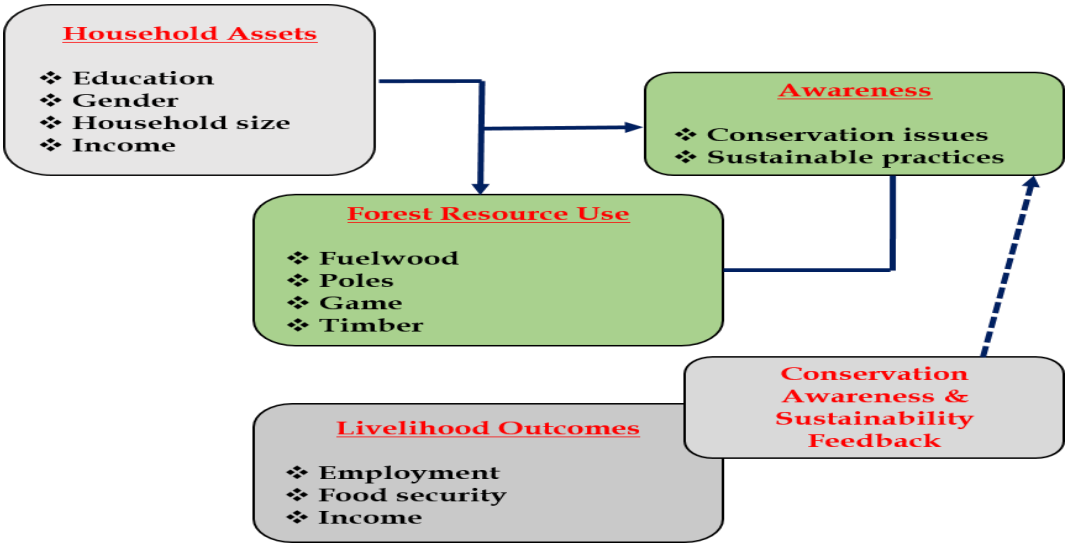

Figure 1: Conceptual framework of the study adopted from DFID, 2009

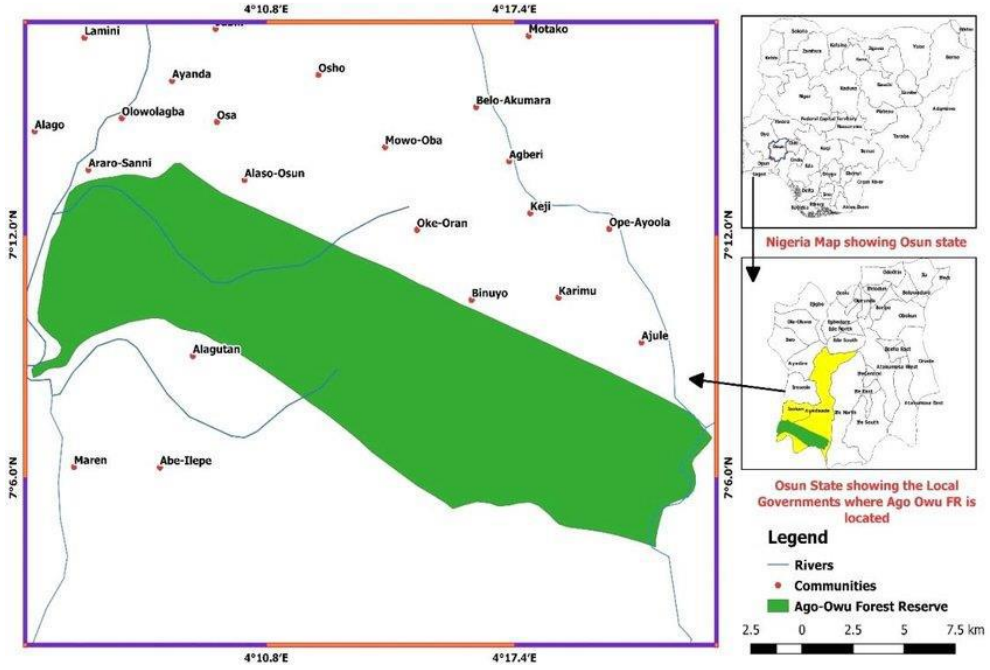

Figure 2: Schematic of Ago-Owu community, Osun State, Nigeria (OSG, 2021)

In the third stage, systematic random sampling was used to select households within each village. Household lists were obtained from village heads, and every *k*th household (i.e. the sampling interval, obtained by dividing the total number of households in the sampling frame by the desired sample size) was selected until the required sample size was reached (Etikan *et al*., 2016). The total of 120 households was derived using Yamane's (1967) formula for finite populations, with adjustments for potential non-responses.

Computational procedure (Yamane, 1967) is expressed as:

$$n = \frac{N}{1+N(e)^2} \qquad (i)$$

Where: n = sample size; N = population/ household size; e= level of precision at 0.05

Data Collection

Consistent with previous studies (see Bernard, 2017; Kothari, 2014), primary data were collected through the administration of structured questionnaire and Key Informant Interviews (KIIs). The questionnaire was designed to elicit information regarding (i) individual demographic profiles such as age (in years), gender, household size, education and income; (ii) types and frequency of forest resource use; (iii) purposes of resource use i.e. subsistence, sale, cultural, etc.; (iv) perceived changes in resource availability over time; and (v) awareness of forest conservation policies and practices. A pre-test of the questionnaire was done in a non-sampled village within the same location to ensure clarity, reliability, and cultural appropriateness. Based on feedback from the pre-test, adjustments were made to language and sequencing of questions. Furthermore, KIIs were conducted with community leaders and forestry officials to ground-truth household survey findings and enhance the contextual understanding of the study area.

Data Analysis

To respond systematically to each of the objectives in the study, analytical procedures unique to each objective was applied (see Table 1)**.** Descriptive statistics such as frequencies, percentages, and means were used to summarize socio-economic profiles and forest resource use patterns. The Chi-square test (χ^2) was used to assess associations between individual socio-economic measure and dependence on forest resources. In addition, Pearson correlation coefficients were used to examine relationships between continuous variables such as household size and quantity of forest products used. The qualitative data from KIIs were analyzed thematically, identifying recurring patterns and narratives that illustrated the real experiences of forest dependence (see Field, 2023; Braun, 2016). These findings were integrated into the discussion to enrich interpretation of the quantitative results.

Table 1: Research Objectives and Data Analysis Matrix

Objectives	Data Sets	Statistical Analysis	Deliverables
(i) Identify types of forest products used by households	- List of products - Frequency of use	**Quantitative:** **Descriptive statistics:** - Frequency - Percentage	- Compendium of forest products - Extent of use
(ii) Examine purposes and frequency of forest resource use	- Purpose - Usage limit	**Quantitative:** - Cross-tabulations - Percentages	- Reasons for forest dependence - Primary - Minor
(iii) Analyze individual socio-economics factors influencing dependence	Demographic measure - Household size - Income - Literacy level - Employment status	**Quantitative:** - Chi-square - Pearson's correlation	- Relationship between socio-economic traits and forest dependence
(iv) Highlight awareness of conservation and sustainable practices	- Knowledge of forest laws - Sustainable practices	**Descriptive statistics:** - Thematic analysis	- Local conservation awareness - Gaps in knowledge

Ethical Considerations

This study adhered to the ethical principles for social research. Participation was entirely voluntary, and informed consent was obtained from all respondents before the interviews. No personal identifiers were collected, and confidentiality was maintained throughout the study. The research did not involve any animal or clinical experimentation.

Results and Discussion

Socio-economic profiles of respondents

The socio-economic profile of the respondents provides important context for understanding patterns of forest resource dependence in Ago-Owu, Osun State, Nigeria (Table 2). Out of the 120 respondents surveyed, 57% (n = 68) were male and 43% (n = 52) were female, indicating that both men and women were actively engaged in forest-related activities, though men slightly dominate. The age distribution showed that the majority (60.9%) were between 31-50 years, followed by 27% aged above 50 years, and 13% aged 30 years or below, suggesting that forest dependence spans across different age groups, but peaks among middle-aged adults who are in their most active years. Educational attainment was generally low such that about 62% of respondents either had no formal education or had completed primary education, and only 38% had secondary or higher education. In terms of household size, most (45%) of the respondents reported living in households of 5-8 members, while 34% had 1-4 persons and 21% had over 9 individuals. Income levels varied but were generally low. A significant majority (76%) reported earning between

₦200 000 and ₦400 000 annually (USD$ 130-270), while the remainder (24%) earned less than ₦200 000 or above ₦400 000. This low-income bracket underscores the economic vulnerability of the households and partly explains the reliance on freely available forest products as a means of supplementing both food and income needs (Shackleton *et al*. (2017). Primary occupations included farming (56%), forest product harvesting and trade (24%), and other informal sector jobs (19%). This indicates that agriculture remain a dominant livelihood, but a substantial proportion of respondents rely directly on the forest as a source of income.

Table 2: Demographic information of the respondents

Socio-economic measure[++]	Number of respondents (n = 120)	Percentage (%)
Age (in years)		
20 - 30	15	12.5
31 - 40	35	29.2
41 - 50	38	31.7
> 50	32	26.6
Gender		
Male	68	56.7
Female	52	43.3
Educational attainment		
No formal education	28	23.3
Primary	46	38.3
Secondary	36	30.0
Tertiary	10	8.3
Income per annum (₦' 000)		
< 200	18	15.0
200 – 400	91	75.8
More than 401	11	9.2
Household size		
1 - 4	41	34.2
5 – 8	54	45.0
> 9	25	20.8
Primary occupation		
Farming	67	55.8
Trading	29	24.2
Others	24	20.0

[++]Rounding may result in number not adding up to 100%; ₦ is the Nigerian currency *Naira* (USD$ = ₦1 510); (Source: Authors' analysis)

Types and Uses of Forest Resources

The study revealed that households in Ago-Owu depend on a diverse range of forest products for varying purposes (Figure 3). Overall, Bush meat (n = 44) and fuel wood (n = 38) were the most frequently cited forest resources. This aligns with national patterns, where bush meat is consumed primarily for protein and occasionally sold for cash. In addition, fuel wood remains the primary cooking energy source for rural households owing to the limited availability of affordable alternative energy sources. (NPC & ICF, 2019). Household size (r = 0.42, p < 0.05) showed a positive correlation with forest dependence, suggesting that larger households tend to consume more forest products. This relationship is intuitive, such that the higher the household demand for energy, construction materials, and food, the greater the pressure of extraction on forest resources (Vedeld *et al*., 2017). Other products, such as timber and poles (n = 14), medicinal plants (n = 8), fruits and nuts (n = 12) though smaller in number, highlights the diversity of forest resources that contribute to rural livelihood strategies for many households.

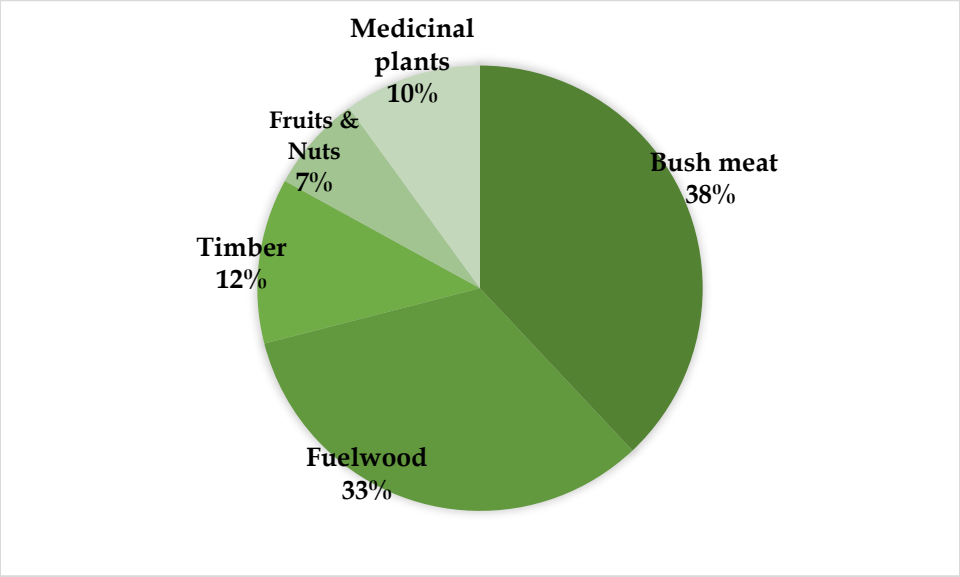

Figure 3: Diverse Forest resources used in the study area; (Source: Authors' analysis)

Similarly, 61% of the respondents reported the use of forest products mainly for personal needs and household upkeep like cooking fuel, food, and shelter materials (Figure 4). In addition, 39% combined subsistence with commercial use. The Chi-Square test revealed that income (χ^2= 34.612, p= 0.001) emerged as a significant factor such that households earning below ₦400 000 annually relied more on forest products for both cash and subsistence use compared to those earning above this threshold. This

aligns with findings by Kamanga *et al*. (2019) and Babulo *et al*. (2019), who noted that low-income households often depend on forests as a primary safety net. In addition, education level (χ^2= 9.434; *p*= 0.001) had an inverse relationship with dependence, i.e. households where the head had no formal education exhibited higher dependence compared to those with secondary or higher education. This supports the argument that education enhances access to alternative livelihoods and improves awareness of conservation issues (Adhikari *et al*., 2014). The dominance of subsistence use in the study suggests that forest resources remain a critical safety net, especially for low-income households, consistent with Vedeld *et al*. (2017) findings that rural forests serve as a natural insurance against poverty and income shocks. These results highlight the multifunctional role of the forest in rural livelihoods providing energy, food, medicinal resources, and construction materials but also suggest potential sustainability concerns if harvesting rates are not regulated.

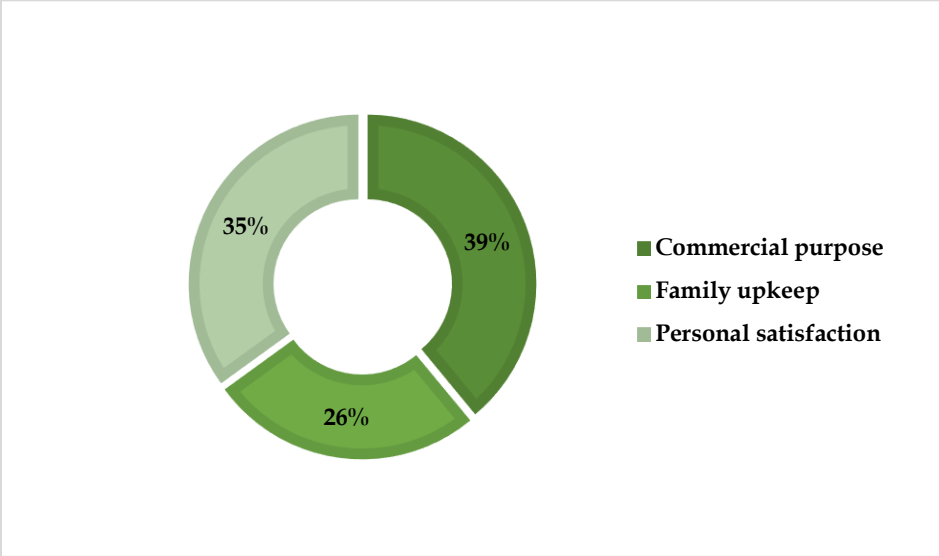

Figure 4: Pattern of use of forest resources in Ago-Owu; (Source: Authors' analysis)

Awareness of Forest Conservation and Sustainable Use

The *"thematic analysis"* revealed mixed levels of awareness regarding forest conservation and sustainable use among respondents (Table 3). More than half (58%) of the respondents had heard of forest conservation laws or regulations, yet only 27% could describe specific rules governing the Ago-Owu Forest Reserve. This suggests while basic awareness exists, detailed understanding is lacking. Similar patterns have been reported by Ofoegbu *et al*. (2017) and Inoni *et al*. (2022), where rural communities were generally aware of conservation laws but often lacked full comprehension of their scope. The respondents also demonstrated a relatively narrow perception of conservation impacts in the study area (Table 3). For instance, when

asked about the consequences of overexploitation, they were more likely to mention immediate effects such as reduced availability of forest products (22%) and loss of biodiversity (46%), with only 12 % recognizing broader ecological consequences like climate change or soil erosion. This finding aligns with Ofoegbu *et al*. (2017), who observed that conservation is often associated with short-term resource availability rather than the broader integrity of ecosystems.

Regarding sustainable practices, adoption levels were low (Table 3). Only 34% reported engaging in at least one conservation-related activity, such as selective harvesting or tree planting. Notably, these practices were mostly self-initiated rather than the result of formal training. Indeed, 72% of respondents stated they had never received any formal training on sustainable forest management. Appiah *et al*. (2019) demonstrated in Ghana that community-based forest management and training programs significantly improved conservation compliance, suggesting similar approaches could benefit Ago-Owu. Overall, the findings reveal a persistent gap between awareness and effective practice, driven by limited technical knowledge and insufficient extension services. Strengthening community-based training and participatory forest management could bridge this gap and enhance sustainable forest use in the area.

Table 3: Themes derived on awareness and practices related to forest conservation and sustainable use

Themes**	Number of respondents (n = 120)	Percentage (%)
General Awareness		
Heard about forest conservation laws/regulations	70	58.2
Can accurately explain specific rules governing Ago-Owu Forest Reserve	32	26.7
Perceived Consequences of Overexploitation		
Mentioned environmental effects i.e. biodiversity loss	55	45.8
Mentioned reduced availability of forest products	26	21.7
Mentioned broader ecological issues, e.g., climate change	14	11.7
Sustainable Practices		
Engaged in at least one conservation-related activity like tree planting	41	34.2
Never received formal training on sustainable forest management	86	71.6

**Rounding may result in number not adding up to 100%; (Source: Authors' analysis)

Conclusion and Recommendations

The study showed that rural households in Ago-Owu rely on forest resources for both subsistence and income. Men and women are equally involved, with most participants aged 31-50 years and having no formal education. Most households earn between USD$ 130-270 annually, highlighting the forests as both an economic safety net and a source of essential needs. Bush meat, fuel wood, timber, and non-timber forest products remain crucial for energy, nutrition, and income. Socio-economic factors, especially income, household size, and education, significantly influenced forest dependence. Although general awareness of conservation laws exists, detailed knowledge of regulations and sustainable harvesting is limited, and adoption of conservation practices remains low, threatening long-term forest availability. The findings underscore the need to integrate livelihood support, poverty alleviation, and environmental education into forest conservation strategies. Recommended actions include strengthening environmental education and extension services to improve understanding of conservation laws and sustainable harvesting, and promoting livelihood diversification and affordable alternative energy sources to reduce over-reliance on forest resources. These measures, if effectively implemented could sustain forests while improving rural households' welfare of in the study area and similar forest-dependent regions.

Declaration of Conflict of Interest: There is no conflict of interest between the authors

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