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Human Activities and Livelihood Dependence as Drivers of Deforestation in Agudu Forest Reserve

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Abstract

Deforestation remains one of the most pressing environmental challenges in Nigeria, particularly in the Guinea Savannah, where agricultural expansion, fuelwood extraction, and weak governance converge. This study assessed the human activities driving forest decline in Agudu Forest Reserve, Lafia Local Government Area of Nasarawa State. Data were collected from 50 respondents using structured questionnaires, direct field observations, and photographic evidence. The results were analyzed using descriptive and inferential statistics, including frequencies, percentages, chi-square tests, and regression analysis. Findings revealed that access to the reserve is almost unrestricted, with 98% of respondents confirming entry rights and 62% visiting very often. Farming was the leading reason for entry (60%), followed by hunting, fishing, and fuelwood collection. Livelihood dependence on the forest was high, as 76% of respondents relied on it for income, most of which was generated year-round. Awareness of deforestation was relatively high (76%), and while only half of respondents acknowledged their personal role in forest loss, 96% expressed willingness to comply with restrictions, and all indicated readiness to plant trees if provided with seedlings. These results suggest that deforestation in Agudu is driven more by livelihood needs than by ignorance, and that communities could be mobilized for conservation. The study concludes that effective conservation requires balancing forest protection with local survival needs. It recommends alternative livelihood programmes, community-based afforestation, clean energy access, and stronger governance mechanisms.

Keywords

Forest governance; Community participation; Conservation policy; Sustainable forest management

1. Introduction

Forests are more than trees; they are home, lifeline, and climate regulator. They harbor biodiversity, store carbon, maintain rainfall, and support livelihoods. Yet today the world is losing them at an alarming rate [1, 2]. In 2023 alone, tropical primary forests shrank by about 3.7 million hectares, the equivalent of almost 10 football fields disappearing every minute [3]. Global deforestation increased by roughly 4% in 2022 compared to 2021, amounting to more than 6.6 million hectares lost [4]. The greenhouse gas emissions from this forest loss were estimated at 2.7 gigatons of CO_2, nearly as much as India's annual fossil fuel emissions. These losses not only accelerate climate change but also undermine biodiversity, water security, and the livelihoods of millions of forest-dependent people worldwide. Nigeria is a land of forests, but they are shrinking fast. Between 2021 and 2024, Nigeria lost about 922,000 hectares of natural forest which is over 400 million tonnes of carbon stock gone [5]. Overall, since 2000, tree cover decline has been around 10-11% of what it was [1]. Much of this comes from natural high forest zones and protected reserves that are supposed to be spared from degradation, yet still face pressures. To respond, Nigeria has put several policies in place. It developed a National REDD+ Strategy to help reduce emissions from deforestation and degradation, and has submitted revised forest emission levels tied to its Paris Agreement commitments [6]. States like Cross River, which hold large swathes of remaining forest, are leading with sub-national REDD + plans and new forest protection safeguards. Nevertheless, policy is not enough by itself. Weak enforcement, land tenure conflicts, hike in fuel pump price, rising demand for fuelwood, agricultural expansion, and illegal logging continue to undermine the law. For people living close to forests, forests are part of everyday life, a source of income, fuel, and food; they often cannot afford to wait for large-scale interventions. Because of this, deforestation persists, especially near forest margins [7-9].

Nasarawa State, in Nigeria's north-central region, reflects this national story of forest decline on a smaller scale. Once rich in Guinea Savannah woodlands and plantation forests, it has seen large areas cleared for farming, grazing, and settlement. The Agudu Forest Reserve in Lafia Local Government is one of the most important forest estates in the state. Originally established as a teak (*Tectona grandis*) plantation in the early 1980s, it was meant to provide sustainable timber and environmental protection [10]. However, much of the original stand has been harvested, leaving behind coppices and degraded plots that are now heavily encroached by surrounding communities [11]. For local people, mainly the Koro (Migili), Alago, Gwandara, Eggon, Hausa, and Fulani, the forest is not just land; it is farmland, grazing space, a source of poles and firewood, and even a place for cultural practices. The socio-economic dependence of these communities on Agudu mirrors the national challenge: conservation targets collide with daily survival needs. Without new approaches, the reserve risks being lost entirely to agriculture, uncontrolled logging, and other pressures

Across Nigeria, the pressures facing forests are often the same, and Agudu is no exception. Farming is the most visible driver, with communities clearing forest land each season to plant cassava, maize, yams, and other staples. Fuelwood collection is another daily reality; about 70% of Nigeria's population still relies on wood or charcoal for cooking energy [12, 13]. Logging, both licensed and illegal, continues to strip valuable timber, while cattle grazing prevents the natural regeneration of tree seedlings. Beyond these, local practices like hunting, fishing, and harvesting of herbs also chip away at the reserve's ecological balance. These activities are not simply acts of neglect; they are survival strategies for households with limited access to modern energy, formal jobs, or alternative income sources. Population growth and poverty compound the problem, creating a cycle where dependence on forest resources steadily erodes the very resource base that sustains livelihoods [14, 15].

Although many studies have examined deforestation across Nigeria, most focus on broad national patterns or on well-known high forest areas such as Cross River and Ogun States [16, 17]. Far fewer have explored how small reserves like Agudu are being reshaped by the everyday activities of surrounding communities. Where local-level studies do exist, they often concentrate on timber yields or plantation growth variables, rather than the social drivers of forest decline and how these link to rural livelihoods [11]. This leaves a critical gap. There is no doubt that human dependence on forests is intense, but detailed insight into how communities around smaller reserves perceive their own activities, balance livelihood needs with conservation pressures, and respond to the idea of restrictions or reforestation is lacking. Understanding this interplay at the grassroots level is essential if sustainable management strategies are to move beyond policy rhetoric and become grounded in the realities of people's daily lives.

Building on these gaps, this study set out to evaluate the impact of human activities in and around Agudu Forest Reserve that are contributing to deforestation. Specifically, the objectives were to: (i) identify the major socio-economic activities carried out by local communities within and around the reserve; (ii) assess the level of community awareness of deforestation and their willingness to adopt conservation practices; and (iii) examine the extent to which livelihoods are dependent on forest resources. The hypotheses of the study assumed that human activities such as farming, fuelwood collection, and logging have a significant negative effect on Agudu Forest Reserve. Secondly, the awareness of deforestation among local dwellers is low and does not significantly influence their forest-use behaviour. Thirdly, livelihood dependence on forest resources is a major factor driving continued encroachment into the reserve.

2. Materials and Methods

2.1 The study area

Agudu Forest Reserve is located in Lafia Local Government Area of Nasarawa State, North-Central Nigeria, between latitude 08°N and longitude 09°E. The reserve covers approximately 161 hectares, originally established as a Tectona grandis (teak) plantation in the early 1980s. The climate is typically Guinea Savannah, characterized by a wet season from April to November and a dry season from December to March. Average annual rainfall is about 1,200-1,600 mm, while mean monthly temperatures range from 20°C in the cooler months to over 36°C at the peak of the dry season [18]. The soils are generally loamy to clayey, with some swampy patches used as fadama for dry-season cultivation. The vegetation is a mosaic of secondary forest, grassland, and remnant teak coppices, reflecting decades of timber extraction and encroachment. The reserve is bordered by Agudu village, whose inhabitants include the Koro (Migili), Alago, Gwandara, Eggon, Hausa, and Fulani ethnic groups. Agriculture is the mainstay of the local economy, with most households engaged in subsistence farming of cassava, yams, maize, millet, and groundnuts [11]. Beyond farming, residents depend on the reserve for fuelwood, poles, grazing, and non-timber forest products such as medicinal herbs and fruits. With a local government population exceeding 100,000, demand for land and resources continues to grow, putting steady pressure on the reserve. The location is therefore not only ecologically important but also socially significant, as it represents the tension between conservation and livelihood needs in Nasarawa State.

2.2 Research design and sampling

A multi-stage sampling technique was employed. First, major activity groups within and around the reserve were identified during reconnaissance visits. These include farmers, fuelwood collectors, hunters, grazers, and artisans. From these groups, respondents were randomly selected to ensure a fair representation of livelihood types. In total, 50 respondents were interviewed, a sample size considered adequate for exploratory community-based studies of this nature [16]. This corrected earlier pilot testing, which had used only 10 participants, ensuring that the final dataset reflects a broader spectrum of community perspectives. Respondents were adult men and women who had lived in the area for at least two years and were directly engaged in activities linked to the forest.

2.3 Methods of data collection

Primary data were collected using a structured questionnaire designed to capture both socio-demographic information and forest-use practices of respondents. The instrument included closed- and open-ended questions covering age, gender, marital status, education, occupation, and length of residence. Sections were also devoted to specific forest-related activities such as farming, grazing, fuelwood collection, hunting, fishing, and harvesting of non-timber products. To assess environmental awareness, questions probed respondents' understanding of deforestation, perceptions of climate change, and willingness to participate in tree planting or conservation measures. Livelihood dependence was captured by asking about income derived from the forest, frequency of forest visits, and coping strategies if access were restricted. Questionnaires were administered face-to-face, with the help of trained field assistants who spoke both English and local languages, ensuring that participants understood the questions.

To complement the survey, direct field observations were conducted within the reserve and its surroundings. These observations documented the visible signs of human activities such as logging sites, firewood depots, grazing areas, farms carved out of the reserve, and forest patches converted into plank markets. Photographic evidence (Figures 1-6) was also collected to provide visual confirmation of these activities. Informal conversations with forest guards and village elders were used to validate questionnaire responses, particularly in cases where sensitive topics such as illegal logging or payment of unofficial "premiums" were raised. Triangulating questionnaire data with observations helped reduce bias and improve the reliability of the findings.

Figure 1. Washing and bathing.

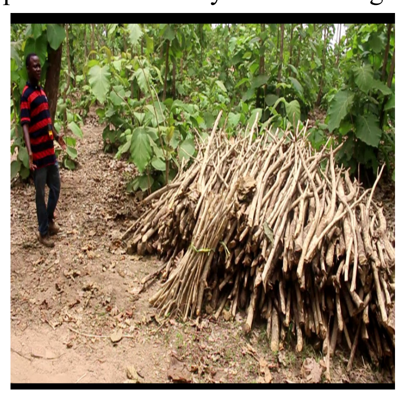

Figure 2. Harvested for fuel wood.

Figure 3. Animals grazing in the forest.

Figure 4. Logging activities.

Figure 5. Agricultural Activities.

Figure 6. Forest reserve turned plank market.

2.4 Data analysis

All completed questionnaires were checked for accuracy, coded, and entered into SPSS version 20 for statistical analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were first computed to summarize respondents' socio-demographic characteristics, levels of forest use, and patterns of livelihood dependence. Beyond description, inferential statistics were employed to test the study's hypotheses and establish the significance of observed relationships. Chi-square tests of independence were used to assess associations between categorical variables such as awareness of deforestation and willingness to reduce activity, or livelihood dependence and frequency of entry into the reserve. Where appropriate, binary logistic regression was applied to explore the predictive effect of socio-economic factors (e.g., gender, occupation, and livelihood dependence) on outcomes such as willingness to comply with restrictions. Statistical significance was set at $p < 0.05$.

3. Results

3.1 Demographic characteristics, access, and use of the reserve

The result of the socio-demographic profile of respondents indicated that forest use is highly gender-skewed, with more males than females. A binomial test confirmed this to be significantly different from parity ($p < 0.001$), with a large effect size (Cohen's h = 0.86; 95% CI = 0.76-0.94). Respondents were predominantly young adults, with half falling between 21-30 years and another 26% between 31-40 years. The majority were married and educated. Farming was the dominant occupation (Table 1). Access to the forest reserve was nearly universal, with 98% of respondents reporting they could enter freely ($p < 0.001$ vs. 50%; h = 1.29; CI = 0.90-1.00). Frequency of entry was also high, "very often," though this was not significantly different from a neutral expectation of 50% ($p = 0.119$; CI = 0.48-0.74). Reasons for entry were diverse, with farming accounting for the largest share, followed by sightseeing, hunting, fishing, herbs, and fuelwood. Some of the respondents reported being disturbed by forest officials, while the majority carried out activities without disturbance. These, therefore, confirm that access to the reserve is essentially open and respondents navigate official restrictions, with farming at the centre of use pressures. In relation to timber exploitation, the majority of respondents reported that contractors freely log wood without a license from the government (Table 2)

Table 1. Demographic characteristics of respondents

Variable	Frequency	Percentage %
Gender		
Male	44	88.0
Female	6	12.0
Age		
10-20	1	2.0
21-30	25	50.0

Table 1 Continued

Variable	Frequency	Percentage %
31-40	13	26.0
41-50	9	18.0
Above 50	2	4.0
Educational status		
S.S.C.E	35	70.0
OND	6	12.0
HND	4	8.0
B.Sc.	2	4.0
No Education	3	6.0
Occupation		
Farming	29	58.0
Hunting	9	18.0
Trader	3	6.0
Artisan	4	8.0
Others	5	10.0
Farming	29	58.0
Hunting	9	18.0
Trader	3	6.0
Artisan	4	8.0
Others	5	10.0

Notes. Statistical note: The gender distribution was significantly different from parity (binomial $p < 0.001$), with a large effect size (Cohen's $h = 0.86$, 95% CI = 0.76–0.94).

Table 2. Access to various practices in the forest reserve

Variables	Frequency	Percentage %
Years of living around or visiting the forest		
Less than 2 years	7	14.0
2-5 years	2	4.0
5-10 years	12	24.0
10-15 years	10	20.0
Above 50 years	19	38.0
Access to Reserve		
Yes	49	98.0
No	1	2.0
Frequency of Visit		
Rarely	2	4.0
Very often	31	62.0
Not often	17	34.0
Rarely	2	4.0
Reasons for Entering (n=38) (multiple responses allowed)		
Farming	30	44.1
Hunting	6	8.0
Fuel wood	1	1.5
Herbs	2	2.9
Fishing	4	5.9
Site seeing	7	10.3

Table 2 Continued

Variables	Frequency	Percentage %
	Disturbance from Forest Reserve officials	
Yes	20	40.0
No	30	60.0
Handling disturbance (n=20)		
Paying premium	6	30.0
Paying the annual dues	10	50.0
Relocation	4	20.0
	If no, why don't they disturb your activities (n=30)	
Legal permission	16	53.3
Absence of a guard	4	13.3
Premium payment	4	13.3
Annual due Payment	6	20.0
Logging activities		
without disturbance	4	8.0
Only with a license	46	92.0

Notes. Statistical note: Access to the reserve was near-universal, significantly higher than chance ($p < 0.001$, Cohen's h = 1.29, 95% CI = 0.90–1.00). Frequency of "very often" entry (31/50; 62%) was not statistically different from 50% ($p = 0.119$, 95% CI = 0.48–0.74).

3.2 Livelihood dependence, income, and willingness to change

Awareness of deforestation was relatively high, the majority of the respondents acknowledging it as a problem ($p < 0.001$ vs. 50%; h = 0.55; CI = 0.63-0.86). Sources of awareness included radio, school, and other informal channels. However, when asked if their own activities contributed to deforestation, responses were evenly split. Among those who admitted their activities had an impact (n = 25), a majority (80%) expressed willingness to stop or reduce those activities. Beyond this, willingness to engage in conservation was exceptionally high. All respondents reported that they would help plant trees if provided with seeds, and 96% stated they would comply with restrictions on farming, hunting, and logging ($p < 0.001$ vs. 50%; h = 1.17; CI = 0.87-0.99). These results reveal a gap between general awareness of deforestation and recognition of personal responsibility, but also demonstrate strong potential for mobilizing communities in conservation initiatives (Table 3). The result Livelihood dependence and income provides evidence that most of the respondents depend on the reserve for their livelihoods ($p < 0.001$), while 24% do not. Among those dependent, some reported that they could carry out similar activities outside the reserve if restricted, although most of them anticipated a reduction in income, and few expected scarcity of raw materials. Regarding income generation, the majority of respondents confirmed that they earn directly from forest activities throughout the year rather than seasonally. In terms of amounts, almost half generate more than ₦5000, while smaller shares are earned in lower income bands. Dependence on forest resources is widespread and continuous, which indicates that any restrictions on forest access without viable alternatives would have immediate negative effects on household welfare (Table 4).

Table 3. Awareness of the respondent about deforestation as it relates to their activities

Variable	Frequency	Percentage %
	Awareness about deforestation	
Yes	38	76.0
No	24	24.0
	How did you get to know (n=38)	
Radio	15	30.0
School	12	24.0
Others	11	22.0

Table 3 Continued

Variable	Frequency	Percentage %
Do your activities contribute (n=38)		
Yes	25	66
No	13	34
Willingness to stop/reduce (n=25)		
Yes	20	80
No	5	20
Role to play in forest reservation		
Yes	46	92.0
No	3	6.0
Not sure	1	2.0
Willingness to plant trees if given seed		
Yes	50	100.0
Willingness to comply with restrictions		
Yes	48	96.0
No	2	4.0
If yes, why		
law and order	38	76.0
Stop deforestation	10	20.0
If no, why		
no means of survival	2	6.0

Notes. Statistical note: Awareness of deforestation was high (38/50; 76%), significantly above 50% ($p < 0.001$, Cohen's h = 0.55, 95% CI = 0.63–0.86). Willingness to comply with restrictions was also very high (48/50; 96%), significantly above 50% ($p < 0.001$, Cohen's h = 1.17, 95% CI = 0.87–0.99).

Table 4. Livelihood dependent on the respondent on forest resources

Variable	Frequency	Percentage %
Livelihood depends on forest activities		
Yes	38	76.0
No	12	24.0
If restricted (n=38): Alternative strategy		
Move elsewhere	30	78.9
Stop activities	8	21.1
Income generated from the reserve		
Yes	38	76.0
No	12	24.0
If Yes (n=38): Nature of income		
Weekly	4	10.5
Monthly	3	7.8
All through the year	31	81.6

Table 4 Continued

Variable	Frequency	Percentage %
How much do you generate (n=38)		
Below 1000	2	5.3
1000-2000	3	7.8
2100-3000	4	10.5
3100-4000	5	13.2
4100-5000	4	10.5

Statistical note: Livelihood dependence was reported by 76% of respondents (38/50), significantly above 50% ($p < 0.001$, Cohen's $h = 0.55$, 95% CI = 0.63–0.86). Income from the reserve was reported by the same proportion (38/50; 76%), and most earners indicated year-round income (31/38; ~82%).

4. Discussion

This study tested three hypotheses, and the results provide clear evidence on each. H_1, which proposed that human activities such as farming, fuelwood collection, and logging negatively affect the reserve, is supported. Table 1b showed that farming alone accounted for most of the reported entry reasons, while frequent access and near-universal entry rights confirm that human use is extensive and ongoing. H_2, which states that awareness of deforestation is low and does not influence behavior, is not supported. On the contrary, Table 2a demonstrated relatively high awareness and a strong willingness to act, as the majority of those who acknowledged their role in forest decline indicated readiness to stop or reduce their activities. H_3, which assumes that livelihood dependence on forest resources is a major driver of encroachment, is strongly supported. Table 2b confirmed that the majority of respondents depend on the reserve for their livelihoods, with most earning income year-round, and many anticipating reduced income if access were restricted. Together, the study shows that deforestation in Agudu is primarily driven by livelihood pressures rather than ignorance, and that solutions must balance conservation with the economic realities of local households.

The findings from Agudu Forest Reserve echo a wider story of how rural communities interact with forests across Nigeria and beyond. The demographic profile shows a young, male-dominated, farming-dependent population, which mirrors the situation reported in parts of northern Nigeria where agricultural expansion is the main driver of forest loss [16, 17]. The dominance of farming as the top reason for entering the reserve is consistent with studies in Ogun and Oyo States, where farmland encroachment was identified as the single largest pressure on reserves [14, 18, 19]. This pattern is not unique to Nigeria. In Tanzania, Richard et al. [20] also found that local subsistence farming and wood collection were leading contributors to forest decline in Meru Catchment Reserve. Similarly, [21] in Eastern Tanzania and [22] in Kenya observed that forest degradation often follows household survival strategies rather than deliberate exploitation.

The result highlights a striking gender imbalance, with men making up 88% of forest users. This pattern contrasts with findings from other African contexts where women are often the primary users of forest resources, particularly for fuelwood and non-timber forest products. For example, Luoga [19] reported that 75% of forest users in Tanzania's Meru Catchment were women, reflecting gendered divisions of labour in household energy and food security. In Ghana, Acheampong et al. [23] similarly observed that women play a central role in collecting firewood and medicinal plants, making them key stakeholders in conservation programs [24]. The male dominance in Agudu is likely linked to the types of activities that drive forest use: farming, logging, and hunting, which are culturally perceived as male responsibilities in much of northern Nigeria. By contrast, women may be more engaged in small-scale gathering closer to homesteads, which may not have been captured in this survey. Lessons from Uganda and Kenya show that when women are empowered to lead community forestry groups, compliance improves and reforestation outcomes are stronger [25, 27]. Therefore, while men are the visible actors in Agudu's forest reserve, women remain silent stakeholders whose participation will be critical for long-term sustainability.

What stands out in Agudu, however, is the paradox of high awareness coupled with high dependence. Unlike findings in some parts of West Africa where low awareness is cited as the reason for uncontrolled forest use [24, 27], respondents here understood the reality of deforestation, yet remained bound by livelihoods rooted in farming, grazing, and forest extraction. The willingness to comply with restrictions and to plant trees places Agudu closer to success stories in community forestry reported in Nepal and India, where strong local participation has been central to forest regeneration [28, 29]. Taken together, the results suggest that the drivers of forest decline in Agudu are not a lack of knowledge or outright defiance of conservation rules, but rather the absence of viable alternatives to meet daily needs. Farming was the most important driver of forest use in Agudu. This pattern aligns with earlier reports that agricultural expansion is the dominant cause of forest loss in Nigeria, especially in the Guinea Savannah and derived savannah zones [16, 12]. In Nasarawa State, where arable land is in high demand, agricultural encroachment into reserves has been reported for decades [10, 11]. The majority of respondents reported that their survival is tied directly to the forest, and they earn from it, generating income year-round. Farming in Agudu is therefore not a seasonal fallback but a continuous livelihood base, making restrictions without alternatives especially difficult to enforce.

This finding mirrors wider patterns across sub-Saharan Africa, where farming and fuelwood extraction jointly account for the bulk of deforestation. Geist and Lambin identified smallholder agriculture as the single most widespread proximate cause of tropical deforestation [30]. More recent studies in Ghana and Cameroon confirm that shifting cultivation and permanent farmland expansion continue to dominate land-use change [21, 31]. In Latin America, similar dynamics are seen in the Amazon, where rural households expand subsistence plots at the expense of forests [32]. The Agudu case, therefore, reflects a global problem: rural poverty and limited access to modern energy or off-farm employment push communities to rely on land and biomass, reinforcing a cycle of dependence that drives forest degradation. Without targeted interventions such as improved agricultural practices, alternative livelihoods, and energy access, the pressure on Agudu will likely intensify. The governance dynamics expose one of the deepest challenges in forest conservation: weak and uneven enforcement. Some of the respondents reported being disturbed by officials, but many continued their activities by paying dues to the government or premiums to guards. Others simply shifted to another part of the forest. These strategies highlight the informal systems that have emerged in place of consistent regulation. The fact that most of the respondents acknowledged that timber contractors log with a license, while a few reported logging without disturbance, suggests that both formal and informal authorizations coexist, eroding the credibility of enforcement. This situation is not unique to Agudu. In Edo and Cross River States, studies have shown how forest guards often operate with limited resources, creating opportunities for rent-seeking practices and illegal logging [14, 17]. Weak governance in Agudu mirrors broader patterns across Africa, where enforcement capacity is low. In Ghana, Hansen et al. [33] observed that despite laws restricting logging, local elites and timber contractors bypassed regulations through informal payments [34]. In Tanzania, Luoga [21] found that households circumvented restrictions by negotiating directly with poorly paid forest officers. The Nigerian case is further complicated by underfunding of forestry departments, outdated policies, and conflicting mandates across government agencies [16, 35].

One of the most striking findings in this study is the high level of environmental awareness and the strong willingness to support conservation measures. This contrasts with earlier assumptions in Nigerian forestry literature that forest degradation persists largely because rural communities lack awareness or education [17, 18, 36]. Instead, the Agudu case suggests that people understand the problem but remain constrained by livelihood pressures. Comparable patterns have been reported in other countries. In Kenya, Luoga [21] found that communities near the Arabuko-Sokoke Forest expressed a strong willingness to adopt conservation practices if alternative livelihoods were made available. In Nepal, Schwartz and Caro [26] documented how communities, once mobilized and resourced, successfully regenerated degraded forests through collective tree planting and rule enforcement [27]. Similarly, in India's community forestry initiatives, Agrawal and Chhatre [28] demonstrated that willingness to act translated into measurable improvements in forest condition when linked to participatory governance. The results of the study, therefore, show that knowledge is not the limiting factor; rather, the challenge is how to harness this willingness into structured, community-driven management schemes. With proper support like the provision of seedlings, extension services, and clear participation rights, Agudu's communities could become allies rather than adversaries in conservation.

Agudu's forest decline is driven less by ignorance than by survival needs, which have important policy implications. Firstly, any strategy that simply restricts access without providing alternatives will fail, as many respondents depend on the forest for livelihood and earn income year-round. Nigeria's National REDD+ Strategy already emphasizes the need to link forest conservation with poverty reduction [6], and the Agudu case confirms that this linkage is essential. Community forestry schemes, where locals are given rights to co-manage forests in exchange for sustainable use, have succeeded in parts of Asia and East Africa and could be piloted here. Secondly, the high willingness to plant trees and comply with restrictions suggests that afforestation and reforestation programmes under the Great Green Wall initiative could gain traction if implemented in Nasarawa with direct community participation. Thirdly, weak enforcement and informal payments call for governance reforms. This should include more transparent licensing, better-trained forest guards, and stronger monitoring systems. Without closing these loopholes, reforestation efforts risk being undermined by unchecked logging.

Finally, addressing energy poverty is central. About 70% of Nigerians still depend on firewood or charcoal for cooking [12, 37], and Agudu residents are no exception. Expanding access to clean cooking technologies, alternative fuels, and off-farm employment opportunities would reduce direct reliance on forest resources. By aligning local interventions with national policies, the Nigeria REDD+ programme, the Great Green Wall, and Sustainable Development Goals 13 (climate action) ecological fund support, and 15 (life on land), Agudu could be transformed from a case of forest decline into a model of community-driven conservation in the Guinea Savannah.

5. Conclusion

This study examines the human activities driving deforestation in Agudu Forest Reserve, Nasarawa State of Nigeria. Farming, fuelwood collection, hunting, and logging were identified as the dominant pressures, with farming alone accounting for 60% of reported entry into the reserve. Access to the reserve is almost unrestricted, households depend on the reserve for their livelihoods, and most income derived from forest activities is generated throughout the year. These findings confirm that the major threat to Agudu Forest Reserve is livelihood-driven exploitation, rather than ignorance of environmental impacts. Importantly, the study found that awareness of deforestation is relatively high and that communities expressed a strong willingness to contribute to conservation. All respondents indicated readiness to plant trees if provided with seedlings, and readiness to comply with restrictions on farming and other activities. Host communities are passive drivers of degradation but potential partners in reforestation and sustainable management, provided their basic livelihood needs are addressed.

Based on these findings, three conclusions can be drawn. First, conservation policies must recognize that restrictions alone are insufficient in a context where forest resources provide food, fuel, and income for the majority of households. Second, there is a window of opportunity to build community-led conservation, as willingness to participate is extremely high. Third, forest governance reforms are urgently needed to curb informal payments, strengthen official monitoring, and align local practices with national strategies such as Nigeria's REDD+ programme and the Great Green Wall initiative. The study therefore recommends that government and non-governmental organizations: (i) develop alternative livelihood programmes that reduce dependence on forest resources, such as small-scale enterprises, improved farming practices, and clean cooking technologies; (ii) implement afforestation and reforestation programmes with direct community participation, supplying seedlings and extension support; and (iii) strengthen forest governance by providing adequate resources for forest guards, improving transparency in licensing, and embedding local communities in co-management frameworks. By integrating these measures, Agudu Forest Reserve can shift from decline to recovery, offering both environmental protection and sustainable benefits to the communities that depend on it.

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