PERCEPTION OF FACTORS RESPONSIBLE FOR DEPLETION OF NON-TIMBER FOREST PRODUCTS (NTFPS) AMONG KUDA GANGARA FOREST RESERVE DWELLERS IN JIGAWA STATE, NIGERIA

[1]Saka, M. G., [2]Aujara, Y. I. and [3]Salami, K. D.
[1]Department of Forestry and Wildlife, Modibbo Adama University of Technology Yola,
[2]Department of Forestry Technology Binyaminu Usman Polytechnic Hadejia, Jigawa State
[3]Department of Forestry and Wildlife Federal University Dutse, Jigawa State
Correspondence author: foristsalam@yahoo.com; yauidrisaujara@gmail.com

ABSTRACT

The study assessed the perceptions of forest reserve dwellers in Kuda Gangara Forest Reserve, Jigawa State, Nigeria, regarding the factors responsible for the depletion of non-timber forest products (NTFPs) and timber products. Data were collected through participatory appraisal, focus group discussions, transect walks, and household questionnaires administered to 364 randomly selected household heads out of a proposed 375. The collected data were analyzed using descriptive and inferential statistics to identify the key drivers of forest resource depletion in the study area. The demographic analysis revealed a predominantly male population (80.77%), with 75.56% of respondents being married and 41.21% falling within the 40-45 age bracket. Occupational trends shifted from forest resource collection (46.67%) to farming (53.33%) due to resource depletion. The study identified human influences (60.35% of variance), unsustainable harvesting practices, and environmental factors as primary drivers of NTFP depletion. Other factors included poverty, population growth, agricultural intensification, and lack of monitoring. The findings highlight the need for targeted policy interventions promoting sustainable forest management and livelihood development, considering the demographic characteristics and interrelated factors driving forest resources depletion. The study's findings underscore the importance of addressing human influences, unsustainable harvesting practices, and environmental factors to mitigate non-timber forest product depletion. Targeted policy interventions promoting sustainable forest management and livelihood development are implied in the study to address the specific needs and challenges of forest-dependent communities.

Keywords: Non-Timber Forest Products (NTFPs), Forest Depletion, Kuda Gangara Forest Reserve, Sustainable Livelihoods and Community Perception

INTRODUCTION

Forests are a vital renewable natural resource, playing a crucial role in maintaining environmental stability and supplying raw materials to wood-based industries (Salami, 2017, Miki *et al.,* 2023, However, the unsustainable practices of forest reserve dwellers have put immense pressure on the environment and natural resources (Khyati *et al.,* 2022). Factors contributing to forest degradation include rapid population growth, urbanization, technological advancements, and industrial development, ultimately threatening the long-term sustainability of these ecosystems. Non-timber forest products (NTFPs) play vital roles in the livelihoods of a significant proportion of the global population (Pimental *et al.,* 2017). According to the United Nations Development Program (2019), NTFPs are widely used in tropical regions, providing essential resources for communities lacking social security. Globally, over two billion people reside in forests, relying on forest resources for subsistence, income, and livelihood security (Ahenkan and Boon, 2021).

NTFPs are crucial for sustaining rural livelihoods, reducing poverty, conserving biodiversity, and promoting rural economic growth (Maske *et al.,* 2021). These products are essential for the well-being and resilience of forest-dependent communities. Forest resources remain crucial to rural communities in developing countries, providing essential services, products, and income (Nerfa *et al.,* 2020). Beyond timber, forests yield a vast array of valuable products, collectively known as non-timber forest products (NTFPs), which have gained global recognition for their ecological, economic, and cultural significance (Agboje *et al.,* 2023; Arnold and Ruiz-Perez, 2022). Globally, non-timber forest products are acknowledged for their significant contributions to conservation, income generation, livelihood improvement, and rural development (Falcon, 2019). These products play a vital role in supporting the well-being and economic stability of forest-dependent communities (**Beckley, 1995).**

The harvesting of non-timber forest products can have both positive and negative impacts on biodiversity conservation (Ghosal, 2021) however increasing population pressure and poverty have led to over-harvesting of resources for commercial purposes, deviating from traditional use. The growing demand for forest resources, coupled with extraction technologies that often lack sustainable management practices, has resulted in severe deforestation and degradation of forest resources globally (Jimoh, 2021). Therefore, the study evaluated the perception of the factors responsible for depletion of Non-Timber Forest Products (NTFPS) among Kuda Gangara Forest Reserve Dwellers in Jigawa State, Nigeria with a view to develop sustainable management approaches for the remaining forest resources in the study area

MATERIALS AND METHODS

Description of the Study Area

The Kuda Gangara Forest Reserve is located in Yankwashi Local Government Area, Jigawa State,

Nigeria, within the geographical coordinates of 12° 46' 0" N to 12° 48' 0" N Latitude and 8° 28' 0" E to 8° 30' 0" E Longitude, at an elevation of 443 meters above sea level and covering an area of 1200 hectares. The Reserve is situated approximately 10 Kilometers

northwest of the Kazaure Emirate Council. It was officially designated as a forest reserve through Order No. 7, Gazette No. 49 of 1947 by the Nigerian Government (Jigawa State Government, 2023) (Figure 1)
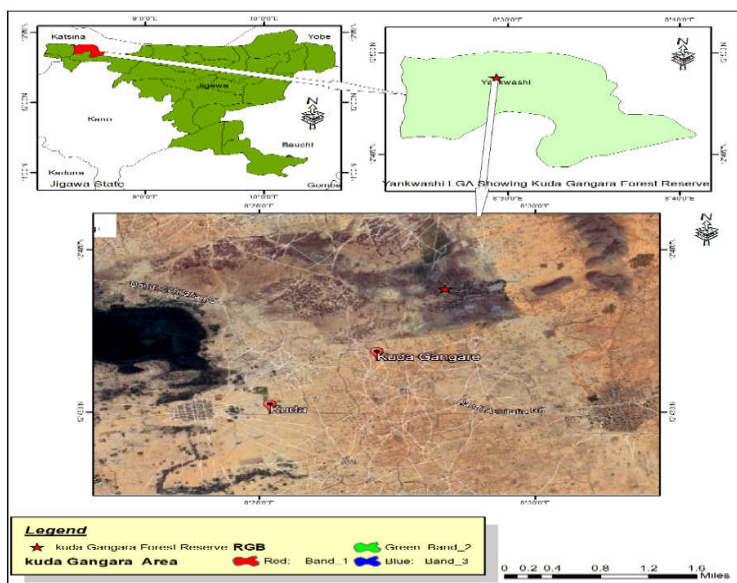

Figure 1: Map of Nigeria showing Jigawa State and Kude Gangare Forest Reserve

Method of Data Collection
This study utilized a combination of oral interviews and direct observations to obtain data. The oral interviews targeted key stakeholders, including taxonomists, elders, community heads, farmers, women leaders, and forestry staff from six forest reserves in Jigawa State. The interview aimed to obtain representative information about the community's relationship with the forest ecosystem, providing valuable insights into local perspectives and experiences.

Focused group discussion
This component of the study adopted the Focused Group Discussion (FGD) approach, following the procedure outlined by Krueger and Casey, 2015. Three FGDs were conducted, each comprising nine participants who were knowledgeable in non-timber forest products in the local language and their uses, and resided adjacent to the forest reserves. The discussions captured information on the uses of non-timber and timber forest products, as well as factors contributing to their depletion.

Participatory rural appraisal method
Data acquisition Participatory Rural Appraisal (PRA) was also used by consulting the ward heads, village heads, youth's councils, women leaders and farmers for detailed information on the utilization pattern and factors responsible for NTFPs depletion

Household questionnaire administration
This component of the study employed a simple random sampling technique to select 375 respondents

from five villages (Kuda Gangara, Kuda, Gwarta Karama, Gwarta Bababa, and Shadamai) situated within or adjacent to the forest reserve. The questionnaires were administered to heads of households, who were considered key decision-makers for their households. Data collected included demographic characteristics, education, and perceived factors responsible for the depletion of non-timber forest products. The sample size was distributed across communities using Cochran's (1977) allocation technique formula, ensuring representative coverage of each village.

$$n_h = N_h \times \frac{n}{N} \dots\dots\dots\dots\dots\text{eqn 1}$$

Where:
$n_h =$ number of questionnaires administered in each community
$N_h =$ estimated population of the people in each community
$n =$total number of questionnaires administered*
$N =$total number of people in all the communities (Cochran, 1977)

Method of Data Analyses
Principal Component Analysis (PCA) was used to assess the strength of the diverse factors responsible for depletion of non-timber forest products and timber in the study area. PCA was used to collapse the variable into significant components to explain the underlying factors, responsible for the prevailing situation, using SPSS version 22."

RESULTS AND DISCUSSION
Table 1: Demographic Characteristics of the Respondents

Variables	Frequency (n = 375)	Percentage (%)
Gender		
Male	294	80.77
Female	70	19.23
Marital status		
Married	275	75.56
Single	89	24.46
Past Occupational status		
Agric/farming	120	32.97
Artisan	108	29.67
Trading	10	2.75
Government worker/civil servant	56	15.38
Others	70	19.23
Present Occupational status		
Agric/farming	229	62.91
Artisan	50	13.74
Trading	45	12.36
Government worker/civil servant	30	8.24
Others	10	2.75
Age class		
40 – 45	34	9.34
45 – 50	150	41.21
50 – 55	70	19,23
55 – 60	56	15.38
60 – 65	40	10.99
65 – 70	14	3.85
Education level		
Tertiary education	40	10.99
Secondary education	80	21.98
Primary education	114	31.31
Informal education	130	35.71

Source: Field   survey (2024)

Table 2: Identified factors responsible for depletion of NTFPs and Timber Products

Variables	Frequency (n = 375)	Percentage (%)	Mean $\mp$
Poverty	**70**	19.23	**0.75**
Intensification of Agriculture	50	13.74	0.53
Construction Activities	6	1.65	0.06
Fire (bush burning)	9	2.47	0.10
Poor soil Conditions	5	1.37	0.05
Rising Value of forest Products	12	3.29	0.13
Lack of monitoring	17	4.67	0.18
Common Property	45	12.36	0.480
Over Exploitation	39	10.71	0.42
Population Growth	40	10.99	0.42
High Demand of Forest products	15	4.12	0.16
Unsustainable harvest of forest products	30	8.24	0.32
Desertification	3	0.82	0.03
Poor Farming Practices	5	1.37	0.05
Over Grazing	13	3.57	0.14
Inadequate rainfall	5	1.37	0.06

Source: Field   survey (2024)

Table 3: Correlation Coefficient Matrix for factors responsible for shrinkage of forest Resources

	Poverty	Intenagriculture	Fire	rising_value_of_f_p	Grazing	common_property	population_growth	Unsustainable_harv	over_exploitation	poor_farm_Practices	construction_act	poor_soil_condition	Desertification	lack_of_monitoring	high_demand_of_pro	others_inadquate_rainfall
Poverty	1.000															
Intenagriculture	.942	1.000														
Fire	0.711	.701	1.000													
rising_value_of_f_p	.563	.573	.868	1.000												
Grazing	.783	.754	.787	.739	1.000											
common_property	.321	.326	.744	.770	.605	1.000										
population_growth	.846	.820	.785	.740	.880	.421	1.000									
Unsustainable_harv	.259	.263	.663	.672	.497	.910	.340	1.000								
over_exploitation	.288	.293	.723	.733	.552	.910	.378	.899	1.000							
poor_farm_Practices	.419	.457	.222	.176	.303	.100	.313	.081	.090	1.000						
construction_act	.221	.225	.581	.589	.417	.791	.290	.927	.856	.069	1.000					
poor_soil_condition	.708	.687	.896	.806	.835	.742	.822	.686	.735	.759	.612	1.000				
Desertification	.257	.262	.675	.684	.484	.887	.338	.939	.881	.080	.852	.711	1.000			
lack_of_monitoring	.157	.160	.418	.422	.302	.598	.207	.770	.730	.049	.887	.440	.656	1.000		
high_demand_of_pro	.781	.762	.844	.774	.877	.552	.902	.453	.503	.273	.380	.861	.442	.275	1.000	
others_inadquate_rainfall	.414	.421	.798	.851	.702	.948	.544	.865	.868	.129	.742	.781	.844	.559	.667	1.000

Table 4: Rotated PCA for the causes of depletion of NTFPs and Timber products in the selected forest reserves

Variable List	Variable Label	Component		
		1	2	3
Unsustainable_harv	USHA	.952**	.219	.009
Constructi on_act	CONA	.940**	.124	.096
over_exploitation	OVEP	.909**	.294	-.033
Desertification	DESERT.	-.035	.245	908**
common_property	COMPR	.866**	.370	-.095
lack_of_monitoring	LAMO	.832**	.005	.186
others_inadquate_rainfall	RAIN	.794**	.502	-.108
population_growth	POGW	.140	.943**	.081
high_demand_of_pro	HDFS	.272	.907**	.010
Poverty	POV	.048	.886**	.303
Grazing	GRAZ	.323	.867**	.065
Intenagriculture	INAG	.059	.864**	.345
Fire	FIRE	.527	.784**	-.021
Poor farming pract.	POSOC	.544	.777**	.029
rising_value_of_f_p	RIVF	.573	.701**	-.109
Poor soil condition	POFA	.025	.270	.894**
	Eigen Value	6.621	6.378	1.100
	Percentage of explain Variance	41.380	39.861	6.874
	Cumulative % of the explain variance	41.380	81.241	88.115

** =Significant loadings t or- 0.60

Demographic characteristics of the Respondents

The demographic analysis of 364 respondents revealed a predominantly male population (80.77%) compared to females (19.23%), likely due to men's greater involvement in forest products collection and related activities. In terms of marital status (75.56%) of respondents were married, indicating a strong motivation to engage in livelihood activities to meet family needs. The age distribution showed that (41.21%) of respondents were within the 40-45years age bracket, primarily engaged in farming, followed by those aged 50-55 (15.38%). This suggests that most respondents are in their active working years. The educational background of respondents varied with (31.31%) having primary education, while (21.98%) had secondary education and (10.66%) had tertiary education, however (36.71%) were illiterates. Their level of education perhaps influenced respondents' livelihood activities and socio-economic status within the forest zone. The dominance of married men in their active and productive age engaging in farming and forest-related activities, highlights the importance of considering demographic characteristics in understanding the dynamics of forest resource utilization and management. Our findings underscore the importance of demographic insights in shaping policy interventions for sustainable forest management and livelihood development. By understanding the unique characteristics of forest-dependent communities, policymakers can craft targeted initiatives that cater to diverse demographic groups,

ultimately enhancing their ability to adopt sustainable practices and improve their livelihoods.

Analysis of Factors of Depletion of NTPFs and Timber Products

The rapid depletion of non-timber forest products and timber in the study communities is a serious concern. Respondents attributed the depletion to unsustainable production and conservation patterns, as well as misallocation of land, water, and environmental resources (Angelsen and Wunder, 2003; Shackleton *et al.,* 2019). These findings highlight the need for improved resource management and conservation strategies to mitigate the loss of forest resources.

The Principal Component Analysis (PCA) identified 16 perceived factors contributing to the depletion of non-timber forest products and timber in the study area. The correlation coefficient matrix revealed strong positive correlations between variables, indicating that they collectively influenced depletion. Notably, intensification of agriculture was strongly correlated with poverty (0.942), common property with population growth (0.910) and population growth with high demand for forest resources (0.901). Conversely, negative correlations were observed between fire and poverty (-0.711) Table 3 while the correlation between lack of monitoring and intensification of agriculture was weak. Table 3. These findings highlight the importance of addressing the interconnected factors driving forest resource depletion,

underscoring the need for comprehensive strategies that tackle multiple challenges simultaneously to effectively mitigate depletion and promote sustainable forest management (Tewari *et al.,* 2022).

The rotated component analysis identified three key drivers of forest resource depletion. Component I (Human influence) accounted for 60.35% of the variance, underscoring the impact of improper management practices, such as unsustainable harvesting and inadequate monitoring (IPCC, 2022; FAO, 2020). Component II (Unsustainable Harvesting Practices) highlighted demographic changes and practices like poverty, population growth, and agricultural intensification, exacerbating forest degradation (MEA, 2019; World Bank, 2021). Component III (Environmental Factors) emphasized environmental degradation, including poor soil conditions and desertification, further threatening forest ecosystems (IPBES, 2019; UNCCD, 2022).

These findings align with recent research emphasizing the complex interplay between human, demographic, and environmental factors driving forest resource depletion (Shackleton et al., 2021; IPCC, 2022). Effective forest management strategies must address these interconnected factors to promote sustainable forest ecosystems and livelihoods."

The analysis revealed that human influences, unsustainable harvesting practices, and environmental factors are the primary drivers of non-timber forest product depletion in the study area. This finding aligns with previous study of Aujara (2012), Ekpenkhio *et al.* (2020), and Udoma *et al.* (2019) who identified human activities like vegetation clearing for farming, logging, bush burning, road construction, urbanization, and industrialization as major contributors to forest depletion. These activities have consistently shown negative impacts on forest resources supporting the findings from this study

CONCLUSION

The study assessed the status of Non-Timber Forest Products (NTFPs) in Kuda Gangara Forest Reserve, findings revealed significant degradation due to intensified agriculture and unsustainable harvesting practices by forest dwellers. The findings underscored the urgent need for deliberate conservation efforts to protect the fragile forest ecosystem. Principal Component Analysis (PCA) condensed 16 variables into three uncorrelated principal components, capturing 90.45% of the original data's variation, thereby simplifying complexity while retaining key information. Based on these findings, it is recommended that government agencies and individuals prioritize participatory forest management strategies to mitigate forest resource depletion and promote sustainable use. Collaborative efforts are essential to ensure the long-term conservation and sustainable utilization of NTFPs in Kuda Gangara Forest Reserve

RECOMMENDATIONS

The occupational trends of respondents in the study area have shifted over time. Previously, the majority (46.67%) engaged in forest resource collection and harvesting, followed by agriculture (16%), artisanship (24%), trading (2.67%), and civil service (10.67%). However, with the depletion of non-timber and timber forest products, the trend reversed. Currently, farming dominates with (53.33%) of respondents, while other occupations accounted for (13.33%), artisanship (13.33%), trading 8%, and civil service 12%. This shift suggests that respondents have adapted to the decline in forest resources by focusing more on farming and other livelihood activities.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interest

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