

## Assessment of Deforestation Impact in Wasagu Forest Reserve Kebbi State Nigeria

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### ABSTRACT

*This study assesses the deforestation and restoration activities in Wasagu forest reserve, Kebbi State Nigeria. Multi-stage sampling technique was used to select five (5) districts for the study and in each district four (4) villages were selected. Convenience sampling was used to select ten (10) respondents from each village, thus giving a sample size of two hundred (200) respondents. The results showed the distribution of respondents based on their socio-economic characteristics which were dominated by males with 74.5% aged 31 – 40 having the highest value of 31.0%, followed by 41 – 50 which had 29.0% who are within productive ages, Married respondents dominated with the value of 85.0%, educational level showed that Arabic/Islamic school had 32.0% which lack literacy or formal education, farmers dominated with the value of 74.0% in terms of occupation in the study area. The results also revealed that agricultural activities dominated with 63.0%, Illegal logging of woods had the value of 9.0% which was the lowest in terms of causes of deforestation with, 4 – 7 trees exploited by individuals per year with a value of 63.5%. Most respondents prefer agricultural lands to forests, 90.5% as observed in the study area. It is therefore recommended that, since agricultural activities are the major causes of deforestation in the study area, agroforestry should be encouraged for forest land sustainability.*

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### INTRODUCTION

Forests served as a source of livelihood for millions of people by providing their physical, material, economic, and spiritual needs (Byron and Arnold, 1997). It also provides a large number of goods and services, including habitat for wildlife species, home-land for indigenous peoples, recreational areas, food, medicines, and environmental services such as soil stabilization, erosion control and carbon sequestration among others (Ormerod 2003). However, forest areas are in a state of various changes mainly caused by either natural or man-made activities. These changes in the forest interacting with air quality fluctuations, may substantially alter forest productivity, stand density

well and sequestration of carbon in both vegetation and soils; the net effect of these is forest degradation (Ormerod 2003).

Deforestation is a crucial phenomenon, and as such, monitoring of forest cover trends and functions offers essential information to support policies decisions guidelines to conserve, protect and sustainably manage the forests, particularly in the tropics where forests are diminishing at a speedy rate. Effective monitoring systems are required for efficient and updated information about land resource trends. Detecting and analysing the pattern of these trends is an essential step, and the results may serve as a necessary input for forecasting, planning and decision-making processes to moderate the adverse effects of forest degradation.

Forested areas continue to decline globally, with negative consequences for environmental sustainability (Rudel *et al.*, 2005). Nigerian Forest reserves were converted to farmlands and grazing lands while others were turned into human settlements and presently many are under pressure from human encroachment. Despite the increasing global concerns about the observed impacts of deforestation, the possible reliable assessments of the extent and nature of the deforestation and the rate at which it is increasing at the global, national and regional scale are limited (Medugu, 2007). Despite attempts made by the government to check desert encroachment through afforestation, deforestation remains the most pressing environmental problem especially in the northern part of Nigeria (Medugu and Rafee, 2007).

Wasagu forest reserves in Kebbi state used to be a natural forest with diverse species and rich in biodiversity. However, it is nowadays one of these reserves under the critical condition of deforestation with most of its matured trees being felled now for fuelwood and timber collection, excessive grazing, bush burning for farmland and other human activities (Zaki, 2005). Part of the forest has been converted to cassava plantations by the state government. Regardless of the adverse impact posed to the environment, the extent, trends and severity of deforestation in the Wasagu forest reserve has neither been fully recognised nor was the rate of development accurately documented. This study can serve as a medium for recommendations for the people in the study area and Nigeria at large. Assessment and monitoring of deforestation as well as restoration efforts in the Wasagu forest reserve is very important.

The main objective of the study is to assess deforestation and Examine the socioeconomic characteristics of the respondents in the study area. Identify the causes of deforestation in the study area; Determine restoration activities in the study area. Examine the relationship between socioeconomic characteristics and the causes of deforestation in the study area. Identify the relationship between socioeconomic characteristics and restoration activities in the stud

## **METHODOLOGY**

### **Study Area**

This study was conducted in Danko Wasagu Local Government of Kebbi State, Nigeria. The study area lies along latitude 11.15'0" N and longitude 5.40" E from the equator (KARDA, 2003). The forest reserve covers an area of 48,806 hectares. The soil types are sandy, clay and loamy (Dark). The majority of the people are farmers who mostly practice mixed farming and to some extent dry season cultivation in low land (Fadama) with irrigation (KARDA, 1999). Danko Wasagu Local government occupies a geographical land area of 4,016 km<sup>2</sup> with an estimated population of about 265,203 (NPC, 2006). Wasagu forest reserve has a favourable climatic conditions for growing many crops. The area experiences a period of harmattan from December to February. The month of March is the hottest month of the year with maximum and minimum temperatures of 47°C and 36°C respectively. The mean relative humidity is highest in August (69%) and lowest in February (16%) (KARDA, 1999) Annual rainfall is approximately 58.33mm while the monthly hours of sunshine are highest in April and lowest in August-September (KARDA, 1995). Wasagu forest reserve is a natural forest (savanna kind of vegetation) transitionally in between northern Guinea savanna and Sudan savanna woodland vegetation along river basins. The dominant tree species are *Vitellaria paradoxa*, *Vitex doniana*, *Tamarindus indica*, *Balanite egyptiaca*, *Adansonia digitata*, *Ficus thoningii*, *Ximenea americana*, *Acacia nelotica*, *Afzelia Africana*, *Ziziphus spina* and *Parkia biglobosa*. Shrubs *Adenium abesium*, *Annona senegelensis*, *Annona squamosa*, *Antiaris Africana*, *Jatropha curcas*, *Guiera senegalensis* & *Pilostigma thoningii*. Grasses *Melia orientalis*, *Ocimum gratissum*, *Physalis angulata*, *Cassia occidentalis* & *Amaranthus spinosu*

### **Sampling Procedure and Sample Size**

The study area is made up of eight (8) districts, (Bena, Danko, Kainya, Kebbo, Ribah, Waje, Wari and Wasagu). A multistage sampling technique was used to select five (5) districts for the study and in each district four (4) villages were selected. Convenience sampling was used to select ten (10) respondents from each village selected, thus giving a sample size of two hundred (200) respondents.

### **Data Collection**

Data for this study were collected from both primary and secondary sources. The primary data were obtained by the use of a structured questionnaire. Data were collected on the socioeconomic characteristics of the respondents and the causes of deforestation.

Secondary data were sourced from relevant publications which include: text-books, bulletins, periodicals, journals, annual reports, seminar papers, unpublished materials of relevance to the study, report documents from different ministries and even internet search to obtain the most recent information on the subject matter.

### **Data Analysis**

In this research, descriptive statistics (using tables, frequency distribution and percentage) and inferential statistics (correlation analysis) were used to analyze the data obtained from the questionnaire using SPSS software.

## RESULTS AND DISCUSSION

### 1.0 Distribution of respondents according to their socioeconomic characteristics

The results in Table 4.1 showed the distribution of respondents based on their socio-economic characteristics which were dominated by males with 74.5% (157) and females with 23.5% (43) in terms of gender. Men are mostly involved in farming, hunting, wood logging and other human activities related to deforestation while the females are engaged in other household activities. This study revealed that males dominated in deforestation which agreed with the findings of Adetoye (2019) investigated the role of farm households in the deforestation process in Nigeria. However, the involvement of females in deforestation could be a result of a female-headed household, a woman who lost her husband. This was in line with the findings of Adekunle *et al.*, (2011) reported that the female-headed households group are more likely to engage in open forestland than the male group due to involvement in agriculture and gleaning firewood for energy.

This table also revealed that age 31 – 40 had the highest value of 31.0% (62), followed by 41 – 50 which had 29.0% (58) and the lowest value was recorded between ages 10 and 20 years. The age of respondents was important in this study because it was to determine an economically active group whose activities have serious repercussions on the environment. Since age goes with manpower, the more active the age group engage in any degradable activity the higher the exploitation, hence the greater the environmental impact.

In terms of marital status, the table showed that a good number of the respondents were married 129 (86.0%) followed by singles with 14 (9.3%), widowed respondents had 5 (3.3%) and the least were divorced with 2 (1.3%). This was similar to the findings of Wada *et al.* (2019) who earlier reported that 88.2% of the respondents were married with ten or more children whose activities were seasonal and subsistence farmers, inadequate to cater for their family demands. So they have to look for additional income to shoulder the responsibilities of their family. As such they engaged in forest exploitation to sell the firewood for domestic use. The high percentage of married people involved in deforestation in the study area could be a result of seeking income, agricultural lands and fuel wood for their households.

The result on the Educational level showed that Arabic/Islamic schools had 32.0% (81) which was the highest and the lowest observed in respondents who attended Adult education 2.5% (5). Most of the respondents have no formal education, and some with formal education stop at the secondary school level and, therefore have not much knowledge of the dangers of deforestation. This is in

line with Oladusu *et al.*, (2002) finding that, formal education could therefore be a critical factor influencing the effectiveness of farmer’s adaptive capacity to deforestation.

In terms of occupation, farmers dominated with a value of 74.0% (162) which was the highest and the lowest was recorded in off farming business with a value of 3.0% (6). The majority of the respondents were subsistence farmers in this study than other forms of occupation. This was as reported by (Lamb *et al.*, 2003) who observed that the majority of the respondents were subsistence farmers and accounted for 77.7%, with low-income and extended family, only a few of them were commercial farmers. It has been elicited during a focus group discussion that the majority of the respondents are seasonal farmers, they only cultivate during the rainy season, and it was however revealed that more than half of the respondents lack formal education as such there is a lack of technical knowhow that will help them to improve their production. This study revealed that few respondents were involved in livestock rearing. This was contrary to the findings of Musa *et al.*, (2020) who reported 82.0% of the respondents are engaged in animal production and animal grazing due to the proximity of the forest and the majority revealed that they used free-range management in feeding their animals. About 60% of the respondents relied solely on Duddurun Gaya forest reserve and nearby farmland to feed their animals.

**Table 1.0: Socio-economic characteristics of the respondents**

Variable	Frequency	Percentage (%)
<b>Gender</b>		
Male	157	76.5
Female	43	23.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Age</b>		
10-20	3	1.5
21-30	21	10.5
31-40	62	31.0
41-50	58	29.0
51-60	42	21.0
> 60	14	7.0
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Marital status</b>		
Single	21	10.0
Married	170	85.0
Widowed/Widower	5	3.0
Others	4	2.0

<b>Total</b>	<b>200</b>	<b>100</b>
<b>Educational level</b>		
Primary school	28	14.0
Secondary school	54	27.0
Tertiary	32	16.0
Arabic/Islamic school	81	32
Adult education	5	2.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Occupation</b>		
Farming	162	74.0
Selling farm produce	15	10.5
Off-farm business/Civil/Public Services	6	3.0
Rearing livestock	17	12.5
<b>Total</b>	<b>200</b>	<b>100</b>

Source: Field Survey (2021)

## 2.0 Distribution of respondents according to anthropological activities leading to deforestation in the study area

The results in Table 4.2 showed that agricultural activities dominated with 51.0% (106) and Illegal logging of woods had the value of 9.0% (22) which was the lowest in terms of human needs that cause deforestation. This study revealed that agricultural activities play a major role in deforestation. This was in line with the findings of Adetoye (2019) who investigated the role of farm households in the deforestation process in Nigeria. The results show that 64 % of the farmers gain access to cultivate already opened forestland through uncoordinated harvesting of forest trees while others still maintain sustainable forest land use practice agro-forestry. Farmers soften encroach the forest for the cultivation of grains and tubers in the last three decades as was observed in the study area. This agrees with Musa *et al.*, (2020), who noted that areas with more suitable environmental conditions present a lower proportion of native forest cover, due to intrusion by farmers, particularly in the developing tropics. However, the less-accessible zones or too marginal to support agricultural activities were least disturbed, and hence may retain good forest cover, also reported that major drivers of forest degradation in the area include illegal timber exploitation, unsustainable charcoal production and overgrazing. (Adeyemi *et.al*, 2021).

The exploitation of the forest revealed that 4 – 7 trees exploited per year had the highest value of 63.5% (123) and the lowest value was observed in >7 trees exploited per year. The use to which the tree was put showed that fuel wood dominated with a value of 72.0% (144) which was the highest and the lowest was used for fencing poles with a value of 11.0% (22). The results of this

study observed that there are quite many people involved in the exploitation of trees, alongside the corrupt practices that foster the illegal trade in logs. This confirms the reports of White (2008) that corruption permeates every aspect including the forest environment. The study showed that 16.0% of the respondents were involved in illegal wood logging. The result was lower than the findings of Musa *et al.*, (2020) who revealed that 69.9% of the respondents reported not seeking legal permission before cutting down trees in the forest, and only 30.1% seeking permission before cutting down trees in the study area through “Malamin daji”. The result on preference for agricultural land over forestland was 90.5% (181) which was the highest observed in this study. Due to the increase in population and demand for land, the respondents prefer agricultural lands to a forest as land is a resource that cannot be expanded.

The result revealed that the forest should not be accessed by everyone because the respondents’ opinion was dominated by NO with the value of 88.5% (177) when asked ‘Should everyone have access to the forest in the study area? Studies in Congo DRC and Cameroon are evidence of the destination point of such precious woods (Anon, 2009). As revealed, going in and out of the forest is easy, but it becomes difficult when it has to do with illegal logging and lumbering for business purposes. Forest guards and security operatives were said to be involved in the issuance of fake permits with the cooperation of other officials in the Ministry of Agriculture and Natural Resources. Both the forest guards and officials have also been alleged as conniving and giving consent to foreigners through local agents to exploit the forest illegally.

The result also revealed that forest occupies land meant for agriculture; the respondents’ opinion was dominated by YES with the value of 56.5% (107) when asked ‘if forest occupies lands meant for agriculture in the study area. Adeyemi and Owolabi (2021) confirmed that unsustainable practices and compromise have birthed illegal land-use types, especially farming and charcoal production, which fragmented the forests and subsequently led to eventual deforestation. According to Jonah Busch (2016), a senior research fellow at the US-based non-profit Center for Global Development, forests contribute toward the achievement of many Sustainable Development Goals, not just climate and biodiversity, but also food security, energy, clean water and health. The report says that forests support sustainable agriculture by stabilizing soils and climate, regulating water flow, providing shade and shelter and providing a habitat for pollinators and natural predators of agricultural pests. When integrated judiciously into agricultural landscapes, trees can increase agricultural productivity. “Increasing crop productivity, if paired with direct forest protection measures, can increase both agricultural production and forest cover. But without direct forest protection, increasing crop productivity can put forests at greater risk by making it more profitable to clear land for crops,” Busch added.

**Table 2.0: Anthropological activities leading to deforestation in the study area**

Variable	Frequency	Percentage (%)
Human needs		

Agriculture	106	51.0
Illegal logging	22	9.0
Fuel/Firewood	42	17.0
Forest fire/burning Bush	30	13
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Trees exploited per year</b>		
0 – 3	42	21.0
4 – 7	123	63.5
>7	15	17.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Use to which trees are used</b>		
Timber	34	17.0
Fuelwood	144	72.0
Fencing poles	22	11.0
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Prefer forest over agriculture</b>		
Yes	19	9.5
No	181	90.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Should everyone have access to the forest</b>		
Yes	23	11.5
No	177	88.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Forest occupies land meant to be for agriculture</b>		
Yes	107	53.5
No	93	46.5
<b>Total</b>	<b>200</b>	<b>100</b>

Source: Field Survey (2021)

### 3.0 Relationship between some selected socioeconomic characteristics and causes of deforestation

Table 3.0 shows the analysis of the Pearson correlation between the socioeconomic characteristics of the respondents and causes of deforestation; the relationship between age and causes of



deforestation was found to be strong positive and statistically significant ( $r = 0.888, p < 0.001$ ). This shows age influences deforestation; age would lead to an increase in deforestation. The age of respondents was important in this study because it was to determine economically active groups whose activities have an impact on the forest. Since age goes with manpower, the more active the age group engage in any degradable activity the higher the exploitation, hence the greater the deforestation. The majority of the respondents were young, more energetic and could afford to engage in agricultural production and other non-farm economic activities. This finding supports that of Krishna (2004) that age significantly influences the adaptive capacity of farmers against deforestation. The correlation between marital status and causes of deforestation was found to be low negative and statistically significant ( $r = -0.318, p < 0.001$ ). This indicates that marital status does not tend to influence deforestation. This might be because married women prefer to engage in domestic tasks near farmhouses rather than exploiting forest resources. This is not in agreement with David et al., (2020) findings that agricultural practices are mostly associated with the married individuals and it is also likely that they engaged their family members in farming activities hence making farm work relatively simple to operate. The smaller the household, the smaller the family labourers hence the smaller the degradable activities, and vice versa. The relationship between educational level and causes of deforestation was found to be highly positive and statistically significant ( $r = 0.831, p < 0.001$ ). This indicates that the educational level of the respondents has the tendency to influence deforestation because most of the respondents had no formal education, this may have contributed to the increase in deforestation in the study area, this is possible due to the low level of education attained by the majority of the respondents, as such awareness about the benefits of forests may be lacking as a result of low level of public enlightenment. This agrees with the findings of Vande *et al.* (2009) who opined that literacy level could improve the adoption of strategies for adaptation to deforestation. Also, an educated farmer could readily access information on deforestation and how it could be adapted.

**Table 3.0** Correlation between some selected socioeconomic characteristics of the respondents and causes of deforestation

	AGE	MS	EDULVL	COD
AGE	1			
MS	-0.417**	1		
EDULVL	0.913**	-0.499*	1	
COD	0.888**	-0.318*	0.831**	1

Source: Field Survey (2021)

\*\* Correlation is significant at 1%

\* Correlation is significant at 5%

Key: AG=Age, MS= Marital status, EDCLVL= Educational level, COD= Causes of deforestation

## **Conclusion**

The study found that the main economic activities of the indigenes were farming, hunting, and logging, which destroyed large areas of land because they did not take any measures in afforestation or restoration of the forest used. They conserve the forest in search of their daily bread. The study also revealed that major causes of deforestation in the study area include agricultural activities, illegal logging for fuel woods, timber exploitation and fencing poles. The result of this study further showed that 4 – 7 trees were exploited per year by an individual from the forest which is highly detrimental to the environment. Correlation between age, marital status and educational level with causes of deforestation has a positive relationship.

## **Recommendation**

From the result obtained by this study, the following recommendations are as follows:

1. Enforcement against logging, education on effects of deforestation, re-introduction of tree planting programs annually
2. The government should also give more emphasis on providing alternative energy means of cooking and lightening apart from fire woods, providing modern means of farming with crops that require a small amount of land and lastly emphasis more on public enlightenment campaign on the dangers of deforestation and desertification.
3. Forest guards should step up actions in the reserved area to prevent further encroachment and access by unauthorized persons, especially herdsmen, farmers and charcoal producers to prevent further losses in forest extent.
4. Since agricultural activities are the major causes of deforestation in the study area, agroforestry should be encouraged for forest land sustainability.

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