

## Appraisal of Forest Restoration Activities in Wasagu Forest Reserve Kebbi State

M.A. Mansur, Senchi I. J., Ambursa A.S., Atiku M., D.P. Gwimmi, Z. Yusuf &  
Abdulrahman, A.

Department of Forestry and Fisheries  
Faculty of Agriculture  
Kebbi State University of Science and Technology, Alliero  
aasarki@gmail.com

D.O.I: 10.56201/ijgem.v9.no6.2023.pg136.146

---

### 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 socioeconomic 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 result also indicated that ideas of planting trees in the study area were ere dominated by communal-initiative with 63.0%, Self-initiative had the value of 12.0% with seedlings sourced majorly by purchasing from the market. 88.0% for fruits and feed 70.0% and 1 – 3 trees were planted by individuals with the value of 64.5% as observed in the study area. Major forest restorative activities were for environmental protection with a value of 50.5% and agencies responsible for forest restorative activities were the Community with 70.5%. Also relationship between age and restoration activities was found to be weak positive and statistically significant ( $r = 0.195$ ,  $p < 0.006$ ). It is therefore recommended that re-introduction of tree planting programs annually and forest nurseries should be established in the study area to enable them to raise seedlings for planting, and continued reforestation and restoration of the forest trees in the study.*

---

### Introduction

Forest restoration is a key activity used to implement ecosystem management. Forest restoration aims to enhance the resiliency and sustainability of forests through treatments that incrementally return the ecosystem to a state that is within a historical range of variability of conditions tempered by potential climate change impacts (Landres *et al.*, 1999). Forest restoration techniques include

activities such as tree cutting and prescribed fire, stabilizing slopes, and removing invasive species. Knowledge of the historical range of variability of forest landscapes can help to clarify the types, extent, and causes of ecosystem changes and can help to identify restoration objectives (Landres *et al.*, 1999). Forest accelerates the process of re-instate ecological processes, which accelerate recovery of forest structure, ecological functioning and biodiversity levels (Stanturf, 2005). Forest restoration is a specialized form of reforestation, but it differs from conventional tree plantations in that, its primary goals are biodiversity recovery and environmental protection (Lamb, 2011).

Forest restoration is needed to reverse forest degradation and increase forest cover so that the remaining and relatively untouched forests can be conserved (Lamb, *et al.*, 2012). Even though there is little forest cover loss in the world, deforestation is regionally significant (e.g., Sub-Saharan Africa) (FAO, 2009). In some parts of the world, for instance, Western Europe, the eastern United States, and Southeast Asia, virtually all protected areas have been altered and therefore need restoration. However, there is also a growing movement for the re-creation of “wilderness,” and this creates tension with restoration activities and sometimes an objection against management interventions within protected areas (Landres *et al.*, 2000).

Forest restoration is an inclusive process, which depends on collaboration among a wide range of stakeholders including local communities, government officials, non-government organizations, scientists and funding agencies. Its ecological success is measured in terms of increased biological diversity, biomass, primary productivity, soil organic matter and water-holding capacity, as well as the return of rare and keystone species (Martínez *et al.*, 2012).

## 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 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 favourable condition (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, Xylocarpus americana, Acacia nelotica, Afzelia Africana, Ziziphus spina and Parkia biglobosa. Shrubs Adenium abesium, Annona senegalensis, Annona squamosa, Antiaris Africana, Jatropha curcas, Guiera senegalensis & Pilstigma thoningii. Grasses Melia oriental, Oqcimun 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 restoration activities.

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 is an economically active group whose activities have serious repercussions on the environment. Since age goes into 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 are 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. A 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, and 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**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<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 restoration activities in the study area

The results in Table 4.3 revealed that communal initiative dominated with 63.0% (111) and self-initiative had the value of 12.0% (24) which was the lowest in terms of ideas of planting trees in the study area, this revealed that major restorative initiatives or activities are most communal. This was in line with the findings of Ormerod (2003) who noted that the restoration initiative is a community-based forest restoration project, named the 'Buffelsdraai Landfill Site Community Reforestation Project'. Tree seedlings for planting were supplied by tree-pruners (community tree-growers) within the Buffelsdraai, Osindisweni and KwaMashu local communities who source the seeds from the reference habitat and forest patches within a 50-km radius of the site.

The seedlings were sourced by majorly purchasing from the market with a value of 88.0% (176) and self-raised had the lowest value of 12% (24). The purpose of planting tree species showed that fruits and feed dominated with a value of 70.0% (124) which was the highest and the lowest was used for shade and shelter with a value of 9.0% (15). The number of trees planted per year revealed that 1 – 3 trees planted had 64.5% (129) which was the highest and the lowest was 7 – 10 trees planted per year with a value of 13.5% (27) observed in this study, this showed that 1 – 3 numbers of trees were planted per year in the study area and seedlings were mostly purchased from the market. This was in line with the findings of Douwes *et al.*(2015) who reported that 67.5% of tree seedlings were purchased from treepreneurs. Although the number of species planted in the three- and five-year-old habitats is unknown, a greater number of fast-growing species in the nursery probably contributed to lower species richness, evenness and diversity in the restored compared with the reference habitat. To overcome this challenge, Douwes *et al.*(2015) recommended that treepreneurs should be incentivized to increase species richness. Major forest restorative activities showed that environmental protection had 50.5% (105) and the lowest was observed on the protection of water shade with a value of 6.0% (15). The agencies responsible for forest restorative activities observed that Community had 70.5% (137) while Non-Governmental Organizations (NGO) played little role with a value of 5.0% (15) in this study area.

The Brazilian Atlantic Forest restoration study by Rubiano-Cardona *et al.* (2013) revealed that the challenge was addressed by sourcing planting stocks and seedlings from both community-based seed collectors and professional seed collectors, to increase species richness. The result of this study

The result of this study showed that most trees were planted for fruits/feed and environmental protection. This was in line with the findings of Douwes *et al.*(2015) who revealed that fruit tree species are easily noticeable, thus promoting their collection by treepreneurs. Douwes *et al.*(2015) assessed the nursery tree seedling stock ready for planting at the Buffelsdraai Landfill Site and found that species that produce large fruits were the most dominant. Furthermore, these species are easy to propagate and are relatively fast-growing (Douwes *et al.*,2015).

**Table 3.0: Distribution of respondents based on restoration activities in the study area**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>The idea of planting trees</b>		
Self-initiative	24	12.0
Communal-initiative	111	63.0
Forest guards/FD-initiative	65	55.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Sources of seedlings</b>		
Self-raised	24	12.0
Purchased from market	176	88.0
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Purpose of planting tree species</b>		
Fruits & feed	124	70.0
Environmental protection	62	31.0
Shelter and Shade	15	9.0
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Trees planted per year</b>		
1 – 3	129	64.5
4 – 7	44	22.0
7 – 10	27	13.5
<b>Total</b>	<b>200</b>	<b>100</b>

<b>Measures in place towards restoration</b>		
Protection of environment	105	50.5
Tree planting	48	24.5
Protection of water shade	15	6.0
Timber production	32	19.0
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Who is responsible for the above measures?</b>		
Community	137	70.5
Non-Governmental organization	14	5.0
Government	49	24.5
<b>Total</b>	<b>200</b>	<b>100</b>

Source: Field Survey (2021)

### 3.0 Correlation between some selected socioeconomic characteristics of the respondents and restoration activities

**Table 3.0** shows a relationship between the socioeconomic characteristics of the respondents and restoration activities; age and restoration activities were found to be weak positive and statistically significant ( $r = 0.195$ ,  $p < 0.006$ ). This implies that the age of the respondent has a slight influence on restoration activities. It is probably for this reason that within local communities, older people, mainly those aged above 40 years, tend to participate more in tree planting than those below 40 years. This finding is consistent with Mariga et al. (2010) who observed that community members aged between 40 and 54 tended to participate more in community forestry programs because they can plant trees and harvest them within their lifespan. In this regard, age has an important bearing on the participation of people in forest restoration, since it relates to benefits from tree and forest resources in their lifetime. The relationship between marital status and restoration activities was found to be weak negative and statistically significant ( $r = -0.295$ ,  $p < 0.001$ ). This indicates that marital status has no influence on restoration activity, that is married people were less likely to participate in forest management. The relationship between educational level and restoration activities was found to be moderately positive and statistically significant ( $r = 0.426$ ,  $p < 0.001$ ). This shows that educational level might moderately influence restoration activities in the study area. Quaye (2009) pointed out that education is one of the important human capital which plays an important role in determining status in society. Education is expected not only to contribute to people's ability to read and understand instructions but also to help them adopt new techniques. This could lead to more direct employment generation, better economic empowerment and well-being of the rural populace. Also, Adekunle (2009) pointed out that the level of education of farmers will directly affect their ability to adapt to change and to accept new ideas. Similarly, the



World Bank (2006) cited that education is one of the potentials rural dwellers possess in improving their socio-economic status. It is realized that most people in the rural communities of the five districts have attempted to acquire some formal education but the majority stopped at secondary school and this cuts across the various age categories.

**Table 3.0** Correlation between some selected socioeconomic characteristics of the respondents and restoration activities

	AGE	MS	EDULVL	RA
AGE	1			
MS	-0.417**	1		
EDULVL	0.913**	-.499*	1	
RA	0.195*	-0.295*	0.426**	1

Field survey 2021

\*\* . Correlation is highly significant at 1%

\* . Correlation is significant at 5%

Key: AG=Age, MS= Marital status, EDCLVL= Educational level, RA=Restoration activities

### Conclusion

The study found that the main economic activities of the indigenes were farming, hunting, and logging, which resulted in destroying large areas of forest land with not much effort on afforestation or restoration of the forest used. They conserve the forest in search of their daily bread. The result of this study showed that 1 – 3 trees were planted per year using seedlings purchased from the market or self-raised by the community for fruits/feed and environmental protection in their farmlands. The study showed that the community and government were the agencies responsible for forest restorative activities while Non-Governmental Organizations (NGOs) had little role play in this study area. The correlation between age and educational level with restoration activities 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. Forest nurseries should be established by the state forest department in the study area to enable them to raise seedlings for planting.
3. Communities should be proactive in restorative activities by forming a communal-based initiative for greater ecological and socio-economic benefits in the study area.

## REFERENCES

- Adekunle, V. A., (2009). Contributions of agroforestry practice in Ondo State, Nigeria, to environmental sustainability and sustainable agricultural production. *Journal of Agroforestry and Silviculture*, 4(3): 278-284.
- Adekunle, V.A.J. & Olagoke, A.O. (2010) The impacts of timber harvesting on residual trees and seedlings in a tropical rain forest ecosystem, southwestern Nigeria. *International Journal of Biodiversity Science, Ecosystem Services and Management*, 6(3-4), 131-138, DOI: 10.1080/21513732.2010.534976
- Adetoye, A. M. (2019). Forestland-dependent households: a primary agent of deforestation in Nigeria? *Agricultural Tropical and Subtropical*, 52/1, 19–25, 2019
- Douwes, E.; Rouget, M.; Diederichs, N.; O’Donoghue, S.; Roy, K (2015). Buffelsdraai Landfill Site Community Reforestation Project; XIV World Forestry Congress: Durban, South Africa.
- KARDA (2003). *Kebbi State Dairy prepared by the Ministry of Information, Kebbi State.*
- Kebbi State Agricultural and Rural Development Authorities (1999). *Bulletin.*
- Lamb, D., and Gilmour, D. (2003). *Rehabilitation and Restoration of Degraded Forests.* IUCN, Gland, Switzerland Cambridge, UK, and WWF, Gland, Switzerland.
- Lamb, David (2011). *Regreening the Bare Hills.* World Forests. Springer. p. 547. ISBN 978-90-481-9870-2.
- Landres, P.; Morgan P.; Swanson F. (1999). Overview of the use of natural variability in managing ecological systems. *Ecological Applications* 9: 1279–1288.

- Landres, P.B., Brunson, M.W., Merigliano, L., Sydoriak, C., and Morton, S. (2000). Naturalness and Wildness: The Dilemma and Irony of Managing Wilderness. *Proceedings RMRS, Wilderness Science in a Time of Change*
- Mariga, J. N., Kibwange, J. K. and Oindo, O. (2010). Factors determining community participation in afforestation projects in River Nyando Basin. *Journal of environmental sciences and technologies*.
- Martínez de Aragón, Juan; Fischer, Christine; Bonet, Jose-Antonio; Olivera, Antoni; Oliach, Daniel; Colinas, Carlos (2012). "Economically profitable post-fire restoration with black truffle (*Tuber melanosporum*) producing plantations". *New Forests*. 43: 615–630.
- Musa, K. S., Rabi, M., Nafisa, M. & Yakubu, A. (2020) Assessing the Key Drivers of Energy Demand in Nigeria: Application of ARDL Approach, *Global Scientific Journals*, 8(6):19-40. Available at [www.globalscientificjournal.com](http://www.globalscientificjournal.com)
- National Population Commission (NPC) (2006). *Nigerian population by States*, Kebbi.
- Oladosu, I.O., Ogunwale, A.B. and Ayanwuyi, E.(2002). Farmer's perception of effects of deforestation on agricultural production and economic activities in selected rural communities in Orire Local Government Area of Oyo State, Nigeria. *International Journal of Business and Common Market Studies* vol. 1 (1): 209-216.
- Ormerod, S.J. (2003). Restoration in applied ecology: editor's introduction. *Journal of Applied Ecology* 40:44–50.
- Quaye, S., (2009). Food Security situations in North Ghana, coping strategies and related constraints. *African Journal of Agricultural Research*, 3(5): 48-76.
- Rubiano-Cardona, K.; Arcila-Cardona, L.F.; Jiménez-Carmona, E.; Armbrecht, I (2013). Production, accumulation, and decomposition of leaf litter in a Colombian Subandean forest and neighbouring areas of restoration. *Bol. Cient. Mus. Hist. Nat.*, 17, 47–59.
- Stanturf, John A. (2005). "What is forest restoration?". *Restoration of boreal and temperate forests*. Boca Raton: CRC Press. pp. 3–11.
- Wada A. F., Umar A.F., Bello U.Musa, Tasi'u M., Bilyaminu H., Mubarak M., Ibrahim M. I. and Abubakar A. (2019). Assessment of Deforestation Level in Some Selected Forests in Nigeria. A Case Study of Duddurun Gaya Forest Reserve, Gaya Local Government Kano State, Nigeria. *Direct Research Journal of Public Health and Environmental Technology*, Vol. 4 (1), pp.1-7, March 2019 DOI: <https://doi.org/10.5281/zenodo.2616720>
- World Bank, 2006. *Poverty and Hunger: Issues and options for Food Security in Developing countries*. Washington.