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Assessment of Human Activities and Tree Regeneration Practices in the Sudano–Sahelian Parklands of Nigeria

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SUMMARY

The research was conducted to assess the roles of human activities in tree regeneration in the agricultural parklands of northern Nigeria. A total of 491 structured questionnaires were purposively distributed to respondents in the sampled states (Bauchi, Jigawa, and Kano) to assess their roles in tree regeneration in the parklands. Descriptive statistics were used to analyse the data using SPSS software. The majority of the respondents (94.50%) were male, among whom 82.28% were married. Eighty per cent of respondents had farming as their primary occupation, with over 10 years of experience. The 34.83% of the respondents had never planted a tree on their farm. Regeneration is mostly natural and aided through vegetative propagation. Land is the major problem facing the farmers regarding tree regeneration. The parkland has poor regeneration potential due to little or no intervention by the farmers. Intervention is also needed from the government at all levels, NGOs, and Community-Based Organizations (i.e. CBOs) for proper development, conservation, and sustainable use of tree species on farms for improved livelihoods and biodiversity conservation.

Keywords: Human activities, Tree regeneration practices, Sudano-sahelian region, Parkland

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INTRODUCTION

Human activities and global climate change are among the most important issues in the conservation of forest ecosystems (Trenberth, 2018), not only in developing countries but also in advanced countries. The rapid population growth in developing countries has raised the demand for forest products in the tropics. Urban immigrants, unlike traditional peoples, have no indigenous knowledge or skills in the sustainable use of natural forest resources, leading to severe damage to forest ecosystems. Natural and man-made threats, as well as direct and indirect consequences of socio-economic development, have contributed to the erosion of biodiversity at all levels in the country. It is believed that within the last 25 years, about 43% of the forest ecosystem has been lost due to human activities in Nigeria (Abdullahi, 2021). The agricultural parklands of Northern Nigeria are characterized by a unique landscape where trees are interspersed within farmland, creating a mosaic of trees, crops, and livestock. This agroforestry system plays a crucial role in sustaining livelihoods, biodiversity (Altaf, 2016; Rahman et al., 2023), and

ecosystem services in the region (Pancholi et al., 2023). However, human activities within these parklands can significantly influence tree regeneration processes, impacting the composition, structure, and dynamics of tree populations (Maranz, 2009).

The Sudano–Sahelian parklands in northern Nigeria are increasingly threatened by human activities such as agricultural expansion, overgrazing, fuelwood collection, and unsustainable land-use practices (Azare et al., 2020). These actions threaten both the long-term stability of ecosystems and the natural regeneration of trees. Agroforestry systems are crucial for rural economies, climate adaptation, and biodiversity preservation. However, there is little empirical research on how farmers' activities and sociodemographic traits impact the region's regeneration processes. This study aims to investigate how human activity affects tree regeneration in the agricultural parklands of Bauchi, Jigawa, and Kano states. It will examine the regeneration techniques used by farmers, identify the challenges they face, and develop strategies to support sustainable tree management, protect biodiversity, and improve livelihoods.

MATERIALS AND METHODS

The study was conducted in the Sudano-Sahelian region, located on latitudes 10°N to 14°N and longitudes 4°E to 11°E, encompassing the northern parts of Nigeria (Figure 1). This region has an extensively varied climate; with an average annual precipitation of around 610 mm, this part of Nigeria receives the least amount of rainfall overall. The region is characterised by hot, semi-arid weather and savannah vegetation, with patches of savannah shrubs interspersed with cultivated parkland. Since agriculture and the rearing of animals are the main industries in this area, rainfall is crucial, and fluctuations in its features are concerning (Bako et al., 2020).

RESPONDENTS SAMPLING

The selection of respondents for this research was conducted using a purposive sampling technique. Data for this study were collected through the interview method using a pre-tested and validated semi-structured questionnaire administered to farmers. Because accurate data on the actual population of small-scale farmers were unavailable (who are in charge of almost all the parklands), a total of 491 farmers were conveniently selected across the states, i.e., 20 respondents from each village and one hundred eighty (180) respondents from each state; this makes a total of 491espondents in the study area.

DATA ANALYSIS

The data obtained from individual respondents in the parklands were processed and analyzed based on their questionnaire responses. Descriptive statistical methods, including frequency counts, percentages, and mean scores, were utilized to analyze the collected data. SPSS software was utilized for this study.

RESULTS

DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Table 1 displays the demographic profile of the respondents, including gender, marital status, and educational qualifications. According to the findings, 94.50% of the respondents were male, with only 5.50% being female, indicating a substantial gender disparity.

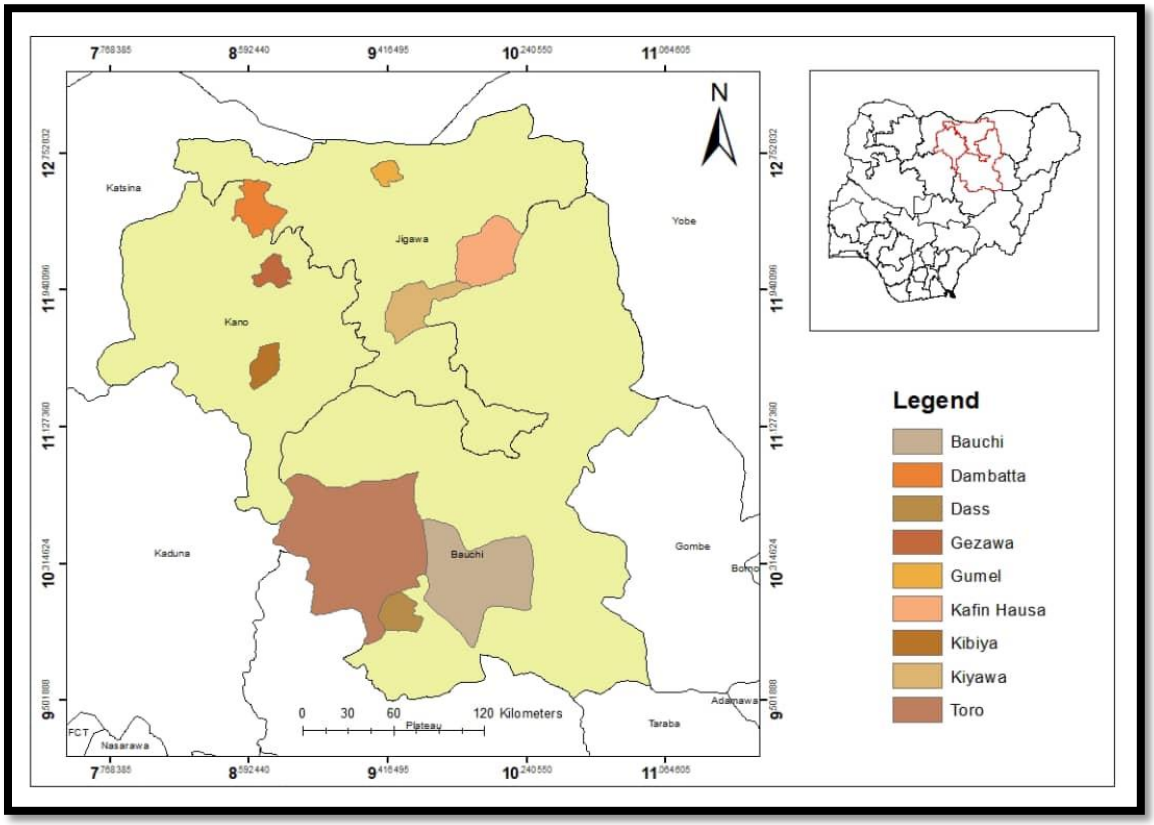

Figure 1: Map showing all the study locations in the region (Source: CDA GIS Lab, Buk).

Furthermore, the results reveal that 4.49% of respondents were aged between 31-40 years, while 40.94% fell within the 41-50 years age bracket, and 48.07% were above 50 years of age, with 6.11% of the respondents being less than 30 years old. Most of the respondents, about 82.28%, were married, and 14.46% were single. The educational status of the respondents indicates that 2.85% had no formal education, 5% had adult education, 19.35% had primary education, 26.48% had secondary education, and 23.83% had tertiary education. Hausa is the most commonly spoken language among the respondents in the region, accounting for 65.17%, followed by English (20.98%) and Fulfulde (13.85%). Farming is the primary occupation of about 80.04% of the respondents, followed by civil servants (7.74%) and trading/business (5.50%), respectively.

INFORMATION ON TREE REGENERATION PRACTICES IN THE STUDY AREA

The results of Table 2 reveal information on tree regeneration practices in the parklands of the region. Table shows that 244 respondents (49.69%) are aware of the yearly tree planting campaign by the government at different levels. Additionally, 34.83% of the farmers have never planted a single tree on their farms, while 35.44% have planted more than five trees on their farms before. Seedlings are privately sourced, and this indicates that 45.82% of the respondents cited fuel wood exploitation as the major reason for tree

planting, while 16.50% and 11.61% cited wind barriers and fodder production, respectively.

Table 1: Demographic characteristics of the respondents.

Variables	Frequency	Percentage
Gender		
Male	464	94.50
Female	27	5.50
Total	491	100
Age (Years)		
Below 30	30	6.11
31-40	24	4.89
41-50	201	40.94
Above 50	236	48.07
Total	491	100
Marital status		
Single	71	14.46
Married	404	82.28
Divorced	3	0.61
Widowed	14	2.65
Total	491	100
Educational Status		
Primary education	95	19.35
Secondary education	130	26.48
Qur'an education	130	26.48
Tertiary education	117	23.83
Vocational education	5	1.02
Didn't attend any school	14	2.85
Total	491	100
Language spoken		
English	103	20.98
Hausa	320	65.17
Fulani	68	13.85
Total	491	100
Occupation		
Farming	393	80.04
Civil servant	38	7.74
Ranching	3	0.61
Cap weaving	8	1.63
Fishing	3	0.61
Business	27	5.50
Student	5	1.02
Not employed	4	0.81
Rope weaving	5	1.02
Driver	5	1.02
Total	491	100

Table 2: Information on Tree Regeneration Practices.

Variables	Frequency	Percentages
Tree planting campaign awareness		
Yes	244	49.69
No	247	50.31
Total	491	100
Number of trees planted		
None	171	34.83
<5	146	29.74
>5	174	35.44
Total	491	100
Source of Seedling		
ADP(Agricultural Development Programs)	54	11.00
Private nursery	225	45.82
Government nursery	57	11.61
State forest nursery	36	7.33
Others	119	24.24
Total	491	100
Purpose for tree planting		
Fuel wood	225	45.82
Soil fertility	30	6.11
Wind barrier	81	16.50
Fodder	57	11.61
Erosion control	33	6.72
Pole production	46	9.37
Others	19	3.87
Total	491	100
Tree class status		
Seedling	44	8.96
Sapling	111	22.61
Trees	336	68.43
Total	491	100
Method of regeneration		
Seeds	73	14.87
Coppicing	136	27.70
Vegetative propagation	282	57.43
Total	491	100.00
Farmers roles on tree Regeneration		
Natural	133	27.09
Watering	73	14.87
Fencing	54	11.00
Pruning	109	22.20
Other tending operations	122	24.85
Total	491	100.00

Mature trees constitute the majority of the tree classes, accounting for 68%, followed by saplings (22.61%) and seedlings (8.96%). Farmers play a very minimal role in helping the trees regenerate, as 27.09% of the trees grow naturally on the farmed parklands, while 22.20% assist with pruning and 14.87% assist with watering.

CONSTRAINTS AND RECOMMENDATIONS TO TREE REGENERATION PRACTICES

The findings depicted in Table 3 provide insights into the obstacles hindering the adoption of tree regeneration practices, along with recommendations aimed at enhancing tree regeneration in the parklands. The results show that land occupied (33.60%), lack of adequate seedlings (21.59%), shortage of labor (12.63%), and lack of incentives (11.00%) constitute the major constraints to the adoption of tree regeneration practices in the region. Halting indiscriminate tree felling (51.73%), provision of more land (11.61%), provision of cheaper energy alternatives (9.98%), and planting more trees (8.35%) were highly recommended by the respondents (farmers) for better tree regeneration practices in the parklands of the region.

Table 3: Constraints and Recommendations to Tree Regeneration Practices

Variables	Frequency	Percentages
Constraints to Tree Regeneration Practices		
Lack of adequate seedlings	106	21.59
Lack of protective basket	29	5.91
Fencing materials	11	2.24
Transportation	22	4.48
Land	165	33.60
Lack of incentives	54	11.00
Termite and insects attack	14	2.85
Scanty rainfall	14	2.85
Shortage of labor	62	12.63
Inadequate extension agent	14	2.85
Total	491	100
Recommendations for better regeneration Practices		
Increased Awareness	38	7.74
Stop indiscriminate tree felling	254	51.73
Planting more tree	41	8.35
Provision of more seedlings	27	5.50
Provision of more land	57	11.61
Provision of more extension agents	11	2.24
Youth involvement	14	2.85
Cheaper energy alternative	49	9.98
Total	491	100

DISCUSSION

In demographic terms, the majority of respondents were male (94.5%), while females made up only 5.5% of the total. The highest proportion of respondents was aged over 50, followed by those aged 40-50, with individuals under 30 being the least represented

group in this study. This corroborates the outcomes of many authors who revealed that older people appeared to know more about tree uses than younger ones (Jamala, 2017; Abdullahi, 2021). This shows that the results obtained in this study are reliable regarding the maturity of the respondents, the majority of whom were above 50 years of age. This also aligns with the long-standing belief that only older people possess knowledge of their environment and have a strong tendency to keep this knowledge secret. Most of the respondents (82%) are in a marital relationship. The respondents are moderately literate, as 23.83% have obtained tertiary-level certificates, 26.48% have secondary school and Qur'anic education, and only 2.85% of the respondents did not attend any school. As indicated by Amaza and Tashikalma (2003), the literacy level of farmers plays a crucial role in determining their uptake of enhanced technology to boost productivity in the parklands. Additionally, Adekunle (2009) suggests that farmers' educational attainment directly influences their capacity to embrace changes and adopt new ideas. Hausa is the predominant language spoken in these regions, followed by Fulani and other indigenous dialects. Agriculture stands as the primary occupation for the majority of respondents in these states. This trend could be attributed to the culture and traditions of the people, which allow men to perform all the farming activities while women take care of the home front. The majority of younger individuals consider farming no longer lucrative (Leavy and Hossain, 2014); this informs their decisions to engage in other businesses that will quickly bring them money, but Abdullahi (2021) observed a contrasting pattern in the agroecological regions of northern Nigeria.

Concerning the farmers' knowledge of tree regeneration efforts, half (50%) of the respondents indicated that they were unaware of any tree planting initiatives conducted by the respective state governments in their areas; only 35.4% of the farmers planted over five trees on their farms, and 29.74% planted less than five, while 34.83% never planted a single tree on their farms. The majority of farmers in the study area obtain seedlings from private sources. Fuelwood exploitation, wind barriers, and fodder were the main reasons for tree planting by the farmers. Moreover, around 68.44% of the regenerating stands in the respondents' farms were trees, followed by saplings and seedlings, which indicates very poor regeneration potential. This also conforms to the findings of Abdullahi (2021) at different agroecological zones of northern Nigeria. The results also revealed that regeneration is mainly natural. Land, lack of adequate seedlings, lack of incentives, and shortage of labor were the main constraints to tree regeneration in the parklands. Stopping and/or discouraging indiscriminate tree felling, land availability (Ghate and Nagendra, 2005), increased awareness regarding the significance of regenerating tree species in the parklands (Echiru and Ojelel, 2023), coupled with the availability of more affordable energy sources, have been identified as the best ways of improving tree regeneration practices in the parklands. This contradicts what Chukwujekwu (2010) reported in the agroforestry farms in Jos, Plateau State, Nigeria, and this discrepancy may be attributed to the climatic variations among the ecological zones.

CONCLUSION

Human activities exert significant influence on tree regeneration processes in the agricultural parklands of Northern Nigeria. Sustainable land management practices that promote tree conservation, agroforestry, and community-based natural resource management are essential for maintaining and enhancing tree regeneration in these

landscapes. Policy interventions, community engagement, and capacity-building initiatives are needed to address the challenges and opportunities associated with human-induced impacts on tree regeneration in agricultural parklands. Collaborative efforts involving government agencies, research institutions, non-governmental organizations, and local communities are crucial for promoting sustainable land use practices and conserving the biodiversity and ecosystem services provided by parkland trees in Northern Nigeria.

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