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Original Article

Assessment of deforestation circumstances in Mokwa, Niger State, Nigeria

OPEN ACCESS

Gbolagade Adeyemi ADEGBOLA[1]*, Luke Temitope SOYEWO[2], Imuwahen Aimufua WOGHIREN[2] & Bernard Ogbor ODEY[3]

[1]*Southern Guinea Research Station-Forestry Research Institute of Nigeria, Mokwa, Niger State, Nigeria*
[2]*Forest Conservation and Protection, Forestry Research Institute of Nigeria (FRIN), Ibadan, Nigeria*
[3]*Trial Afforestation Research Station-Forestry Research Institute of Nigeria (FRIN), Afaka-Kaduna State, Nigeria.*

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ABSTRACT

This study investigated deforestation in Mokwa Local Government Area (MLGA) of Niger State. Simple and systematic random sampling technique was used in selecting the five communities and 120 respondents for the study, respectively. Questionnaire and informal interviews used includes discussion with the community heads, forest users, and personal observations from the field visited were the methods used to collect qualitative information. Findings revealed that the major occupations in the study areas are farming (60.0%), followed by artisan (22.5%) and civil servants (10.8%). As revealed by the respondents, the main circumstances of deforestation in the study areas includes the following: Fuel wood removal (37.5%), Timber logging (22.5%), and Farming (32.5%). It was discovered that global warming (32.5%) was the major consequence of circumstances of deforestation in the study areas, followed by soil erosion (29.2%), desertification (20.8%) and forests animal displacement (17.5%). It was revealed that some species of trees in the study areas have been going into extinction, such as *Vitellaria paradoxa* and *Parkia biglobosa*. This study concluded that the circumstances that have contributed to deforestation in MLGA are complex and multifaceted. Addressing this environmental issue requires a holistic approach that considers the interconnected factors driving deforestation and implements sustainable land management practices, conservation efforts, and community engagement initiatives. By understanding the circumstances leading to deforestation and taking proactive measures to address them, we can work towards preserving the natural resources and biodiversity of rural areas in Mokwa Local Government Area for future generations.

K E Y W O R D S : *Circumstances, Community, Deforestation, Forest*

INTRODUCTION

Forests are crucial environments for storing carbon and biodiversity, it serves as habitats for large numbers of plants and animals species. Forests provide resources for humans, including medicine, food, shelter, timber, and energy. It also plays a critical role in keeping our oceans, rivers, lakes, and streams healthy, Chomitz *et al.* (2007). Despite, the opportunities we derived from forests, reports continue to indicate massive rate of forest shrinks, FAO (2020). Although, deforestation is primarily concerned for the developing countries of the tropics, (Pfaff *et al.*, 2013). As people burn and chop down large amounts of trees, this forest coverage is rapidly dwindling. This causes the remaining plants to become vulnerable to fire as the forest swifts from being a closed, moist environment to an open and dry one. This attitude of deforestation has greatly altered landscapes globally.

*Corresponding author: gbolagadeadegbola23@gmail.com; +238035230945

Mokwa forests reserve is one of the 94 reserves covering about 76,300 square kilometres of arable land in Niger state, north-central Nigeria, Ekpali (2024). The reserve, which spans 8000 hectares, facing rapid deforestation with the rise in demand for charcoal by residents, Ekpali (2024). In 2022, according to Global Forest Watch, a forest-tracking platform, Niger state has lost 76 hectares of trees cover, equivalent to 324 kilotons of carbon dioxide emissions, however, in January 2024 only, at least 334 deforestation alerts were recorded within the confines of Niger state. Tropical forests are home to great numbers of animal and plant species. When forests are logged or burned, it can drive many of those species into extinction.

The escalating losses of forests, especially trees means that, the carbon held back in trees is discharged back into the atmosphere. Because, trees take in carbon dioxide from the air for photosynthesis, scientifically, carbon is locked chemically in the wood. However, when trees are burnt, this carbon returns to the atmosphere as carbon dioxide, this threatens the global biodiversity and further heighten the global climate catastrophe, Ekpali (2024). With fewer trees around to take in the carbon dioxide, this greenhouse gas accumulates in the atmosphere and accelerates global warming. The loss of trees from the forests can leave soil more prone to erosion. Besides, it creates loss of fertile land; it increased pollution and sedimentation in streams and rivers Frederick (2019). Generally, 81 percent of the carbon in the planet's biosphere is hoarded in soil and 19 percent stored in the plants (Watson, *et al.*, 2000). In forests totally, boreal, temperate and tropics simultaneously, nearly 69 percent of the carbon is stored in the soil and 31 percent in the biomass; in tropic forests, nearly 50 percent of the carbon is accumulated in the biomass and 50 percent in the soil Watson *et al.* (2000).

Anthropogenic activity of man is a certain factor of depleting the forest and affecting the tree's regenerative capabilities without knowing the prescient, thereby paving ways for desert encroachment Abiola *et al.* (2016). Building or upgrading roads into forests makes them easy and more accessible for forest exploitation. Forest has been cleared for logging, timber export, subsistence agriculture, ranching and notably the collection of woods for fuel, which remains major issues in Western Africa Summit (2012). Universally, more than 2.4 billion people depend on the fuel-wood utilization, as well as charcoal, as fuel wood for small businesses enterprises and charcoal as crucial energy providers (FAO, 2014). In 2017, FAO estimated that the global production of wood charcoal was about 53.2 million tons, of which 34.2 million tons (or around 64 percent) were produced in Africa. Slash-and-burn agriculture is a big contributor to deforestation in the tropics. With this agricultural method, farmers burn large swaths of forest, allowing the ash to add nutrients to the land for crops. The land is only fertile for a few years, after which the farmers keep on the process elsewhere. Much of earth's farmland was once forests. During the pre-sovereignty period, vast forest reservation took place, about 96,518 square kilometers of land representing 27% of the total forest cover and 10% of the total land area was preserved as covered area, Whereas, 66% of the forest preserves lie in the savanna region of the country, 20% falls within the humid tropical forest zone in southern Nigeria and 4% was fresh water swamps and mangroves of the coastal south of the nation, Olarewaju (2019).

Furthermore, forests are invaluable ecosystems that provide numerous benefits to both nature and humanity. It is essential that we take urgent action to protect and preserve our forests for future generations. By implementing sustainable practices and conservation efforts, we can ensure that forests continue to thrive and fulfill their vital role in maintaining the health and balance of our planet. To address this issue, this research determined to assess deforestation circumstances in Mokwa Local Government area of Niger state with the aims that the information obtained will assist in successful forest management and reestablishment in the area.

MATERIALS AND METHODS

The Study Area

Survey research design was considered the most suitable for this study. This research design studies phenomena as they exist at the particular time of an investigation. This study examined deforestation circumstances in Mokwa Local Government area of Niger state. The target population according to the 2006 population census was 244,937 (NPC, 2006) and it has an area of, 4338km^2 while It is latitude is 9^0 27' N and longitudes 5^0 35' E. The people are predominantly Nupe who are mainly peasant farmers, fishermen and cattle breeders. The study area experiences tropical climatic condition, dry and rainy seasons with annual rainfall are varying from 1100 mm in the Northern part of the state to 1600 mm in the Southern parts. The rainy season lasts for about 150 days in the Northern parts of about 120 days in the Southern parts of the state (NSME, 2008).

Sampling Techniques

The sample of this study consisted of one hundred and twenty (120) respondents that were randomly selected from five forest communities (Kpataki, Kupanti, Tswanle, Jargi and Bokani) in Mokwa Local Government Area of Niger State. Figure 1 shown Mokwa Local Government

Area of Niger State. The simple random sampling technique was adopted in selecting the five forest communities, while the systematic sampling technique was adopted in selecting the respondents used for the study. Structured questionnaire and informal interviews used includes discussion with the community heads, forest users, and personal observations from the field visited were the methods used to collect qualitative information. The structured questionnaire covered important items measuring the variables of the study. The help of the foresters and five villagers were employed, one from each village for local language interpretation and other local help. These interviews accompanied by personal observations which allowed to show the reliability of the answers given. The data collected were analyzed using descriptive statistics in the form of frequency tables and percentages.

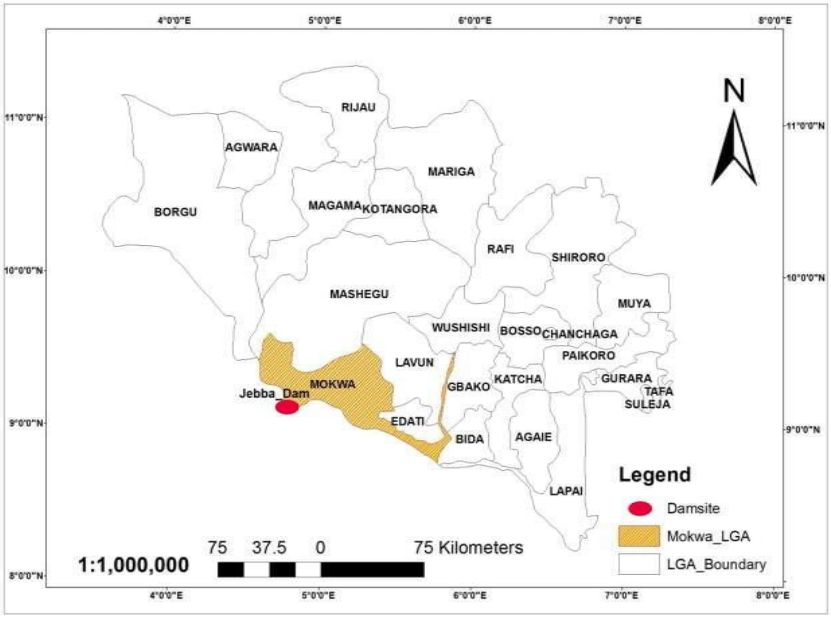

Figure 1: Map showing Mokwa Local Government Area of Niger state

RESULTS AND DISCUSSION

The socio-economic characteristics of the respondents in the study areas are presented in Table 1. The chain of circumstances of deforestation in the study areas are presented in Table 2. Table 3 shown trees that have lost through the chain of circumstances of deforestation in the study areas, and Table 4 revealed consequences of deforestation in the study areas.

Data of personal characteristics of the respondents was observed that (25.8%) of the respondents were between ages 15-30 years, (42.5%) was the maximum of the respondents between ages 31-45 years, while (24.2%) were between ages 46-65 years and 65 age above were the minimum (7.5%.). Respondents were mostly males, (35%) attended primary school, (40%) attended secondary school, (15%) attended tertiary institution while (9.2%) did not have circular education, and the majority of them are farmers as revealed, 32.5% of the respondents were single, 59.2% were married, (5.8%) were divorced while (2.5%) were widowed.

The major occupations in the study area are farming (60%), artisan (22.5%), civil servant (10.8%) and other is (6.7%). This conforms to the fact that the main cause of deforestation is agriculture. Agricultural plants that farmers often replace when the forest is cleared cannot hold on to the soil, and many of the plants can even worsen soil erosion. As the land loses its fertility through erosion, agricultural producers move on to clear more forest and continue deforestation and the cycle of soil losses Frederick (2019).

Table1. Socio-Economic Characteristics of the Respondents

Socio-Economic	Frequency	Percentages (%)
Age (Years)		
15-30	31	25.8
31-45	51	42.5
46-65	29	24.2
Above 65	9	7.5
Educational Status		
Non circular Education	11	9.2
Primary Education	42	35.0
Secondary Education	49	40.8
Tertiary Education	18	15.0
Marital Status		
Single	39	32.5
Married	71	59.2
Divorced	7	5.8
Widowed	3	2.5
Gender		
Male	99	82.5
Female	21	17.5
Occupation		
Artisan	27	22.5
Civil servant	13	10.8
Farming	72	60.0
Others	8	6.7

Field Survey (2024)

Deforestation Circumstances in the Study Area

The major deforestation circumstances in the study area as revealed by the respondents shown in Table 2. Fuel-wood was the greatest chain of circumstances (37.5%), Timber logging had 22.5%, this indicated that timber harvest was the initial deforestation agent, and charcoal productions continues, this is also in line with Chidumayo (2011) which says charcoal production in Africa is considered as the major drive for deforestation; mostly all the charcoal were produced in rural areas, especially in forested areas surrounding the urban centers. As more community households depend on wood for domestic energy, reducing the amount of carbon dioxide in the air can be an arduous struggle Ekpali (2024).

Table 2: Main deforestation circumstances in the study area

Factors	Frequency (n = 120)	Percentage (%)
Fuel wood	45	37.5
Timber logging	27	22.5
Farming	39	32.5
Others	9	7.5

Field Survey (2024)

Further complicating this are people like labourers at there who depend on deforestation to feed themselves. The reason could be attributed to poverty and the relatively higher cost of electricity and cooking gas, which is beyond the reach of the rural people, this is also in line with Odunayo *et al.* (2019) which assessed the effect of indiscriminate charcoal production on Nigeria Forest Estate. On other hand, the rate of charcoal making in the study area cannot be overemphasized, regardless of the effects of charcoal makings on the producers and the environment.

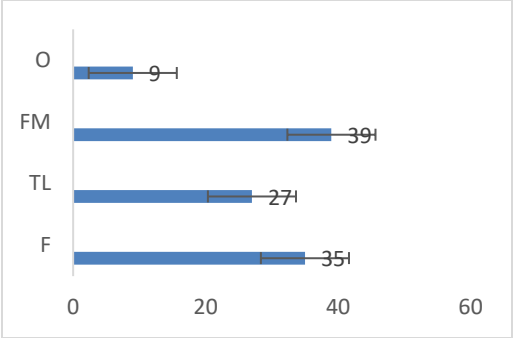

Figure 2: Main deforestation circumstances in the study area.
O: Others; FM: Farming; TL: Timber Logging; F: Fuelwood

One of the respondents said, producing charcoal has been his daily job for over 20 years. He said he needed the work because of paying bills and can't stay idle, and the maize farming that he engaged in can hardly cater for his two wives and seven children. Said charcoal business is side work for him which is used to take care of his family; as he said, he can't rely on crop alone. The charcoal producers adopt pit earth kiln and surface mound earth kiln as methods of producing charcoal which were discovered to contribute to diseases and environmental hazards as well as soil deterioration, Alawode *et al.* (2015). Farming had (32.5%), households close to the forest and keeps on encroaching the forest land for the cultivation of crops and rearing of animals for family consumption. This is in line with Gillet *et al.* (2016) who noted that the forest communal territory is subjected to degradation of forest through increased agricultural activities. According to forestry officials, deforestation in the state dates back to the early 1980s, when the state government began the Taungya farming scheme, which legalized farmers to grow more crops in the forests. However, farmers infringed the forest reserves to broaden their farmlands, cutting down their trees for their crops to thrive. A large area of land is usually cleared to give way for single-crop agriculture. This has resulted in large-scale

deforestation in rural areas. However, rural people who are the major stewards of forest resources live by exploiting forest resources without care Mogaka (2011), causing losses of economic trees. In addition, having a universal pact that their farms will lose fertility after first cultivation, because of this, many farmers ignore their farmlands for fresh ones upon the beginning of a fresh season. "If you cultivate legumes in the old farmland, it will not grow well, a respondent, said.

Unfortunately, these farmers who cut and burnt down the trees for farming silently suffer the attack as they experience lower yield of the crops. Because, the cutting of trees in the forest reduces the water-retention capability of the soil, affecting the area to be more susceptible to flooding and erosion as experienced in study areas. Other activities that contributed to the deforestation in the study area, such as cow browsers, and electric poles had (7.5%) Figure 2. This can be since that most of the households rely on forest as an alternative way to sustain their living. The following species of trees in the study areas need quick intervention *Tectona grandis*, *Daniella Olivera, Pterocerpus erinaceas, Vitellaria paradoxa, Gmalaina arborea, Khaya senegalensis* and *Parkia biglobosa* Table 3. This is also conformed with Izekor and Modugu (2011) that says tree species are very crucial in the charcoal production as there are specific trees species known by charcoal producers to produced charcoal, maybe, because of theirs

Table 3: Trees that lost through deforestation circumstances in the study area

Species of Tree	English Name	Local (Nupe) Name
Tectona grandis	Teak	Fenniko
Daniella Olivera	Senegal rosewood	Danchi
Pterocerpus erinaceas	Padauk	Zanchi
Vitellaria paradoxa	Shea butter	Kochi
Gmalaina arborea	Malay beachwood	Malaina
Khaya senegalensis	Mahogany	Wuchi
Parkia biglobosa	African locust bean	Lonchi

Field Survey (2024)

dense and being a hardwood with higher calorific value. The respondents also revealed that, lack of jobs contributes to deforestation in the study area because "*an idle hand is a devil's workshop''* majority of the school lever see forest exploitation as an alternative way to survive. The rural poor exploit these forest resources indiscriminately to meet their needs because "*a hungry man is angry man*".

Consequences of Deforestation Circumstances in the Study Area

In this section, the consequences of chain of circumstances of deforestation in the study area were revealed, in Table 4. It was revealed that soil erosion had 29.2% and desertification had 20.8%. Tree roots anchor the soil, without trees, the soil is free to wash or blow away, which may lead to vegetative growth problems. The loss of soil from land surfaces by erosion has been significantly increased by human activities, each year about 10 million ha of cropland are lost due to soil erosion Radoslava (2016), also is in line with the findings of Habtamu *et al*. (2017) who found out that the actual common effects of deforestation are soil erosion, loss of soil fertility, temperature increase, loss of biodiversity, rainfall variability and water and fuel wood scarcity.

Table 4: Consequences of deforestation circumstances in the study area

Factors	Frequency (n = 120)	Percentage (%)
Soil erosion	35	29.2
Desertification	25	20.8
Global warming	39	32.5
Forest animal displacement	21	17.5

Field Survey, (2024)

It was also revealed that global warming had the highest (32.5%). The carbon emissions from deforestation was also said to account for 87% of the total carbon emissions of the country, Akinbami (2003). Deforestation promotes global warming and desertification which results from increased atmospheric concentrations of greenhouse gases (GHG) leading to increment of the global mean temperature as the forests are the vital terrestrial sink of carbon. Also in line with Tunde *et al.* (2013) which says deforestation contributes greatly to the deterioration of the environment in Nigeria resulting in increase of carbon-dioxide in the atmosphere where these trees are being felled causing global warming and health issues.

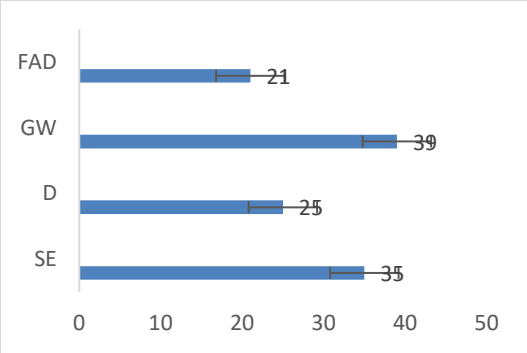

Figure 3: Consequences of deforestation circumstances in the study area.
FAD: Forest animal displacement; GW: warming; D: Desertification; SE: Soil erosion

Meanwhile, proper forest management "provides an opportunity to reduce greenhouse gas emissions into the atmosphere by avoiding deforestation, and to increase carbon uptake from the atmosphere into the terrestrial biosphere through afforestation, reforestation and improved forest, cropland and range-land management activities" Watson *et al.* (2000). Forests animal displacement had (17.5%) Figure 3. It is generally accepted that forests, especially those in the tropics serve as storehouses of biodiversity and consequently deforestation, fragmentation, and degradation destroys the biodiversity as a whole and habitat for migratory species including the endangered ones. When trees are felled without replacement it means that the forest has been depleted and forest serves as many protective roles for the environment, when these forests are depleted, environmental issues will ultimately happen.

CONCLUSION AND RECOMMENDATIONS

Deforestation is a pressing issue that has significant environmental consequences, including global warming, loss of biodiversity, desertification, and soil degradation. This study assessed deforestation circumstances in Mokwa, Niger State, Nigeria. The findings of this study revealed that wood logging, charcoal production, and farming are the primary livelihood activities leading to deforestation in the study areas. These activities have resulted in a significant depletion of the forest cover, posing a major threat to the environment. The deforestation circumstances in these areas are complex and multifaceted, with various factors such as agriculture, urbanization, and infrastructure development all playing a role in exacerbating the problem. To address deforestation circumstances and its consequences in the study area, several recommendations were proposed. Firstly, there is a need for sustainable forest management practices to be implemented, including the promotion of agroforestry and reforestation initiatives. Additionally, stricter regulations and enforcement mechanisms should be put in place to control illegal logging and charcoal production activities. Furthermore, alternative livelihood options should be explored for communities dependent on forest resources, such as ecotourism or sustainable agriculture practices. Overall, the findings of this study highlight the urgent need for action to address the deforestation circumstances in the study areas. By implementing the recommended strategies, it is possible to mitigate the environmental impacts of deforestation and promote sustainable development in the region. It is imperative that stakeholders, including government agencies, local communities, and non-governmental organizations, work together to protect the remaining forest cover and ensure the long-term health of the ecosystem.

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Authors' contributions

Author GAA and BOD managed data collection, interpretation of data, data analysis and writing of the manuscript and LTS and IAW managed the development of the methodology and local language interpretation.

Ethical Statement

Not applicable.

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