TES Trends in Environmental Sciences

OPEN ACCESS

Impact of Deforestation on Climate Change and Agricultural Activities in Jajere

[1]Ahmed Idriss, [2]Ahmed Ibrahim and [3]Ahmed Mohammed
[1]Department of Biological Sciences, Federal University Gashua, Gashua, Nigeria
[2]Department of Geography, Federal University Gashua, Gashua, Nigeria
[3]News Agency for Nigeria, Abuja, Nigeria

ABSTRACT

Background and Objective: Deforestation occurs when a stand of trees is permanently destroyed or removed and the area is then transformed to a non-forest use. This research was conducted to examine the impact of deforestation on climate change and agriculture in Jajere Ward. **Materials and Methods:** Over three months, the researcher conducted personal field observations and interviewed 300 household heads, farmers and village heads in Jajere and selected surrounding villages. This approach was used to gather both qualitative and quantitative data on the causes and effects of deforestation in the study area. **Results:** Findings from the interviews revealed that the primary perceived cause of deforestation is the removal of fuel wood, as stated by 150 respondents (50%). Additionally, 90 respondents (30%) identified population growth as the major contributing factor, while 60 (20%) attributed it to bush burning. A smaller proportion, 30 respondents (10%), believed that grazing and farming are also significant contributors to deforestation. Regarding the perceived effects of deforestation, 75 respondents (25%) believed that desertification and herding/grazing challenges are the main outcomes. Meanwhile, 30 respondents (10%) indicated that declining land quality, species extinction and loss of species' habitats are the major consequences. Only 15 respondents (5%) cited soil erosion, intensifying global warming, flash flooding and future food security issues as key impacts. **Conclusion:** It is therefore concluded that deforestation is a catalyst for desertification and has an impact on climate change and agricultural activities in the study area. It is thus recommended that afforestation and legislation against the illegal cutting of trees be employed to curtail the impact of deforestation on climate change and agriculture in the study area.

KEYWORDS

Deforestation, afforestation, climate change, agriculture, legislation, illegal cutting

INTRODUCTION

Deforestation occurs when a forest or a stand of trees is permanently destroyed or removed and the area is then transformed to a non-forest usage. Conversion of forestland to farmland, ranches, or urban usage is an example of deforestation. Tropical rainforests have the highest concentration of deforestation[1]. Forests encompass around 30% of the earth's land surface.

ISSN: 3080-0943 (Online)
ISSN: 3080-0951 (Print)
https://doi.org/10.17311/tes.2025.193.199

Received: 29 Mar. 2025
Accepted: 23 May, 2025
Published: 30 Jun. 2025

Deforestation occurs for a variety of reasons: Trees are felled for construction or sold as fuel (sometimes in the form of charcoal or wood) and cleared land is utilized for animal pasture and plantations. Habitat destruction, biodiversity loss and aridity have all occurred from tree removal without adequate reforestation. It hurts the carbon dioxide biosequence in the atmosphere[2].

Deforested areas are prone to severe soil erosion and frequently deteriorate into wasteland. Deforestation on a broad scale is enabled by causes such as disregard for assigned value, weak forest management and ineffective environmental legislation. Deforestation causes extinction, changes in temperature, desertification and population displacement in many areas, as evidenced by contemporary conditions and the fossil record[1]. Tropical forests are home to more than half of the world's plant and animal species[3].

Between 2000 and 2012, the world's forests were cut down by 2.3 million km^2 (890,000 square miles). Only 6.2 million km^2 (2.4 million square miles) of the original 16 million km^2 (6 million square miles) of forest that once covered the earth remain due to deforestation[3].

Agriculture is the leading direct driver of deforestation, according to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat. Deforestation is caused by subsistence farming in 48% of cases, commercial agriculture in 32% of cases, logging in 14% of cases and fuel wood removal in 5% of cases. Experts disagree over whether industrial logging contributes significantly to global deforestation[4].

Some claim that impoverished people are more prone to remove forests because they have no other options, while others argue that the poor lack the financial means to pay for the supplies and labor required for forest clearing[5]. In only 8% of situations, population growth due to high fertility rates was determined to be a significant cause of tropical deforestation, according to one study[4].

Other causes of modern deforestation include political corruption, inequitable wealth and power distribution and climate change[6]. Urbanization, population increase[6], overcrowding[7] and population growth[6,8] Although the implications of globalization (new movements of labor, capital, commodities and ideas) have aided localized forest recovery in some circumstances[7], globalization is typically seen as another driver of deforestation[9].

Economic incentives that make forest conversion appear more attractive than forest protection have also been linked to the degradation of forest ecosystems[10].

Deforestation is still happening and it is changing the climate and landscape[11]. Deforestation is one of the key reasons of the increased greenhouse effect and it contributes to global warming. Deforestation in the tropics is responsible for roughly 20% of global greenhouse gas emissions[12]. Deforestation, primarily in tropical places, could account for up to one-third of total anthropogenic carbon dioxide emissions, according to the Intergovernmental Panel on Climate Change (Report on "The Physical Science Basis").

Deforestation increases the quantity of runoff and reduces the protection of the soil from tree litter, which leads to higher rates of soil loss. Almost three billion people in underdeveloped nations rely on wood for heating and cooking[13].

Deforestation removes a piece of the canopy from the forest, which shields the sun's rays during the day and traps heat at night. More dramatic temperature swings result from this disruption, which can be damaging to plants and animals (agriculture). Deforestation results in extinction, climate change, desertification, soil erosion, flash floods and population displacement.

In Nigeria, particularly in Yobe State, deforestation incurs significant adverse soil erosion and desertification.

The objective of this study is to assess the impact of deforestation on local climate patterns and agricultural productivity in Jajere. Specifically, the study aims to analyze the extent of forest loss, evaluate changes in temperature and rainfall associated with deforestation and determine how these climatic shifts affect crop yields and farming practices in the region.

MATERIALS AND METHODS

Study area: Jajere is located at Latitude 11°58'57"N and Longitude 11°26'24"E. Jajere is a populated village in the Fune Local Government Area of Yobe State, Nigeria, having about 7,356 inhabitants. The local government has an area of about 95,270 km^2. Jajere climate can be described as a Sudan Savanna climate, which is characterized by semi-arid conditions with a long dry season followed by a short period of rainfall. The wet season begins in June and lasts until September, 2024. The temperature is fairly consistent and the hottest months are March and May, with average temperatures of 39 to 40°C.

Sampling: Convenient sampling was conducted based on the availability and willingness of the participants and three hundred household heads, farmers and village heads were interviewed on the impact of deforestation on climate change and agriculture in Jajere, Yobe, Nigeria.

Experimental design: A total of 300 household heads, farmers and village heads were interviewed at Jajere town and selected surrounding villages in three months. The locations for the sample collection sites are designated as follows: Jajere A is designated as Area JA, Jajere B as Area JB and Kolere as Area K.

The methodology adopted for this research is an interview. The interview was conducted in Jajere Town and selected surrounding villages. Those interviewed include household heads, farmers and village heads. The researcher also conducts personal field observations.

RESULTS

Table 1 shows that 150 (50%) respondents believe fuel wood removing is the major cause of deforestation in the study area, whereas 90 (30%) believes increase in population is the major cause and 60 (30%) believes bush burning is the major cause, however, 30 (15%) believes over grazing and farming is the major cause of deforestation in the study area.

Table 2 shows that 75 (25%) of the respondents believe that herding/grazing problems and desertification are the effects of deforestation on climate change and agriculture in the study area, whereas 30 (10%) believe that decreasing the quality of land, extinction of many species and loss of habitat for some species are the effects, while only 15 (5%) believe that soil erosion, increasing severity of global warming and flash floods are the major effects of deforestation on climate change and agriculture in the study area.

Table 1: Causes of deforestation in Jajere

Causes of deforestation	No. of respondents (%)
Farming	30 (10)
Grazing	30 (10)
Fuel wood removing	150 (50)
Increase in population	90 (30)
Bush burning	60 (20)
Total	300 (100)

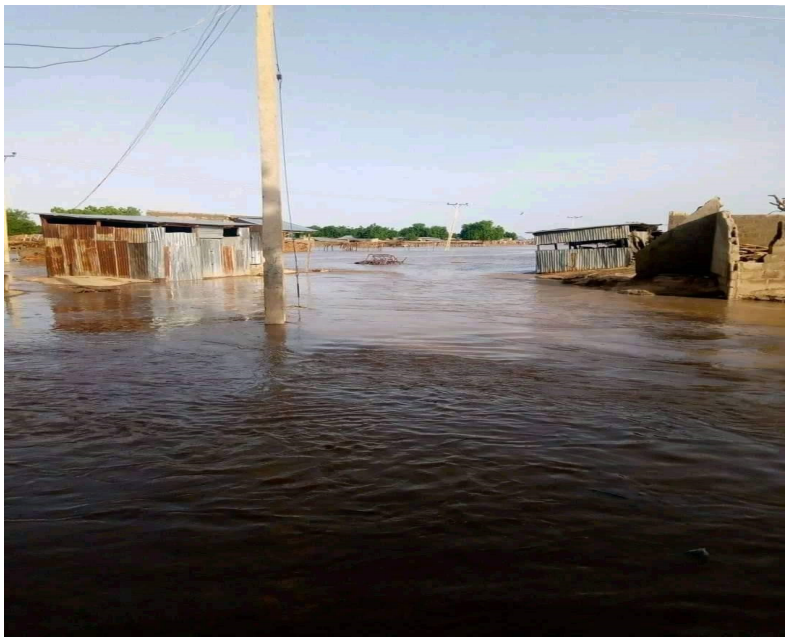

Fig.1: Flash flood in Jajere, 2018

Table 2: Effects of deforestation on climate change and agriculture in Jajere

Effects of deforestation	No. of respondents (%)
Soil erosion	15 (5)
Herding/grazing problems	75 (25)
Decreasing the quality of land	30 (10)
Extinction of many species	30 (10)
Loss of habitat of some species	30 (10)
Increasing severity of global warming	15 (5)
Flash flooding	15 (5)
Desertification	75 (25)
Future food problem	15 (5)
Total	300 (100)

Table 3: Respondents' views on solving deforestation in Jajere

Solution	No. of respondents (%)
Afforestation	150 (50)
Forest management	15 (5)
Legislation against bush burning	15 (5)
Forest plantation	30 (10)
Legislation against illegal cutting of trees for fuel wood	90 (30)
Total	300 (100)

Table 3 shows that 150 (50%) of the respondents believe that afforestation is the best solution to deforestation due to climate change and agriculture in the study area, whereas 90 (30%) believe legislation against illegal cutting of trees for fuel wood is the best solution and 30 (10%) believe forest plantations are the best solution, while only 15 (5%) believe that forest management and legislation against bush burning are the best remedies for deforestation in the study area.

Researcher's personal observations: Jajere town started observing flash flooding in August 2015, which was characterized by raging torrents after heavy rains that rip through river beds (the Ganji and Waere Rivers), town streets and the Tikau-Jajere Bridge, sweeping everything before them. This flooding resulted in severe losses and destruction of agricultural products, farmlands, houses and caused soil erosion in the town seen in Fig. 1.

On the illegal cutting of trees for fuel wood, I ascertained that there are over 5 lorries from Potiskum that carry fuel wood from Jajere daily, out of which I witnessed that 75% of the wood is freshly cut (green wood).

The researcher also observed that there is bush burning in Kolere-Kafaje, Jajere A (Koljalaje) and Jajere B (Borno Kichi). After a brief discussion with some of the members of affected settlements, they claimed that they don't know who is responsible for the bush burning in all the areas and that this has been happening for over a decade. Some of them complained that this factor has resulted in hardship and shortages of grass to feed their cattle and shee.

DISCUSSION

Deforestation occurs when a forest or a stand of trees is permanently destroyed or removed and the area is then transformed to a non-forest use. This research examines the impact of deforestation on climate change and agriculture in the Jajere ward. Despite humans' inability to control the occurrence of climate change, several measures can be taken to reduce its devastating impacts on people's livelihoods and the environment.

For example, afforestation, legislation against illegal cutting of trees for fuel wood, forest plantations, forest management and legislation against bush burning should be employed as remedies for deforestation on climate change and agriculture in the study area.

Current findings indicate that population growth in Jajere Ward is a primary driver of expanding farming activities, leading to increased pressure on adjacent forests for fuelwood. This aligns with recent research on the Nigerian environment, as highlighted by Oyetunji *et al.*[1]. Their study emphasizes that deforestation has become a serious environmental problem in Nigeria, requiring urgent attention and they identify population growth as one of the major underlying causes[1]. Specifically, argue that reducing population growth is crucial to alleviate the pressure on the nation's available forest resources. This national perspective strongly supports our observation of the local impact of population growth on deforestation in Jajere Ward. This historical perspective suggests that the link between population dynamics and forest loss in populated areas with similar resource demands is a long-standing trend, likely contributing to the pressures observed in Jajere Ward.

Furthermore, the current finding that the majority of respondents in Jajere Ward perceive fuelwood removal as the primary cause of deforestation resonates with observations from other densely populated and fragmented landscapes globally[7]. In their study of the Northern portion of the Brazilian Atlantic Forest, they similarly identified fuelwood harvesting as a significant and persistent source of forest degradation in areas with high population density. Their emphasis on the need to reconcile biodiversity conservation with poverty alleviation highlights the complex socio-economic factors driving fuelwood dependence, a dynamic likely at play in Jajere Ward as well.

Deforestation acts as a catalyst for desertification and significantly impacts climate change and agriculture in Jajere Ward is strongly supported by the broader analysis[11]. Their study underscores deforestation as a critical and enduring environmental challenge facing Nigeria, identifying key drivers such as agricultural expansion, urbanization, timber cultivation and firewood collection. The alarming estimate by Azare *et al.*[11] of approximately 326,000 km^2 affected across Northern Nigerian States, including Yobe, highlights the regional vulnerability and the relevance of our findings in Jajere Ward.

The perception of our respondents, with a significant portion (25%) identifying herding/grazing problems and desertification as key effects of deforestation and another segment (10%) noting declining land quality, species extinction and habitat loss, aligns with the work of Obianagwa *et al.*[8] in the Lake Chad Region.

Their research, conducted in an area with similar ecological vulnerabilities, demonstrates how deforestation contributes to food insecurity, biodiversity loss and livelihood challenges, alongside soil degradation and erosion. The interconnectedness of these environmental issues between the Lake Chad Region and Jajere Ward emphasizes the far-reaching consequences of deforestation in this part of Nigeria.

The recognition by our respondents that deforestation contributes to climate change and desertification aligns with the perspective articulated by Halilu[3], who describes these as significant external shocks to the world driven by human activities and natural systems. Underscores the immense global challenge these interconnected issues pose. Current findings from Jajere Ward provide a localized illustration of how deforestation acts as a human-induced factor exacerbating these global challenges within our specific context.

In light of these findings, recommendation for the implementation of afforestation initiatives is supported by the work of Ibrahim and Muhammad[14]. They highlight the numerous benefits of afforestation in addressing environmental degradation, including desertification, deforestation itself, erosion and flooding, as well as mitigating the effects of climate change. Their research underscores the potential of tree planting to reverse negative impacts and enhance environmental resilience in vulnerable regions like Jajere Ward.

The global context of widespread environmental issues, with deforestation being a critical concern, further emphasizes the importance of our findings. As Geidiam and Mohammad[15] points out, Nigeria is actively addressing this challenge through national afforestation programs. Our study in Jajere Ward contributes to this national understanding by highlighting the local drivers and impacts of deforestation, thereby informing and supporting broader mitigation efforts.

Focus group discussions with the village heads revealed that most settlements were small 60 years ago and farmers' farmlands were very close to their settlements; they attributed unsustainable forest exploitation to rapid settlement expansion due to population growth and farmers' desire to expand their farmlands to meet their families' food and income needs. Fallow is no longer an option because nearly all of the farmlands surrounding the community have been converted to new settlements, forcing farmers to relocate.

CONCLUSION

It's concluded that deforestation is a catalyst for desertification and has an impact on climate change and agricultural activities in the study area. About 25% of respondents believes that herding/grazing problems and desertification are the effects of deforestation on climate change and agriculture in the study area, whereas 10% believes decreasing the quality of land, extinction of many species and loss of habitat for some species are the effects, while only 5% believes that soil erosion, increasing severity of global warming and flash floods are the major effects of deforestation on climate change and agriculture in the study area.

SIGNIFICANCE STATEMENT

The study reveals deforestation as a key driver of desertification, significantly impacting local climate patterns and farming activities. Survey responses show varied perceptions of these effects: 25% link deforestation to grazing problems and desertification, 10% associate it with land degradation, biodiversity loss and habitat destruction, while only 5% cite soil erosion, worsening global warming and flash floods as primary concerns. These findings highlight the diverse consequences of deforestation, emphasizing its role in environmental degradation and agricultural challenges. Combating deforestation is essential to prevent further ecological damage, protect wildlife and ensure sustainable land use in the region.

REFERENCES

1. Oyetunji, P.O., O.S. Ibitoye, G.O. Akinyemi, O.A. Fadele and O.T. Oyediji, 2020. The effects of population growth on deforestation in Nigeria: 1991-2016. J. Appl. Sci. Environ. Manage., 24: 1329-1334.
2. Kauppi, P.E., M. Posch, P. Pirinen, 2014. Large impacts of climatic warming on growth of boreal forests since 1960. PLoS ONE, Vol. 9. 10.1371/journal.pone.0111340.
3. Hailu, F., 2023. Climate change as a trigger for desertification and possible alternatives to reduce biodiversity loss. J. Selva Andina Biosphere, 11: 94-111.
4. Geist, H.J. and E.F. Lambin, 2002. Proximate causes and underlying driving forces of tropical deforestation: Tropical forests are disappearing as the result of many pressures, both local and regional, acting in various combinations in different geographical locations. BioScience, 52: 143-150.
5. Angelsen, A. and D. Kaimowitz, 1999. Rethinking the causes of deforestation: Lessons from economic models. World Bank Res. Obs., 14: 73-98.
6. Hussaini, M.U., 2014. The impact of economic activities on deforestation in Bauchi State (a theoretical perspective). IOSR J. Humanit. Social Sci., 19: 14-18.
7. Specht, M.J., S.R.R. Pinto, U.P. Albuquerque, M. Tabarelli and F.P.L. Melo, 2015. Burning biodiversity: Fuelwood harvesting causes forest degradation in human-dominated tropical landscapes. Global Ecol. Conserv., 3: 200-209.
8. Obianagwa, C.E., U.P. Okafor, L.A. Ifem, O.G. Uwaechia and C.C. Ejiofor, 2023. Beyond climate change: The effects of deforestation on food security in the Lake Chad Region. IKENGA Int. J. Inst. Afr. Stud., Vol. 24. 10.53836/ijia/2023/24/2/002.
9. Hecht, S.B., S. Kandel, I. Gomes, N. Cuellar and H. Rosa, 2006. Globalization, forest resurgence, and environmental politics in El Salvador. World Dev., 34: 308-323.
10. Pearce, D.W., 2001. The economic value of forest ecosystems. Ecosyst. Health., 7: 284-296.
11. Azare, I.M., M.S. Abdullahi, A.A. Adebayo, I.J. Dantata and T. Duala, 2020. Deforestation, desert encroachment, climate change and agricultural production in the Sudano-Sahelian Region of Nigeria. J. Appl. Sci. Environ. Manage., 24: 127-132.
12. Fearnside, P.M. and W.F. Laurance, 2004. Tropical deforestation and greenhouse-gas emissions. Ecol. Appl., 14: 982-986.
13. Baohene, K., 1998. The challenge of deforestation in tropical Africa: Reflections on its principal causes, consequences and solutions. Land Degard. Dev., 9: 247-258.
14. Ibrahim, K.M. and S.I. Muhammad, 2015. A review of afforestation efforts in Nigeria. Int. J. Adv. Res. Eng. Appl. Sci., 4: 24-37.
15. Geidam, A.A. and L.Z. Mohamad, 2022. Factors effecting afforestation program in Nigeria: Building a conceptual framework. Int. J. Acad. Res. Bus. Social Sci., 12: 1378-1385.