African Journal of Social and Behavioural Sciences (AJSBS)
Volume 14, Number 8 (2024) ISSN: 2141-209X

ECOLOGICAL AND SOCIO-ECONOMIC IMPACTS OF SOLID BIOMASS-DRIVEN DEFORESTATION AND FOREST DEGRADATION IN MALUMFASHI, LGA, KATSINA STATE

Ibrahim Danladi Sule[1]*, Sanusi Adamu[2] & Bishir Abdulmalik[3]

[1,3]Department of Environmental Resource Management, Federal University Dutsin-Ma, Katsina State, Nigeria

[2]Department of Geography, Federal University Dutsin-Ma, Katsina State, Nigeria

*idanladi@fudutsinma.edu.ng

ABSTRACT: This study assessed the perceived ecological and socio-economic impact of deforestation and forest degradation arising from the consumption of solid biomass in Malumfashi Local Government Area of Katsina State, Nigeria. Taro Yamani's (1967) formula for sample size determination was used in determining the sample size and a total of 400 questionnaires were administered to the respondents across the LGA using systematic sampling method. The questionnaires were administered to the target respondents who are the head of households. Data obtained were analysed using descriptive statistics and presented in tables. The study revealed that loss of biodiversity, ecological stability and reduction in density of trees was the major perceived impact and accounted for 44.5%, this is followed by desert encroachment and increased frequency of dust storms (24.0%), soil degradation resulting in loss of soil fertility and soil erosion accounts for 21.5%. The results further discovered that 77.5% of the respondents agreed that deforestation and forest degradation arising from solid biomass consumption have led to a change in the density of trees. The result further showed that 45.5% of the respondents were of the opinion that loss of vegetation and reduction in density of trees have resulted in the scarcity of cooking fuels and timber resources was the major socio-economic impact of deforestation and forest degradation. Reduction in fodder resources, edible fruits, leaves and medicinal herbs in turn resulting in severe food shortages and insecurity account for 25.0% of the responses. This study concluded that deforestation and forest degradation arising from the consumption of solid biomass play a significant role in the degradation of the environment and was identified as one of the human environmental interventions affecting the ecological and socio-economic stability of the local communities. The study recommends that the government and other stakeholders should be committed to more urgent action to control the menace of deforestation and forest degradation by providing cheap, affordable and efficient alternative energy sources to solid biomass. It is also recommended that robust and result-oriented proactive strategies, policies and programs aimed at improving afforestation, reforestation, agro forestry, the establishment of more woodlots and protection of existing forest reserves to reduce the rate of deforestation and forest degradation should be put in place and appropriate sanctions must enforce on defaulters and incentives for promoters of tree planting be encouraged and provided.

Keywords: Ecological and Socio-Economic, Impact, Deforestation and Forest Degradation, Consumption, Solid Biomass

INTRODUCTION

Globally there is considerable uncertainty about knowledge of deforestation, degradation, and forest fragmentation. Important questions such as what is the rate of forest conversion, what is the age structure of forest re-growth, and what is the area affected by deforestation and forest degradation arising from the collection of solid biomasses in many parts of the world are unknown up to today. There is no doubt that vegetation is tangible and non-tangible services such as the provision of energy for cooking and heating, discouraging soil erosion by holding particles together, and acting as windbreaks. It plays a vital role in direct rain drops. Vegetation also favours the development of food, climate, etc. It also contributes in the reduction of albedo, increasing humidity etc. added to all these become the issue of maintaining global gaseous balance like carbon dioxide CO_2 and oxygen (O_2) which are essential for human survival (Adamu, 2022).

Forests are dominated by trees in a complex ecological system with the crowns of these trees touching each other, as a result of the close growth. Within the forests are herbs, shrubs, climbers, lianas and other plant species as well as assorted wildlife. In developing countries, high population growth coupled with rapidly expanding agriculture, over-exploitation of forest resources and collection of solid biomass is believed to be responsible for an accelerated rate of deforestation and forest degradation. Solid biomass is said traditional form of fuel used for cooking and heating services which includes charcoal, wood fuel, cow dung and other waste from agricultural production (Sule, 2022). It is observed that the production of solid biomass for cooking and other services was one of the significant contributors to deforestation and forest degradation. It is established that deforestation and forest degradation in developing countries are held to account for about 18% to 20% of increased emission of greenhouse gases (GHGs) that are responsible for global warming and arid climate change. There is an established relationship between deforestation and global warming because forests, notably forests are major Carbon sinks (Gorte & Sheikh, 2010 in Adamu, 2022).

The act of clearing forested areas in Nigeria dates back to the pre-colonial era when crude oil was discovered in Nigeria (Adamu, 2022). Deforestation is generally associated with the clearing out of forest areas in order to accommodate new land for farming, infrastructural development, and urbanization. Ogunwale (2015) in Adamu (2022) define deforestation is the process by which an area is deprived of existing natural vegetation resources. FAO (2007) defines deforestation as the conversion of forested areas to non-forest land use such as arable land, urban use, logged area, or wasteland. FAO further added that deforestation is the conversion of forest to another land use or the long-term reduction of tree canopy cover below the 10% threshold. Deforestation can result from deliberate removal of forest cover for agriculture or urban development, or it can be an unintentional consequence of uncontrolled grazing (which can prevent the natural regeneration of young trees). The combined effect of grazing and fires can be a major cause of deforestation in dry areas. Deforestation implies the long-term (>10 years) or permanent loss of forest cover. According to FAO (2007) forest degradation is a process leading to a 'temporary or permanent deterioration in the density or structure of vegetation cover or its species composition'. It is a change in forest attributes that leads to a lower productive capacity caused by an increase in disturbances. Oyediji and Adenika (2022) further describe forest degradation as a change process that usually affects the characteristics of a forest adversely and negatively in such a way that its value, as well as the production of goods and services, could be reduced and decline.

It should be noted that Nigerians have always depended on the forest for their survival, economic development, as well as environmental amelioration. Based on visible results, so far only half-hearted efforts have been made to control deforestation, leading to the almost total destruction of Nigerian forests (Adamu, 2022). Therefore, Nigeria has one of the world's highest rates of deforestation of primary forests, where more than 50% of such forests have been lost in the past decades through unsustainable logging, agriculture, as well as fuel wood collection (FAO, 2004; Alapata & Abolaji, 2024).

Alapata and Abolaji (2024) and Ahmed and Aliyu (2019) established that the total land area of Nigeria is 91,077,000 hectares (910,770 km2), with a total forest area of 11,089,000 hectares (110 890 km2), representing 12.18% of forest cover. Adamu (2022) further argues that harvesting solid biomass for cooking services, excessive logging, settlement, and related infrastructure construction are factors that lead to deforestation and forest degradation in Katsina State and the study area. The forest reserve and, indeed, part of the Natural forests in Malumfashi Local Government Area are gradually disappearing due to deforestation and forest degradation through man's activities, predominantly through the harvesting of solid biomass. It is based on this reason that the study intends to find out the ecological and socio-economic impacts driven by the consumption of solid biomass in the study area,

Biomass energy is one of the most widely utilised in the most parts of Nigeria, including the study area. Wood fuel and charcoal still constitute the major source of cooking fuels for the rural and even urban dwellers in the area. It has been established that the use of solid biomass contributes to ecological and socio-economic challenges, such as loss of biodiversity, soil erosion, and annual deaths from smoke-related illnesses caused by indoor and outdoor pollution due to overdependence on solid biomass (Newsom, 2012; Nwofe, 2013; Nwofe, 2014).

It was established that there is a positive relationship between the level of poverty and utilization of forest resources, which leads to deforestation and exploitation of forest resources. The Federal Government of Nigeria (FGN), through the ministry (Federal Ministry of Environment), confirmed that in Nigeria, as in most third-world countries, has adopted firewood as the major source of fuel, and the rural accounts for between 65-80% of the total population depend on fuel wood for its energy needs (Oyedeji & Adeniki, 2022, Sule et al., 2023). This inefficient utilization of fuel wood has contributed to serious resource depletion, which is more noticeable in the arid zone of the country (Oyedeji & Adeniki, 2022). There is no doubt that the wood fuel and charcoal used for cooking are mostly generated through deforestation and forest degradation from the remnant patches of forest. Despite the fact that efforts have been made towards fighting deforestation and forest degradation occurring in solid biomass consumption, in this regard, investigation into The ecological and socio-economic impact of deforestation and forest degradation on solid biomass consumption is highly needed. It is, therefore, important to understand local people's perceptions of the ecological and socio-economic impacts of deforestation and forest degradation for solid biomass consumption with particular reference to some local communities in Malumfashi Local Government Area of Katsina State.

STUDY AREA

Location of the Study Area

Malumfashi Local Government Area (Figure 1) is located in the southeastern 674 km2 part of Katsina State. It is located on a plateau at a height of about 2200 feet above sea level. It absolute

location lies at Latitude $11^0$48'N and $12^0$6'N and Longitude $7^0$61'E and $7^0$76'E. Relatively, Malumfashi LGA is bordered by Musawa LGA to the north, to the northwest by Kankara LGA to the west, Bakori LGA, to the south by Kafur LGA and to the east by Gwarzo LGA in Kano State. Malumfashi has a total land area of 674km^2, which is about 150km, and is almost a two-hour drive to Katsina, the capital of Katsina State (Yakubu, 2014 and Adamu, 2022).

Climate

Malumfashi's climate is classified as tropical as wet and dry type. The summers here have a good deal of rainfall, while the winters have very little. The climate is classified as Aw by the Köppen-Geiger system. The average temperature in Malumfashi is 25.2 °C. Malumfashi lies within a region which has a A tropical savanna climate with distinct wet and dry seasons, the average annual rainfall is 921 mm. Rainfall occurs between May and September, but most of it falls in August, averaging 271 mm (Yakubu, 2014).

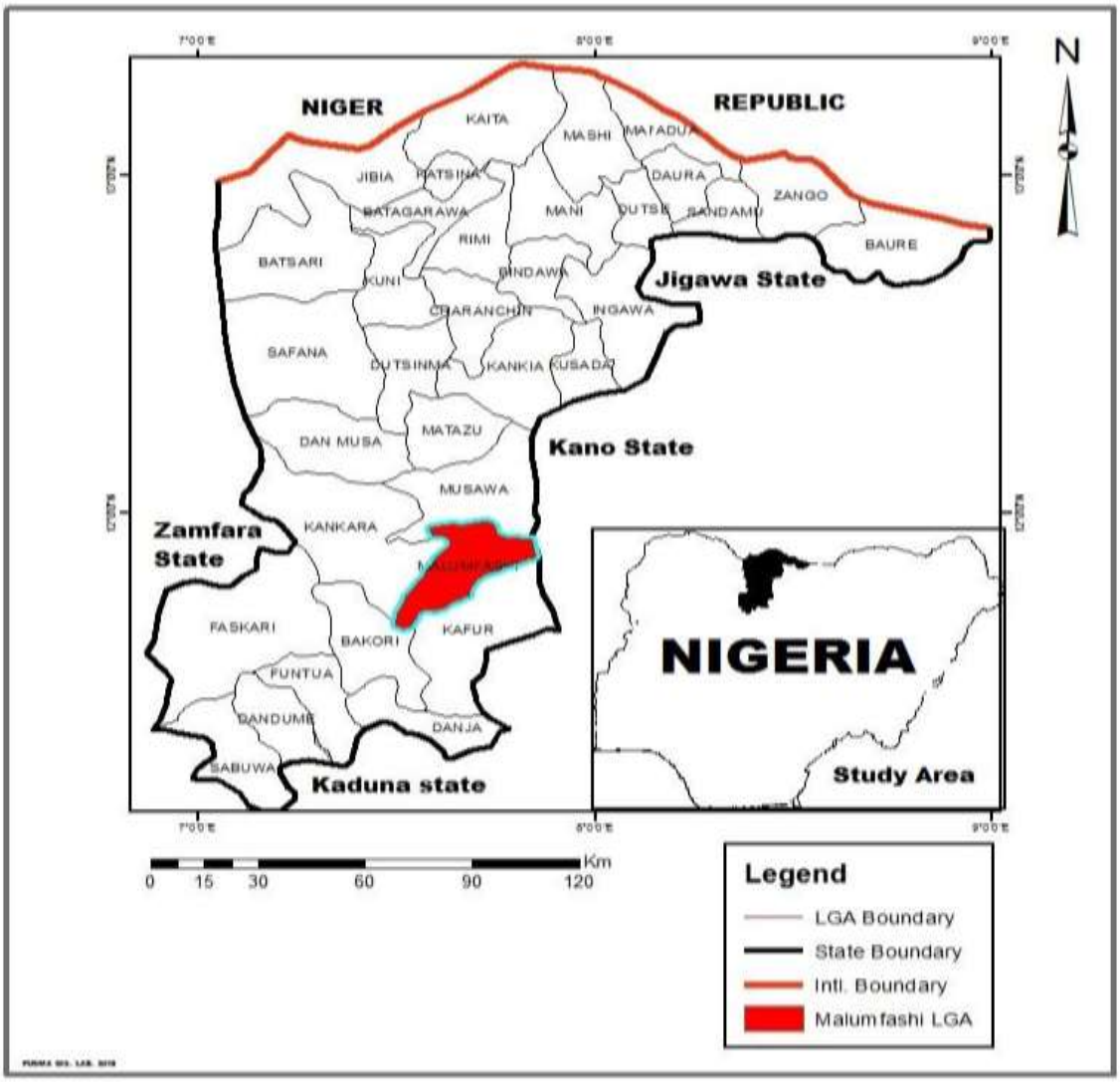

Figure 1: Map of Katsina State showing Malumfashi Local Government Area.

Source: Ministry of Land and Survey, Katsina State (2021).

Vegetation

Naturally, Malunfashi is located in the Northern Guinea Savannah zone, a designation which implies a woodland vegetation type characterized by the presence of *Isoberliniatomentosa* and *Upacatogonensis,* with well-developed grass layer of tufted and low ground cover of *Andropogoneae.*(Yakubu, 2014).

Many savanna trees can also exist for years in a suffrutex form, but unlike the suffrutices, their shoots are perennial and will develop into trees when conditions are suitable (Aigbe and Oluku, 2012). Specific tree species are also found in the northern part of the country, such as Tamarindusindica, shear butter, mango, cashew, baobabs, locust bean, neem, eucalyptus, etc. (Yakubu, 2014).

Soil

The soil type of Malumfashi is reddish ferruginous tropical soil in nature. The lower part of the soil is derived in situ from underlying weathered gneiss and still contains pieces of quartz and mica. The upper part is a mixture of the same material together with transported, probably windblown particles. There are also the fadama soils which vary in texture and have been formed from alluvial materials along river valleys. These soils are mostly dark grey clays with poor to very poor drainage and are found along the banks of the rivers Hinachi and Asha Da Lafiya (Yakubu, 2014).

Population and People

Malumfashi LGA has a population of 182,920 (2006 Census). There is also a large young population (age 0-14 years), which is 47.4% of the population; this signifies a built momentum for population growth (Yakubu, 2014). Malumfashiis is predominantly made up of the Hausa/Fulani- a major ethnic group in northern Nigeria. The indigenous people are generally referred to as 'Katsinawa', and they constitute 'Hausawa' and 'Fulani. They speak Hausa and Fulfulde, which are the major languages across northern Nigeria and some sub-Saharan African countries. There are other ethnic minorities, such as Yoruba and Igbo, among others, who have come as immigrants from the western, eastern, and other parts of the country. The religions in that area are Islam, which is the dominant religion; Christianity, the second dominant, followed by traditional worshipers (Adamu, 2022).

Economic Activities

Malumfashi's economy is primarily based on agriculture. It is an important centre for the marketing and processing of agricultural products. Farming is the major economic activity in which much of the populace of Malumfashi engages in farming. Farmers produce and sell cereal crops such as maize, millet, guinea corn sweet potatoes, and cocoyam; legumes like beans, groundnut, soya beans; sugarcane, vegetables etc, both on small and large scales. There is also the aspect of livestock rearing (which is mainly the means of livelihood for the Fulanis). Commercial activities such as banking transactions, wholesale, retail and petty trading, commercial transportation, and hotel and communication services form the main economic activities. Other economic activities include civil service in government and privately owned parastatals and institutions. Small industries such as barbing, catering, as well as tailoring took place there.

METHODOLOGY

Sources of Data

The data used for this study was obtained mainly from both primary sources through qualitative as well as quantitative methods of information collection. The data were sourced through administration of a questionnaire and field observation. The questionnaire was designed to source information from the target respondents on the ecological and socio-economic impact as well as strategies adopted for addressing deforestation and forest degradation in Malumfashi LGA.

Sampling Procedure

Sampling Frame and Size

In order to determine the sample size of the population, Yamane's (1967) formula was adopted during the research.

Yamane sample size determination is expressed as:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = sample size,

N= the study population,

e = level of significance (error limit),

1= unity (constant).

Therefore:

$$n = \frac{362{,}700}{1 + 362{,}700(0.05)^2}$$

$$n = \frac{362{,}700}{1 + 906.75}$$

$$= \frac{362{,}700}{907.75}$$

$$n = 399.6 \cong 400$$

400 is the sample size

Therefore, the sample size (SS) which is also the number of questionnaires was administered. In this regard non-proportionate sampling method was employed to administer the questionnaires. This is to enable have a wide geographical spread and because there is no current data on population for wards in Malumfashi LGA of Katsina State.

Sampling Techniques

In order to select the respondents for the questionnaire survey, communities with a history of forest resources were traced and made the target for the questionnaire distribution in each of the wards of the LGA. A systematic A sampling method was employed to select the respondents for questionnaire administration. The first respondents were chosen at random, and subsequent respondents were chosen at a predetermined interval (after every 3 households) until the required sample size was attained.

Techniques of Data Analysis

The quantitative data generated from the field was analysed using descriptive statistics based on responses obtained from the administered questionnaires. These data were computed, processed and analysed using Microsoft Excel 2007 and SPSS version 26 (Statistical Package for Social Science). The result was presented using tables and was discussed according to the goal of the study.

RESULT AND DISCUSSION

Perceived Ecological Impact of Deforestation and Forest Degradation Arising from Consumption of Solid Biomass

Table 2 shows the perceived ecological impact arising from deforestation and forest degradation in the study area. It is evident from the result that loss of biodiversity, ecological stability, and reduction in the density of trees was the major perceived impact and accounted for 44.5% of the responses. This is followed by desert encroachment and increased frequency of dust storms (24.0%), soil degradation resulting in loss of soil fertility and soil erosion accounts for 21.5%. The result implies that deforestation and forest degradation in the study area is responsible for environmental degradation, considering the fact that all the impact outlined by the respondents is a serious and contemporary environmental issues in the area worth urgent action. This study shows the need for more urgent action to control the menace of deforestation and forest degradation by providing cheap, affordable and efficient alternative energy sources. Thus, this study further calls for adopting robust and result-oriented proactive strategies such as afforestation, reforestation and agro-forestry to reduce the impacts arising from deforestation and forest degradation in the study area. The study of Oyediji & Adenika (2022) further identified a lots of environmental and aesthetic benefits of forest that ranges from watershed protection to animal hunting, medicine, stabilization of hydrological regimes and carbon sequestration. These benefits could be compromised as a result of deforestation and forest degradation.

Table 2: Perceived Ecological Impact of Deforestation and Forest Degradation Driven By Consumption of Solid Biomass

Responses	%
Soil degradation resulting in loss of soil fertility and soil erosion	21.5
Loss of biodiversity, ecological stability and reduction in density of trees	44.5
Desert encroachment and increased frequency of dust storms	24.0
General lowering of groundwater table and drying up of shallow wells thereby limiting access to water for animals and domestic use	10.0
Total	100%

Source: Field Survey, 2022.

Perceived Impact of Deforestation and Forest Degradation Driven By Consumption of Solid Biomass on Trees Density

Table 3, shows the distribution of responses in respect of the perceived impact of deforestation and forest degradation for solid biomass consumptionon tree densities. It is noteworthy that about 77.5% of the respondents emphasized that, cutting down trees and degradation of natural vegetation is one of the major causes of deforestation and forest degradation in the area. This is supported by Oyediji & Adenika (2022) who highlighted the major causes of deforestation and forest degradation to include wood fuel harvesting, road construction, shifting cultivation, overgrazing urbanization, population growth, corruption, inequitable distribution of wealth, and poverty

The result further indicated that the majority of the respondents were of the view that deforestation and forest degradation for wood fuel and charcoal generation severely affected the densities as well as the diversity of the patches of forest in the area. This implies that the majority of the people in the area are aware that deforestation and forest degradation for cooking and heating services is having raindrops so much impact on the density and diversity of trees in the area. This has led to the extinction of various plants and plants that have medicinal potential and other animal species are gradually reducing in the study area thereby disturbing the entire ecosystem and worsening the socio-economic development of the study area. This shows the need for policies and programs aimed at minimizing the magnitude of deforestation and forest degradation for solid biomass generation. It is for this reason that the study suggests policies aimed at the provision of modern energy services especially in rural areas to avert environmental degradation arising from deforestation and forest degradation.

Table 3: Perceived Impact of Deforestation and Forest Degradation Driven by Consumption of Solid Biomass on Tree Density

Responses	%
Yes	77.5%
No	22.5%
Total	100%

Source: Field Survey, 2022.

From the results, it was discovered that 77.5% of the respondents agreed to the fact that deforestation has led to the change in the density of trees in Malumfashi Local Government Area some few years back. Most of the respondents agreed that deforestation and forest

degradation for biomass consumption have led to the change in the density of trees and that some trees they used to have in abundance before are gradually disappearing some of the trees mentioned by the respondents include, Malina, Obeche, Shea butter tree and locust bean tree. This shows that aside from using wood as fuel energy for domestic cooking, residents embark on lumbering for commercial purposes for roofing. This phenomenon has been one of the contributing factors for environmental degradation in many parts of Nigeria in general and indeed the study area specific. This study therefore calls for the establishment of more woodlots since man must use available natural resources for the betterment of livelihood and also, existing forest reserves must be identified and protected appropriate sanctions must be enforced on defaulters and incentives for promoters of tree planting should be provided.

Perceived Socio-economic Impact of Deforestation and Forest Degradation Driven by Solid Biomass Consumption

Alapata and Abolaji (2024) argued that deforestation is a global problem which threatens environmental sustainability; it has an adverse effect on the entire environment; the economy and the citizenry's land use and management. Table 4 indicates the perceived socio-economic impact arising from deforestation and forest degradation in the study area. From the result, 45.5% of the respondents opined that loss of vegetation and reduction in the density of trees resulting from the scarcity of cooking fuels and timber resources was the major socio-economic impact of deforestation and forest degradation. Reduction in fodder resources, edible fruits, leaves and medicinal herbs in turn resulting in severe food shortages and insecurity account for 25.0% of the responses. This is closely followed by vegetation degradation resulting in an increased unemployment rate and worsening poverty levels, this is accounts for more than 20% of the respondents' views. The result further discovered that health issues arising from use of solid biomass, higher frequency of resource use conflicts, urban migration and increased environmental refugees account for about 9% of the responses. The result implies that deforestation and forest degradation in the study area are significantly affecting various socio-economic sectors as well as the livelihood options of the people of the study area. This study shows the need for more urgent action especially in the area of public awareness and enlightenment campaigns on the impact of biomass consumption to enable the reduction and control of the menace of deforestation and forest degradation. Thus, this study further calls for the adoption of proactive strategies such as afforestation, reforestation and agro-forestry to reduce the socio-economic challenges arising and associated with deforestation and forest degradation in the study area.

Table 4: Perceived Socio-economic Impact of Deforestation and Forest Degradation Driven by Solid Biomass Consumption

Responses	%
Vegetation degradation resulting in increased unemployment rate and worsening poverty levels	20.5
Loss of vegetation and reduction in density of trees resulting to the scarcity of cooking fuels and timber resources	45.5
Reduction in fodder resources, edible fruits, leaves and medicinal herbs and in turn resulting in severe food shortages and insecurity	25.0
Health issues arising from used of solid biomass, higher frequency of resource use conflicts, urban migration and increased environmental refugees	9.0
Total	100%

Source: Field Survey, 2022.

Perceived Impact of Deforestation and Forest Degradation Driven by Solid Biomass Consumption on Grazing Activities

Table 5 reveals the perception of the respondents on deforestation and forest degradation for solid biomass consumption on grazing activities in the study area. Grazing is a process by which domestic animals are fed either on natural or cultural vegetation. Malumfashi Local Government Area is highly blessed with lush vegetation which attracts herdsmen. The commonest type of grazing system is nomadic and ranching which remain severely affected by deforestation and forest degradation for solid biomass consumption through the cutting down of the remaining trees and shrubs. The majority of the respondents (60%) were of the view that deforestation and forest degradation from solid biomass consumption have a severe negative impact on the major pillars of sustainable development (social, economic and environmental) of Malumfashi Local Government Area (Table 5). This implies that the majority of the respondents are fully aware of the fact that their environment is exposed to danger through their actions and desert encroachment is gradually becoming an issue of concern in the area. During the survey, it was observed that Fulani cattle herdsmen from the drier north of Katsina migrate to the southern part, searching for palatable vegetation to feed their livestock. This was also reported and observed by (Ishaku, 2012 in Adamu, 2021). This implies that occupational mobility has been a source of concern as overgrazing has multiplier effects on available vegetation leading to more environmental degradation. In this regard, the study calls for the provision of cattle colonies, and grazing reserves as well as coming up with policies and programs that may reduce the rate of deforestation and forest degradation arising from the consumption of solid biomass.

Table 5: Perceived Impact of Deforestation and Forest Degradation from Consumption of Solid Biomass on Grazing Activities

Responses	%
Very severe	30%
Severe	60%
Not severe	10%
Total	100%

Source: Field Survey, 2022.

Perceived Strategies in Addressing the Impact of Deforestation Forest Degradation Driven by Consumption of Solid Biomass

Table 6 shows that 39% of the respondents chose afforestation as a strategy to be applied to address the problem arising from deforestation and forest degradation for solid biomass consumption. In comparison, 32% of the respondents thought of reforestation, and 18% were suggesting for agro-forestry and also 7% supported for forest improvement while 4% suggested for other strategies such public establishment community-based woodlots, shelter belts, protection of existing forest reserves as well as awareness campaigns. This also involved switching or transitioning to green and climate-smart energy technologies, as also reported by Sule et al. (2023). This implies that proactive strategies such as afforestation, reforestation, forest improvement, agro-forestry, the establishment of woodlots, and protection of existing forest reserves can help significantly in reducing both the ecological and socio-economic impact of deforestation and forest degradation arising from the consumption of solid biofuels. This study also agreed with Alapata and Abolaji (2024), who pointed out afforestation

programs, legislation, adoption of in-situ conservation processes, and establishment of more forest reserves, among others, as mitigation and control measures against deforestation and forest degradation.

Table 6: Perceived Strategies in Addressing the Impact of Deforestation and Forest Degradation Driven by Consumption of Solid Biomass

Responses	%
Afforestation	39
Reforestation	32
Agro-forestry	18
Forest improvement	7
Others	4
Total	100%

Source: Field Survey, 2022.

CONCLUSION

This study concluded that deforestation and forest degradation driven by consumption of solid biomass plays a significant role in the degradation of the environment and this is one of the pronounced factors identified as an agent of human environmental interventions affecting the ecological and socio-economic stability of the local communities of the study area. Overconsumption of solid biomass constitutes another of the major underlying causes of deforestation and forest degradation and can also be the heart of environmental problems nowadays in the rural communities of the study area, Katsina State, Nigeria and other countries of Sub Africa. Therefore, an in-depth understanding of the impact of deforestation and forest degradation arising from the consumption of solid biomass can be an important tool for monitoring environmental degradation and thus consumption of solid biomass may also give clear indications of the level of forest resource degradation.

REFERENCES

Adamu, S. (2021). *Assessment of the Environmental Impact of Deforestation for Fuel-Wood Consumption in Malumfashi Local Government Area of Katsina State:* Long Essay Project Submitted to the Department of Geography, Federal University Dutsin-Ma for the Partial Fulfillment of the Requirements of the Award of Post Graduate Diploma in Environmental Management

Ahmed, Y.A. & Aliyu, I. (2019). Climate Change Induced Challenges on Deforestation: The Needs to Educe Mitigation Measures in Nigeria. *Analele Universitatii din Oradea, Seria Geografie, 29(2) 64-76.*

Alapata, Y.A & Abolaji O. R (2024). The Challenges of Deforestation and Management in Nigeria: Suggestions for Improvement: *Ghana Journal of Geography Vol. 16 (1),* pages 193-220: Doi: https://dx.doi.org/10.4314/gjg.v16i1.7

Food and Agricultural Organization (2004).*Forest Resource Situation Assessment of Nigeria*, FAO Rome, Italy, http://www.fao.org/docrep/00/ab578e/AB578E02 access on 15th July, 2020

Food and Agriculture Organization (2007). *Manual on Deforestation, Degradation, and Fragmentation Using Remote Sensing and GIS*: Strengthening Monitoring, Assessment and Reporting on Sustainable Forest Management in Asia (Gcp/Int/988/Jpn): MAR-SFM Working Paper 5

Newsom, C., (2012). The Sungas Project, International Institute for Environment and Development.

Nwofe, P.A., (2013). Comparative Analysis of Domestic Energy Use in Nigeria: *A Review. Continental Journal of Renewable Energy, 4(1), 7.*

Nwofe, P.A. (2014). Utilization of Solar and Biomass Energy- A Panacea To Energy Sustainability In A Developing Economy: *International Journal of Energy and Environmental Research 2, (3),10-19*: Published by European Centre for Research Training and Development UK (www.eajournals.org)

Sule, I.D., Yaro, A & Adamu, G.K. (2020). An Assessment of Sedentary Pastoralists Perception of Climate Change in and around Forest and Grazing Reserves of Semi-arid Areas of Northern, Nigeria: *ATBU Journal of Environmental Technology Vol. 13 No. 2*

Sule, I.D., Yakubu, I.B., & Tanko A.I (2023). Perception of Households on Access to Green and Climate Smart Energy in Northern Bauchi State, Nigeria: *Benin Journal of Geography Planning and Environment Vol. 3 No.1, pp 329-346*

Oyediji, O.T & Adenika, O.A (2022). Forest Degradation and Deforestation in Nigeria; Poverty Link: *International Journal of Multidisciplinary Research and Analysis*: V. 05,10 October 2022: DOI: 10.47191/ijmra/v5-i10-35, Impact Factor: 6.261: Page No. 2837-2844: ISSN(print): 2643-9840, ISSN(online): 2643-9875

Yakubu, H. (2014). *People's Attitude and Awareness on Improper Disporsal of Waste in Malumfashi Town*. Bsc. Project, Umaru Musa Yar'adua University, Katsina, Geography, Katsina State.