

Deforestation and its Environmental Consequences, A Case Study of Michika Local Government Area, Adamawa State

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Abstract

This study was aimed at determining the factors that led to deforestation and its environmental consequences in Michika Local Government Area of Adamawa State. The objectives were to determine the causes of deforestation, its environmental consequences, assess the perception of residents towards forest resources conservation, and to find the degree of deforestation in the study area. A total of 300 respondents were selected as a sample size being a purposive study. Data were collected using questionnaires. Descriptive statistics was used to analyze the data. From the findings of the study it shows that various factors such as farming (24.5%), Logging (14.4%), fuel wood harvest (13.4%), Wildfire (9.5%), Overgrazing (8.1%), Overpopulation (7.2%), Poverty (6.6%), Government attitude towards conservation (5.5%), Infrastructure (5.2%), insurgency (3.3%) and Mining (2.3%) led to the destruction of forest resources. The environmental consequences from these factors were loss of biodiversity (22.7%), Environmental degradation (18.1%), Flooding (16.4%), Drought (13.1%), Erosion (10.3%), Climate change (7.4%), Disease (6.3%) and social consequence (5.0%). Majority of the respondents have shown deforestation is on the increase and majority (74.7%) have shown positive attitude towards the conservation of forest resources and willing to support its conservation. The perpetual survival of the forest resources can only be achieved through the collaboration between the local communities and the local government authority. It was recommended that adequate policy and institutional framework should be put in place for the purpose of management and conservation of forest resource at the grassroots, provision of sustainable means of livelihood, enhancement of awareness on conservation education program on forest resources to the local communities and the state government should embark on massive afforestation program through its various agencies.

Key words: Deforestation, Environmental, Consequences, Forest

Introduction

Deforestation is the process of removing forest areas and using the land for other uses such as settlements, industrialization, infrastructure, agriculture, etc. Deforestation also has been described as the cutting down of trees without planting others in their place (Spracklen, *et al.*, 2017). Forests are becoming exhausted in developed nations and attention is now on the tropical areas, more specifically the tropical rain forests. People dependent on forests for their livelihood. As the forests disappear, resources are becoming scarcer. Third world or underdeveloped nations are being extorted for their forests and are given minimal return for the damage done to their own country (Anderson and Fishwick, 2019). Deforestation is a widespread environmental issue that has severe consequences on the ecosystem, biodiversity, and human well-being. The removal of forests, usually as a result of human activities like agriculture, urbanization, and logging, has become a major concern globally (FAO, 2015). In Nigeria, deforestation is a significant problem, with the country losing a substantial portion of its forest cover over the year (Adesina, and Adejuwon, 2021).

The forest is often perceived as a stock resource, a free good, as something freely available for conversion to other uses without recognition of the consequence for the production services and environmental roles of the forest, hence many forest ecosystem have been degraded through human activities (Anderson, 2016). According to Adeofun (2021), the degradation of the forest ecosystem has obvious ecological effects on the immediate environment, but it may also affect distant areas. For instance, agriculture plain or valleys that depend upon forest highlands for their water may suffer flooding or drought as a result of the destruction of the forests. Genetic damages and losses of plants, animals and insects can also be serious and possibly permanent (Adeyoju, 2020). Deforestation can result in erosion which in turn may lead to desertification. The economic and man consequences of deforestation include loss of potential wood and paper products among others which may then need to be imported (FAO, 2013). People, especially those who live in rural areas where electricity and gas are unavailable, resort to use of fire wood as a source of heat. Here, wood is cut down and burnt. Those

proximate reasons are accompanied by underlying causes for deforestation. Faced by food insecurity agricultural land is just more valuable to farmers. Individual farmers do not have many other options than converting forests into agricultural land if they are exposed to severe food insecurity. Their time preference rates are low which means they prefer food today over tomorrow and they definitely cannot carry the costs of forest conservation for the larger national or global society (Griffiths and Hirvela, 2015).

Forests help maintain ecological balance and biodiversity, protect watersheds, influence weather patterns and climate. Forest products provide rural communities with wood, food, fuel, forage, fodder, fiber, honey, mushroom, vegetables, medicines, bush meat, fruits, jobs and income. Historically, forests have been very important for the livelihoods of the people of Nigeria (National Biodiversity Report, NBR, 2016). Forest resources can provide long-term national economic benefits. For example, at least 145 countries of the world are currently involved in wood production. Sufficient evidence is available that the whole world is facing an environmental crisis on account of heavy deforestation. For years remorseless destruction of forests has been going on and we have not been able to comprehend the dimension until recently (Bryant *et al.*, 2022). Nobody knows exactly how much of the world's rainforests have already been destroyed and continue to be razed each year. Data is often imprecise and subject to differing interpretations. However, it is obvious that the area of tropical rainforest is diminishing and the rate of tropical rain forest destruction is escalating worldwide, despite increased environmental activism and awareness (Shukla, 2021). Forest resources provide us with oxygen, clean air and helps to regulate the climate. Trees, encompassing various species with economic value, play a pivotal role in sustainable development and environmental conservation. They are also a valuable source of food, timber, and other products. If the society know the impact of deforestation and they do not practice on those things, it will have negative effect on forest. Knowing the factors that contribute to deforestation are very important to protect and conserve biodiversity (Carvalho *et al.*, 2019).

Materials and Method: Area of Study

Michika Local Government Area of Adamawa State is located in the northern axis of the state on latitude $10^{\circ} 37' 00''\text{N}$, $10^{\circ} 617'\text{N}$ of the equator and longitude $13^{\circ} 23' 00''\text{E}$, $13^{\circ} 383'\text{E}$, of the Greenwich meridian and it is bounded by Madagali Local Government Area to the North, Mubi North Local Government Area to the South, Borno State to the West and Cameroun Republic to the East (Adebayo and Tukur 2013).

The temperature regime of the area is warm to hot throughout the year, because of high radiation income which is relatively evenly distributed throughout the year. However, there is usually a slightly cold period between November and February. There is a gradual increase in temperature from January to April with seasonal maximum occurring in April. Temperature drops slightly at the onset of rains due to the effects of cloudiness. It increases again a bit after the cessation of rains (October-November). This is followed by the hamattan period when temperature drops

to the possible minimum. Although, temperature is very low in some uphill settlements (example, Bazza, Tilijo, Futu, Za, Vi and Garta). Generally, the mean annual temperature is about 27°C , the hottest month is May with about 35°C and the coldest month is January with less than 13°C (Adebayo and Uyi, 2010).

April is a month of transition between the wet and dry seasons in the area. During this period, there is scanty rainfall in most part of the area. The months of May to September constitute the wet season in Michika Local Government. Monthly rainfall increases steadily from May to August which has the highest amounts. Rainfall decreases from September to October at a very sharp rate. The mean annual rainfall ranges from 900mm to 1050mm. Generally, planting of crops begins earlier in mountainous areas than the low land areas due to the orographic factor earlier mentioned (Adebayo, 1997). Relative humidity between January and March is low. It starts rising as from April and reaches the maximum in August, the peak of the raining season. Relative humidity starts decreasing as from October following the cessation of rainy season (Adebayo *et al.*, 2017). Figure 1 shows the map of the study area.

Population of the Study

The target population for this study consists of residents of Michika Local Government Area, particularly, Farmers (crop producers and pastoralists), Timber and fuel wood dealers, Local households relying on firewood, Government forestry officials, and Community leaders. This population is chosen because they are directly involved in or affected by deforestation and its consequences.

Sample and Sampling Techniques

Due to the size of the LGA, it is impractical to study the entire population. This is considered adequate for survey research of this nature. Thirty (30 %) of wards in the Local Government area were selected making a total of five (5) wards for the study (Cochran, 1997) constituting: Garta-Ghunchi, Michika II, Minksi Wuro Ngiki, Moda Dikka and Sina Kamale. Being a purposive study sample size of 300 respondents were selected for the study comprising of 60 respondents from each ward.

Sources of Data

The data was acquired from both secondary and primary sources of data. Primary data was obtained through the administration of questionnaires, oral interviews, and field observations. Secondary data was collected from existing literature such as textbooks, brochure, journal, proceedings, government reports, and other relevant documents.

Data analysis

Data collected was analyzed using descriptive statistics such as frequency counts, percentages, tables and charts.

Result

The result in figure 2 shows the degree of deforestation in the study area according to respondents. 171 (57.0 %) of them were of the view that it is high. Furthermore, 54 (18.0 %) stated that it is very high, 35 (11.6 %) of the respondents reported that it is stable and 26 (8.7 %) low. 14 (4.7 %) of them made no response.

The result shown in figure 3 depicts attitude of respondents towards forest resources conservation in the study area. A total of 224 (74.7 %) of the respondents were in support of forest resources conservation while 58 (19.3 %) were not in

support of its conservation. 18 (6.0 %) of the respondents gave no response.

Table 1 depicts the factors leading to deforestation in the study area. The result is topped by farming with 157 (24.5 %) number of respondents followed by Logging with 92 (14.4%) then fuel wood harvest 86 (13.4%), Wildfire 61 (9.5%), Overgrazing 52 (8.1 %), Overpopulation 46 (7.2%), Poverty 42 (6.6 %), Government attitude towards conservation 35 (5.5%), Infrastructure 33 (5.2 %) , insurgency 21 (3.3%) and Mining 15 (2.3 %).

Table 2 depicts the Consequences to deforestation. The result is topped by Loss of biodiversity 133 (22.7 %) followed by Environmental degradation 106 (18.1 %) then Flooding 96 (16.4 %), Drought 81 (13.1 %), Erosion 60 (10.3 %) Climate change 43 (7.4 %), Disease 37 (6.3 %) and social consequences 29 (5.0%).

Discussion

The result in figure 2 depicted that majority of respondents (57.0 %) have shown that the rate of deforestation is high and this result resembles the findings of Spracklen *et al.*, (2017) whom stated that people are becoming more and more aware of the serious effects deforestation is having on the earth and the number of forests being destroyed is on the increase. The result in figure 2 has shown that majority of the respondents (74.7 %) indicated positive attitude towards the conservation of forest resources meaning that they are willing to support its conservation. This report is in line with the findings of Southgate, (2014) whom reported that communities support conservation of forest resources as a live support system because so many benefits comes from it.

The result in table 1 shows the factors leading to deforestation according to respondents. The result on farming is in consonance with what was obtained by Wilkie *et al.*, (2016) whom stated that the need to feed the population has led to the conversion of vast forested areas into agricultural lands. Because local communities rely on forest resources, including food, fuel wood, and building materials, for survival. As populations grow and traditional agricultural lands become degraded, communities encroach on the nearby forests for cultivation. In the same vein Myers, (2015) stated that About 60 per cent of the clearing of tropical forests is for agricultural settlement with logging and other reasons like roads, urbanization and Fuel wood accounting for the rest. According to the [FAO](#) (2022) report which is also in the same vein, agriculture causes around 80% of deforestation, according to the same report, 33% of agriculture-caused deforestation is a consequence of subsistence agriculture – such as local peasant agriculture in developing countries. Commercial or industrial agriculture (field crops and livestock) cause around 40% of forest loss – in the search for space to grow food, fibers or biofuel (such as soybeans, palm oil, beef, rice, maize, cotton and sugar cane). It is also particularly interesting to note livestock is believed to be responsible for about 14% of global deforestation.

The result on logging is in consonance with what was obtain by Porter, (2019) whom stated that Tropical forests are one of the last frontiers in the search for subsistence land for the most vulnerable people worldwide. Myers, (2015) also stated that millions of people live on the tropical forest with

less than a dollar a day where a third of a billion are estimated to be foreign settlers. However, as the land degrades people are forced to migrate, exploring new forest frontiers increasing deforestation. It is also in agreement with Adepoju and Salau, (2017), according to the authors demand for timber and wood products for various industries, construction, and consumer goods drives extensive logging operations. It is essential for meeting human needs, but unsustainable practices and illegal activities have fueled deforestation and biodiversity loss. Similarly Putz *et al.*, (2014) mentioned that unsustainable logging disrupts ecosystem services, such as carbon sequestration, water regulation, and soil protection, contributing to climate change, unpredictable rainfall patterns, and increased vulnerability to natural disasters like floods and landslides. However, in the words of Chomitz *et al.*, (2017) logging provides access roads to follow-on settlers and log scales can help finance the cost of clearing remaining trees and preparing land for planting of crops or pasture, logging thus catalyzes deforestation.

The result on Fuel wood gathering is in consonance with what was obtain by Nzeh and Eboh, (2019) whom stated that in many parts of the country forests are being destroyed as a result of widespread cutting of wood for fuel. They further stated that this is more pronounced in the rural areas and they depends on fuel wood for up to 15c/c of their total annual energy requirement.

The result on wildfire resonate the findings of Sands, (2018) whom reported that fires are a major tool used in clearing the forest for shifting and permanent agriculture and for developing pastures. Fire is a good servant but has a poor master. Fire used responsibly can be a valuable tool in agricultural and forest management but if abused it can be a significant cause of deforestation. It is also in line with Repetto, (2016) whom stated that based on the data available from 118 countries representing 65 per cent of the global forest area, an average of 19.8 million hectares or one per cent of all forests were reported to be significantly affected each year by forest fire.

The result on Overgrazing is in consonance with what was obtain by Rowe *et al.*, (2020) whom stated that Overgrazing is more common in drier areas of the tropics where pastures degraded by overgrazing are subject to soil erosion. Stripping trees to provide fodder for grazing animals can also be a problem in some dry areas of the tropics and this can turned large areas into a desert.

The result on Overpopulation and poverty is in consonance with what was obtain by Aylward, (2005) whom have shown that rapid population growth is a major indirect and over-arching cause of deforestation. More people require more food and space which requires more land for agriculture and habitation. This in turn results in more clearing of forests. However in the words of Colchester and Lohmann, (1993) arguably increasing population is the biggest challenge of all to achieve sustainable management of human life support systems and controlling population growth is perhaps the best single thing that can be done to promote sustainability. The authors further stated that Poverty and overpopulation are inextricably linked. Poverty, while undeniably responsible for much of the damage to rainforests, has to a large extent been brought about by the greed of the rich

industrialized nations and the third world elites who seek to emulate them. Generally, most of the land is owned by small but powerful elite which displaces poor farmers into rainforest areas. So long as these elites maintain their grip on power, lasting land reform will be difficult to achieve and deforestation continues unabated. In the same vein Chomitz *et al.*, (2017) mentioned that poverty is well considered to be an important underlying cause of forest conversion by small-scale farmers and naturally forest-dense areas are frequently associated with high levels of poverty.

This findings on Government attitude towards conservation resonate the work of Bawa *et al.*, (2014) whom stated that the FAO identified forest crime and corruption as one of the main causes of deforestation in its 2001 report and warned that immediate attention has to be given to illegal activities and corruption in the world's forests in many countries. Also in the same vein Contreras-Hermosilla, (2011). stated that Illegal forest practices may include the approval of illegal contracts with private enterprises by forestry officers, illegal sale of harvesting permits, under-declaring volumes cut in public forest, underpricing of wood in concessions, harvesting of protected trees by commercial corporations, smuggling of forest products across borders and allowing illegal logging, processing forest raw materials without a license.

The result on infrastructure is in consonance with what was obtain by Mather (2016) whom mentioned that expanding cities and towns require land to establish the infrastructures necessary to support growing population which is done by clearing the forests. Also Kaimowitz and Angelsen, (2013) mentioned tropical forests to be a major target of infrastructure developments which inevitably conveys the expansion of the road network and the construction of roads in pristine areas. The authors further stated construction of roads, railways, bridges, and airports opens up the land to development and brings increasing numbers of people to the forest frontier. Whether supported or not by the governmental programmes, these settlers have usually colonized the forest by using logging trails or new roads to access the forest for subsistence land. In addition the findings of Nepstad *et al.*, (2018) shows that urbanization, the process of human migration from rural to urban areas, grows cities and towns. As cities expand, people occupy nearby forests, clearing large tracts of land for housing, commercial buildings, and infrastructure projects. The authors further stated that Urban land is estimated to increase between 120 and 160 million hectares by 2030 due to urbanization, as the United Nations approximates around 68% of the world's population will be living in urban areas by 2050.

The result on insurgency coincide with what was obtain by Bruijnzeel *et al.*, (2014) Whom stated that It is well established that military operations caused deforestation during Wars in many parts of the world. Similarly Lusigi (1984) also reported that across the African continent there are still vivid examples of military coups, boarder disputes, civil confrontation and internal political tensions. All these have affected atmosphere in which conservationist work and change national priorities to favour other unrelated activities. The result on mining is in consonance with what was obtain by Mather, (2016) whom reported that Mining is very intensive and very destructive. Mining is a lucrative activity

promoting development booms which may attract population growth with consequent deforestation. However in the same vein Ascher, (2019) stated that mining for valuable resources, including oil, gas, coal, and minerals, significantly promotes deforestation and environmental degradation. The extraction process involves large-scale forest clearing to access the mineral deposits, resulting in severe environmental consequences and harmful effects on surrounding ecosystems.

The result in table 2 depicts the consequences to deforestation according to respondents. The result on Loss on Biodiversity in this study is in agreement with findings of Dickinson, (2022) whom stated that the most known consequence of deforestation is its threat to biodiversity. In fact, forests represent some of the most veritable hubs of biodiversity from mammals to birds, insects, amphibians or plants, the forest is home to many rare and fragile species. 80% of the Earth's land animals and plants live in forests. He added that by destroying the forests, human activities are putting entire ecosystems in danger, creating natural imbalances, and putting Life at threat. Similarly the works of Charney, (2010) shows the natural world is complex, interconnected, and made of thousands of interdependencies and among other functions, trees provide shade and colder temperatures for animals and smaller trees or vegetation which may not survive with the heat of direct sunlight. Besides, trees also feeding animals with their fruits while providing them with food and shelter they need to survive.

The result on environmental degradation in this study is in line with the findings of Dudley and Stolton, (2013) whom mentioned that deforestation as a major phenomenon that brings about environmental degradation through environmental hazards such as loss of soil fertility, erosion, change in climate, flooding, disruption of the water cycle to mention but a few, is now becoming a threat to the physical environment of most rural communities in the world.

The result on soil erosion and flooding in this study is in agreement with what was obtain by Fearnside, and Barbosa, (2019) stating that deforestation weakens and degrade the soil because forested soils are usually not only richer on organic matter, but also more resistant to erosion, bad weather, and extreme weather events. This happens mainly because roots help fix trees in the ground and the sun-blocking tree cover helps the soil to slowly dry out. As a result, deforestation will probably mean the soil will become increasingly fragile, leaving the area more vulnerable to natural disasters such as landslides and floods. Similarly Lawton *et al.*, (2019) stated that deforestation can also result into watersheds that are no longer able to sustain and regulate water flows from rivers and streams. Once the forest are gone, too much water can result into downstream flooding, many of which have caused disasters in many parts of the world. This downstream flow causes soil erosion thus also silting of water courses, lakes and dams.

The result on climate change and drought in this study is in agreement with what was obtain by Dregne, (2015) whom stated that deforestation also has a very strong contribution to climate change because trees absorb and store CO₂ throughout their lives and tropical forests hold more than

210 gigatons of carbon, their destruction means releasing back into the atmosphere the CO₂ they were keeping and fewer trees available means reducing the planet's overall ability to capture and store CO₂. Both these effects negatively contribute to the greenhouse effect and to climate change. The author further stated that deforestation disrupts normal weather patterns creating hotter and drier weather thus increasing drought and desertification, crop failures, coastal flooding and displacement of major vegetation regimes. In the dry forest zones, land degradation has become an increasingly serious problem resulting in extreme cases in desertification. Similarly Asdrasko, (1990) describe desertification is the consequence of extremes in climatic variation and unsustainable land use practices including overcutting of forest cover. It contributes to global warming which occurs from increased atmospheric concentrations of greenhouse gases (GHG) leading to net increase in the global mean temperature as the forests are primary terrestrial sink of carbon

The result on disease in this study is in agreement with what was obtained by Bawa *et al.*, (2014) whom stated that degradation and loss of forests disrupts nature's balance. Indeed, deforestation eliminates a great number of species of plants and animals which also often results in an increase in disease, and exposure of people to zoonotic disease. It can also create a path for non-native species to flourish such as certain types of snails, which have been correlated with an increase in schistosomiasis cases. It is also in the same line with the words of Yin and Li, (2021) whom stated that Forest-associated diseases include malaria, Chagas disease (also known as American trypanosomiasis), African trypanosomiasis (sleeping sickness), leishmaniasis, Lyme disease, HIV and Ebola. The majority of new infectious diseases affecting humans, including the SARS-CoV-2 virus that caused the COVID-19 pandemic, are zoonotic and their emergence may be linked to habitat loss due to forest area change and the expansion of human populations into forest areas, which both increase human exposure to wildlife.

The result on social consequences in this study is in agreement with what was obtained by Rowntree, (2016) whom shows that healthy forests support the livelihoods of 1.6 billion people globally, one billion of whom are among the world's poorest. This means there are many people depending on forests for survival and using them to hunt and gather raw products for their small-scale agriculture processes. This allows big businesses to get these lands and use them for other ends, disrupting local people's lives. The author further stated the locals decide to abandon "their" land and migrate somewhere else, avoiding conflict and embracing the challenge of a new different life. Or they can stay and work for the companies exploring it in remote plantations – often getting unfair wages and working under inhumane conditions. Gupta *et al.*, (2017) corroborate this findings by showing the most immediate social impact of deforestation occurs at the local level with the loss of ecological services provided by the forests. Because forests afford humans valuable services such as erosion prevention, flood control, water treatment, fisheries protection and pollination- functions that are particularly important to the world's poorest people who rely on natural resources for

their everyday survival. By destroying the forests we risk our own quality of life, gamble with the stability of climate and local weather, threaten the existence of other species and undermine the valuable services provided by biological diversity. In the same vein Cropper and Griffiths, (2018) observe deforestation as an expression of social injustice. The social consequences of deforestation are many, often with devastating long-term impacts. For indigenous communities, the arrival of civilization usually means the destruction/change of their traditional life-style and the breakdown of their social institutions mostly with their displacement from their ancestral area. Also Schmink and Wood, (2017) view the intrusion of outsiders destroys traditional life styles, customs and religious beliefs which intensifies with infra-structure development like construction of roads that results into frontier expansion often with social and land conflicts. Hansen, (2016) also shows that the tropical forests destroyed each year amounts to a loss in forest capital valued at US \$ 45 billion. By destroying the forests, all potential future revenues and future employment that could be derived from their sustainable management for timber and non-timber products disappear.

Conclusion

From the result of this study it can be concluded that various factors such as farming, logging, fuel wood harvest, wildfire, overgrazing, overpopulation, poverty led to the destruction of forest resources. The environmental consequences from these factors were loss of biodiversity, environmental degradation, flooding, drought, erosion etc. Majority of the respondents have shown that the rate of deforestation is increasing and majority have also shown positive attitude towards the conservation of forest resources. The sustainable conservation of forest resources can only be achieved through collaboration between the local communities and the local government authority.

Recommendations : The study recommended:

Adequate policy and institutional framework should be put in place for the purpose of management and conservation of forest resource at the grassroots.

To prevent the local communities from indiscriminate expansion of land for agricultural and other anthropological activities, local communities should be trained to acquire skills in modern agricultural practice and other areas such as tailoring, crafting, shoe and bag making, carpentry etc. this will decrease their dependence on forest resources.

Enhancement of awareness on conservation education programme on forest resources to the local communities.

To reverse the trend on deforestation that is prevailing in the study area, the state government should embark on massive afforestation program through its various agencies.

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Figure 1: Study Area
Source: Adebayo and Tukur, (2013)

Deforestation and its Environmental Consequences, A Case Study of Michika Local Government Area, Adamawa State

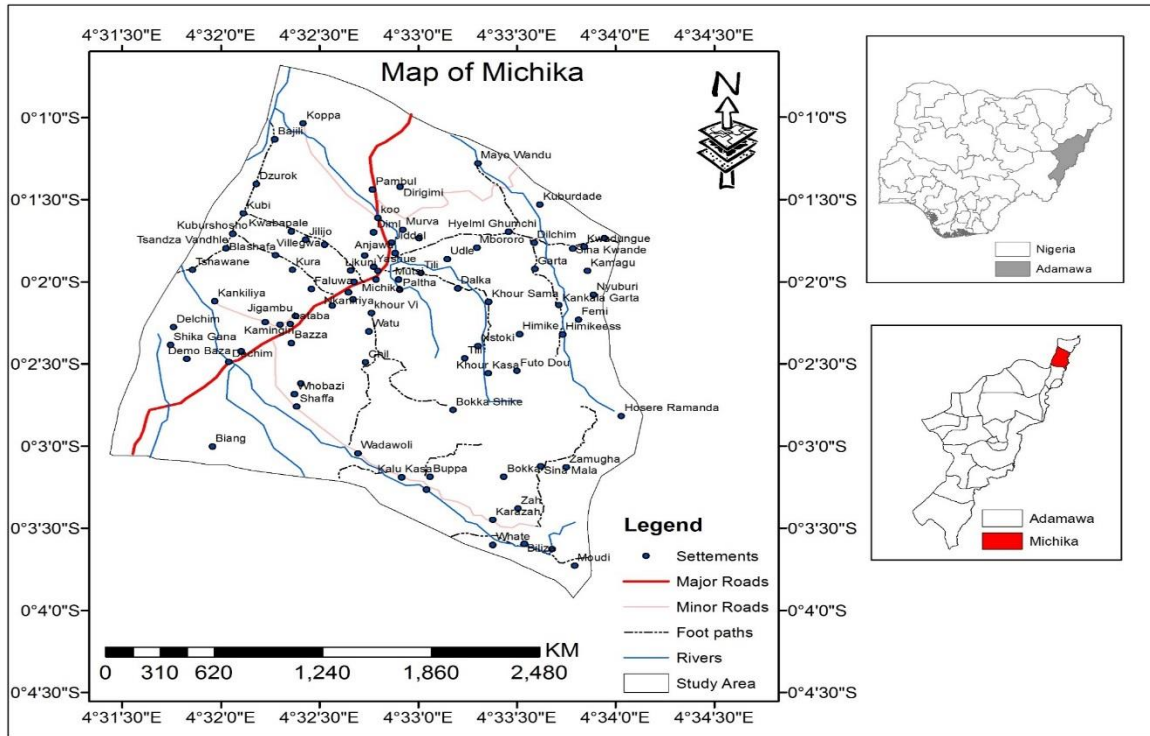


Figure 2: Degree of Deforestation in the study area

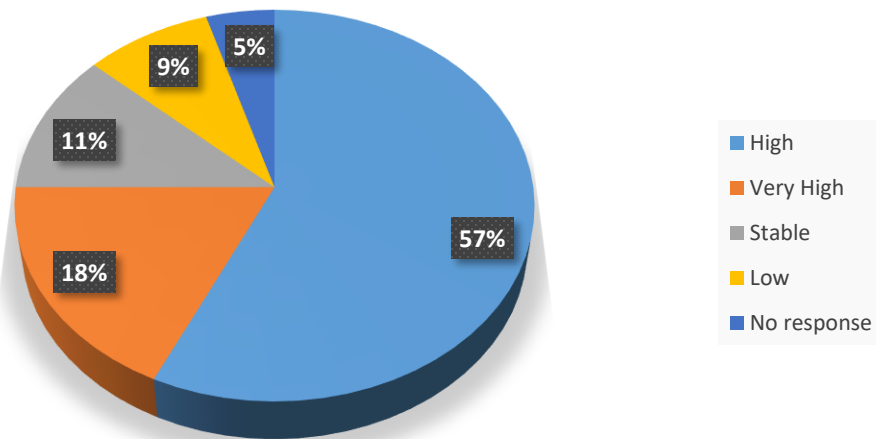


Figure 3: Attitude toward forest resources conservation in the study area

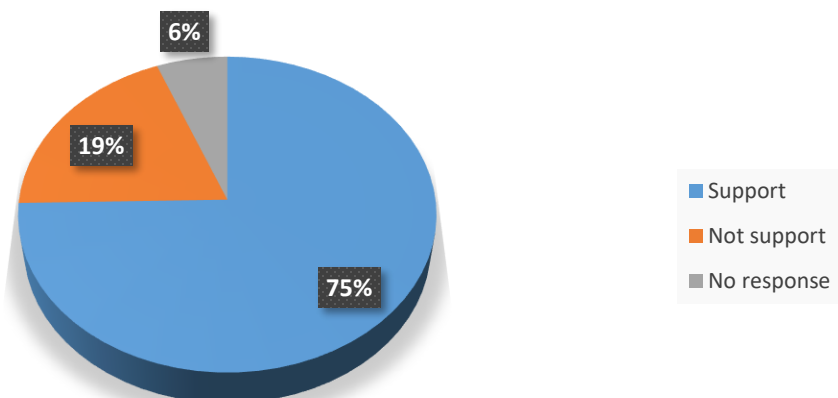


Table 1: Factors causing deforestation

S/n	FACTORS	FREQUENCY	PERCENTAGE
1	Farming	157	24.5
2	Logging	92	14.4
3	Fuel wood harvest	86	13.4
4	Wildfire	61	9.5
5	Overgrazing	52	8.1
6	Overpopulation	46	7.2
7	Poverty	42	6.6
8	Government attitude towards conservation	35	5.5
9	Infrastructure	33	5.2
10	Insurgency	21	3.3
11	Mining	15	2.3
	Total	640	100

Table 2: Consequences to deforestation

S/n	CONSEQUENCES	FREQUENCY	PERCENTAGE
1	Loss of biodiversity	133	22.7
2	Environmental degradation	106	18.1
3	Flooding	96	16.4
4	Drought	81	13.1
5	Erosion	60	10.3
6	Climate change	43	7.4
7	Disease	37	6.3
8	Social consequences	29	5.0
	Total	585	100

