Effect of deforestation on livelihood and the adaptation strategies in Niger south Senatorial District, Niger state, Nigeria

Abstract
Tropical rainforest are a natural reservoir of genetic diversity which offers a rich source of medicinal plants, high-yield foods and a myriad of other useful products. They are an important habitat for migratory animals and sustain as much as 50 percent of the species on earth, as well as a number of diverse and unique indigenous cultures. They also play an elemental role in regulating global weather in addition to maintaining regular rainfall, while buffering against floods, deforestations, and erosion. The studies aim is to assess the effect of deforestation on livelihood and the adaptation strategies in Niger south Senatorial District, Niger state, Nigeria. Information about the various effects of deforestation and adaptation strategies was collected using a structured questionnaire and Focus Group Discussion (FGD). The result shows that wind storm, flooding, late rainfall; low output yields and wide spreads of pest infestation were ranked as the major effects of deforestation. Various adaptation strategies are been implemented by the respondents ranging from fishing, animal rearing, poultry production, hire labour and use of fertilizer to maximize production. It was agree by the majority of the discussants at FGD that artisan work and small scale businesses are the major other sources of livelihood adopted by the individuals. In their various submissions they all attest that wind storm and flooding are the most common effects of deforestation noticeable in the study area.
Keywords: deforestation, livelihood, adaptation, strategies, Niger south

1.0 INTRODUCTION

Tropical rainforest are a natural reservoir of genetic diversity which offers a rich source of medicinal plants, high-yield foods and a myriad of other useful products (Panayotou and Ashton, 1992). They are an important habitat for migratory animals and sustain as much as 50 percent of the species on earth, as well as a number of diverse and unique indigenous cultures. They also play an elemental role in regulating global weather in addition to maintaining regular rainfall, while buffering against floods, deforestations, and erosion (Taylor, 2005). The transformation of forested lands by human actions such as deforestation represents one of the great forces in global environmental change and one of the great drivers of biodiversity loss (Aliyu, A, Modibbo, M.A, Medugu, N.I. and Ayo. O. (2014).

The over-reliance on forest resources and Non-Timber Forest Products (NTFPs) has accounted for the huge change in forest cover and that; deforestation in Africa is estimated at around 3.4 million hectares per year (FAO, 2010). According to Nzeh and Eboh (2007) poor people have thus been able to exploit the forest for food, fuel and other marketable products which create both income and employment for the rural dwellers. The forest is often perceived as a stock resource, a free good, with the land as something freely available for conversion to other uses without recognition of the consequences for their action on services and environmental roles of the forest, hence many forest ecosystem have been degraded into less diverse and stable ones. According to Aruofor, (1999) deforestation can result in erosion which in turn may lead to desertification.

According to a report by (FAO, 2005), Nigeria with total land area of 92,377,000 hectares has annual change in total forest cover of 3.12% between 2000 and 2005 whereas her primary forest covers annual change within the same period 2000 and 2005 stood at - 11.14%. The loss of forest coverage is characterized by illegal logging of forests wood and bad government policies. This

requires adequate attention. According to a report by (FAO, 2005), Nigeria with total land area of 92,377,000 hectares has annual change in total forest cover of 3.12% between 2000 and 2005 whereas her primary forest covers annual change within the same period 2000 and 2005 stood at - 11.14%. The loss of forest coverage is characterized by illegal logging of forests wood and bad government policies. This requires adequate attention. As environmental degradation and its consequences come clearly into focus we are faced with the prospect that the renewable forest resources may be exhausted and that man stands the risk of destroying his environment if all the impacts of deforestation are allowed to go on unchecked. It is therefore, important to carry out a periodic impact assessment of deforestation on the livelihood of its communities in Niger south, Niger state.

While, it is widely acknowledged that this forest decline has far reaching social and economic consequences, based on the knowledge of the researcher there is no available documented research work on the effects and the adaptation strategy on the impacts of the deforestation on the communities in Niger south, Niger State. This gap in no documented research work is hampering policy responses by government and forest stake holders.

2.0 MATERIALS AND METHODS

2.1 The Study Area

Niger South consists of eight (8) local government areas among the twenty-five (25) LGA in Niger State namely: Mokwa, Edati, Lavun, Bida, Gbako Katcha, Agaie and Lapai. The study area is located between Longitude 4°30'00" to 6°34'00" East and Latitude 8°30' 00" to 10°00' 00" North and covers a total land area of 17,364km^2. The study area by 2006 national population census is 1,296,032 people (National Population Commission of Nigeria). The study area is located in the southern part of Niger State experiencing two distinct seasons, dry and wet seasons with an annual rainfall of about 1000mm to 1,200mm (Adefolalu, 1986).

Figure 1 shows the location of the study area.

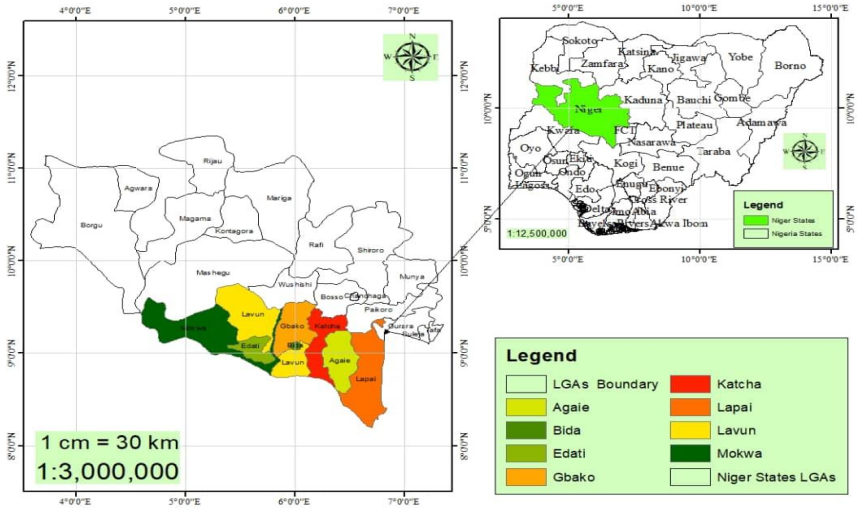

Figure 1 Showing Map of Nigeria, Niger State and the Study Area (Niger south, Niger State, Nigeria)

Climate

Meteorological research confirms that the climate of the study area is well suited for agricultural as it is a Guinea Savanna climate. Rainfall is highly seasonal and controlled by the irregular movement of the Inter-Tropical Discontinuity (ITD). Rainfall usually starts by April/May and

stop in October. It usually recorded an average of 200 days of rainy days for year with an average mean annual rainfall of 1,300mm (Adefolalu, 1986) as shown in Fig 3.However, the temperature rarely falls bellows 20^{o}C. The wet season temperature average is about 20^{o}C. The peak is 38^{o}C in February to March and 35^{o}C in November to December. The mean relative humidity is 33-83%.

2.2 Research Design, Sources and Types of Data

This study adopted a descriptive-survey research design whereby both quantitative and qualitative types of data will be collected. Direct and indirect modes of inquiries were employed to seek opinions and knowledge of a sampled population of respondents on Deforestation in Niger South, Niger State.

The data collection was specific to the set objectives of the study. The study drew from both primary and secondary sources of data.

Secondary data used for the study includes satellite imagery as well as publications, annual and quarterly reports and books (hard and soft copies) that deals with the concepts and issues of deforestation extent and causes.

Collection procedure data for this study were collected from both primary and secondary sources.

The primary data were obtained by the use of structured questionnaire. Reconnaissance surveys, desk studies, interviews and on-field observations were undertaken in the study area to obtained first-hand information on the prevailing situation, causes of deforestation. Extensive literature review were undertaken to gather information on the extent of deforestation over the years and changes in forest cover.

A pilot test was conducted with a small group representative of the population to assess the face validity of the questionnaires. The questionnaires were pretested to ten farmers. Respondents were asked to fill out the questionnaire accompanied by interviews in order to refine the meaning, understanding, wording and formatting of the questions.

Sample size and procedure

The population of the study area was derived from the National Population Commission census of 2006 which put the figure as 1296032. Hence, the total population of the study area was used as sample frame for this research. Sample size was calculated from the projected total population of the study area using the formula PF= PP (1+r) n at the growth rate of 3.5% for 12 years up to 2019.

Exponential population projection formula $Pn= Po(1+r/100)^{n}$ 3.1

Where;

Pn= projected population,

Po= base population,

r = growth rate (3.5%)

n= projected number of years

From the projected population of 1,355,685 the sample size was calculated using simplified formula:

$n = N/1+ N (e^2)$ 3.2

where:

n = Sample size,

N = Population size of the sample unit

e = Level of precision which is ±5% (0.05), at 95% confidence level.

Hence, a sample size of 400 respondents was sought from Mokwa, Edati, Lapai and Agaie LGA. Based on this, a total number of 400 questionnaires were randomly administered and 264 were returned.

Sampling techniques

In the sampling techniques, both purposive and random sampling techniques were employed to ensure a good spread of respondents for the study.

Focus Group Discussion (FGD)

Focus Group Discussion is a technique where a researcher assembles a group of individual to discuss a specific topic, aiming to draw from the complex personal experiences, beliefs, perceptions and attitudes of the participants through a moderated interaction.

Focus Group Discussion (FGD) were held with major stake holders (forestry officers, community heads, religious heads, heads of trade unions of various communities) to seek for vital information and to validate or otherwise of the issues rise during the interview.

2.3 Methods of Data Analysis

The two objectives were achieved using descriptive statistics and were presented as frequency tables, percentages, graphs and charts. The Statistical Package for Social Sciences (SPSS) and Excel were employed to process and analyze the data.

3.0 Results and Discussion

Table 1 Parameters analysed on how deforestation has affected the livelihood patterns of the respondents in the study area.

Parameters	Frequency	Percentage (%)
Does changing forest cover effects your livelihood?		
Yes	258	98
No	06	2
Effects of deforestation		
Wind storm	238	90
Flooding	238	90
Wide spreads of pest infestation	26	10
Reasons for late planting		
Late rainfall	216	82
Other reasons	48	18
Effects of late planting of crops		
Low output yield	158	60
Poor quality of yield	98	37
Pest infestation	08	3
Reasons for decreasing of output yield		
Inadequate rainfall	120	45
Excessive rainfall (flooding)	21	8
Pest an diseases	76	29
Soil infertility	47	18
Annual income from farming activities (Naira)		
Less than 100,000	17	6
100,000 – 500,000	89	34
500,000 – 1Million	83	31
1Million – 5Million	41	16
5Million – 10Million	29	11
Above 10Million	05	2

Source: Field Survey, 2021

3.1.1 Does changing forest cover affect your livelihood?

Fig 2(a) presents the analysis of the question; does changing forest cover affect your livelihood? The result indicates that 98 percent of the respondents attest that changes in forest cover has affected their livelihoods. While 2 percent attest to no effect of change in forest cover on their livelihoods.

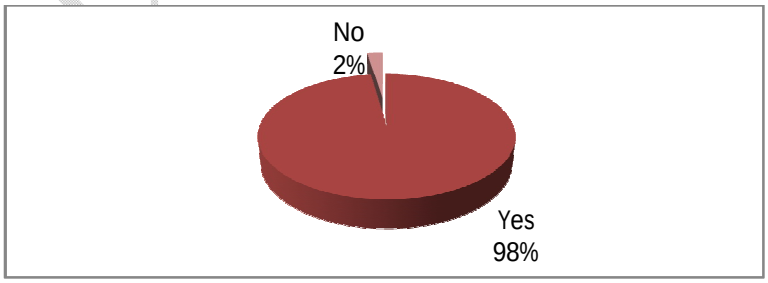

Fig 2(a) Effects of changing forest cover on livelihood

The result implies that majority of the respondents has been affected by changing forest cover, that is decreasing vegetation cover here refers to as deforestation.

3.1.2 Effects of Deforestation experience by the respondents.

Fig 2(b) shows the analysis of the types of effect of deforestation experience by the respondents. The result reveals that wind storm and flooding tops the effect of deforestation experienced by the respondents accounting for 48 and 47 percent respectively. While wide spread of pest infestation accounted for 10 percent.

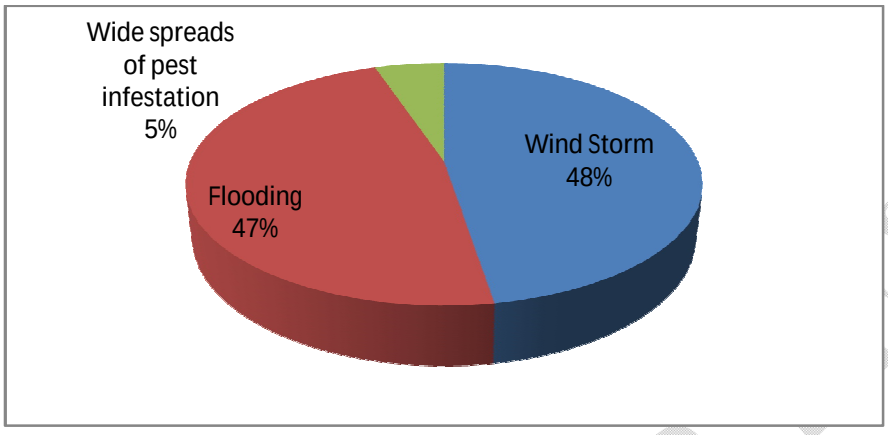

Fig 2(b) Effects of deforestation experience by the respondents

This implies that the respondents are not unaware of the consequences of deforestation but they still choose to continue with their actions of deforestation. This result is similar to the earlier report of Jeminiwa, *et al*., (2020) on the assessment of forest degradation indices in Mokwa forest reserve, Niger state, Nigeria; who reported that wind storm and flooding are some of the effects of deforestation in the study area.

3.1.3 Reason(s) for late commencement of planting

Fig 2(c) Present the analysis of those who said that they were not able to commence planting at the right time. The result reveals that 82 percent of the respondents said that they were unable to commence planting at the right time due to late starting of rainfall. However, 18 percent of the respondents give other reasons like: lack of money for land preparation and sickness for their late planting.

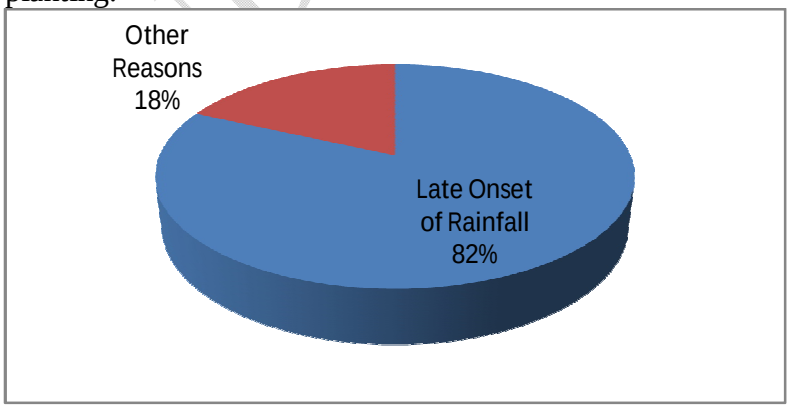

Fig 2(c) Reason(s) for Late Commencement of Planting

This implies that deforestation has affected the livelihood of majority of the respondents in the study area.

3.1.4 Effects of late planting of crops

The analysis of effect of late planting of crops is presented in Fig 2(d); the result reveals that the majority of the respondents accounting for 60 percent attributed the effect of late planting of crops to low output yields. 37 percent attributed the effect to poor quality of yields. However, only 3 percent of the respondents attributed the effect of late planting of crops to pest infestation. This implies that low output yield is the major effect of late planting of crops.

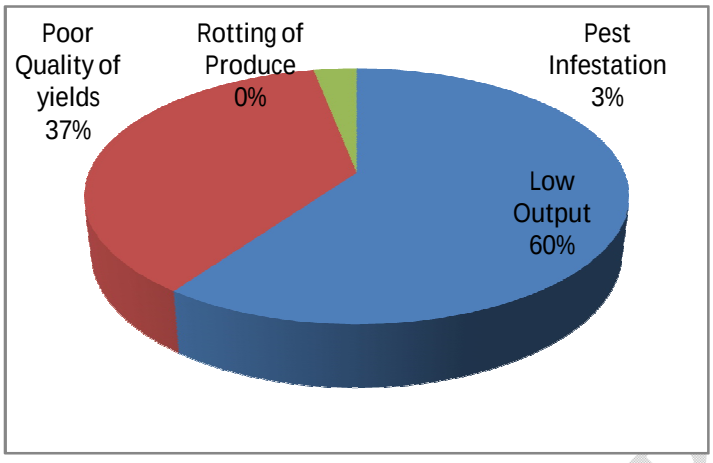

Fig 2(d) Effects of Late Planting of crops

This result is similar to the work of Abubakar, (2014) on deforestation and its effects on livelihood patterns of forest fringe communities in the Asunafo North municipality of Ghana; who reported that low output production is one of the effects of deforestation in the study area.

3.1.5 Reason(s) for decreasing of farm yields

Further analysis of the respondents that attest to decreasing output yield is presented in Fig 2(e); the result shows that majority of the respondents accounting for 45 percent attributed the decrease of output to inadequate rainfall. 29 percent attributed it to pest and diseases. 18 percent of the respondents attributed decrease in output yield to soil infertility. While only 8 percent of the respondents attributed the decreasing of output yield to excessive rainfall (flooding).

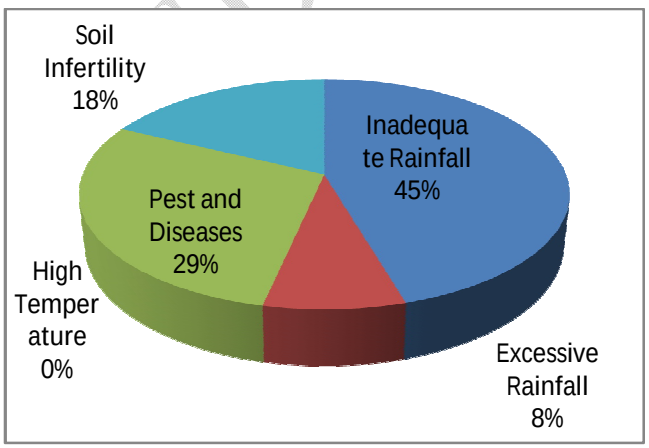

Fig 2(e) Reason(s) for Decreasing of farm Yields

This result is similar to the earlier report of Jeminiwa, *et al.*, (2020) on the assessment of forest degradation indices in Mokwa forest reserve, Niger state, Nigeria; who reported that some of the effects of deforestation in the study area include climate change which resulted to erratic rainfall season leading to late planting of crops in some years.

3.1.6 Annual income from farm sells

The analysis of annual income from farm proceeds is presented in Fig 2(f) the result indicates that 6 percent of the respondents earn less than #100,000 from the sales of their farm goods. 34 percent of the respondents earns between #100,000 to #500,000. #500,000 to #1million accounted for 31 percent and #1million to #5million accounting for 16 percent. #5million to #10million accounted for 11 percent, while the respondents that earns more than 10 million accounts for 2 percent of the total respondents.

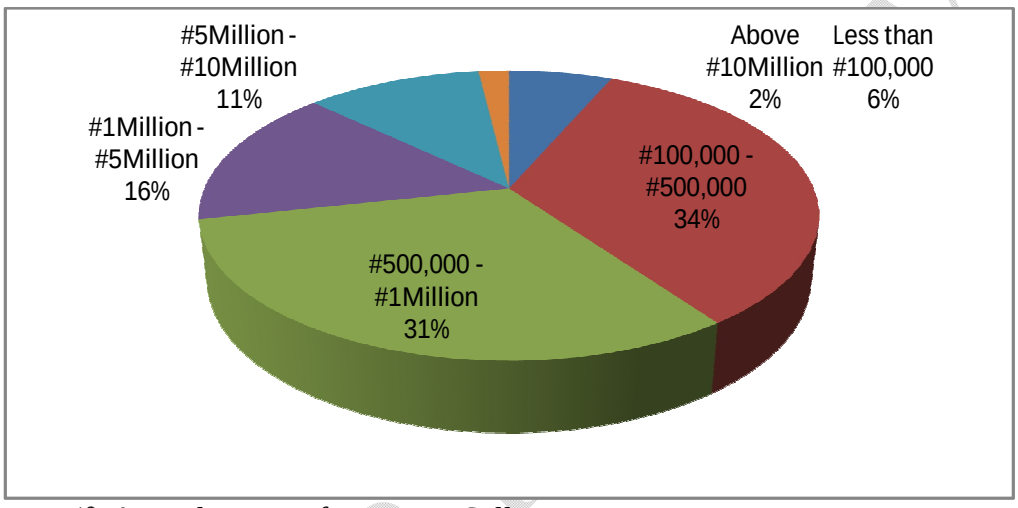

Fig 2(f) Annual Income from Farm Sells
Source: Field Survey, 2021

Table 2 present the various parameters analysed on the adaptation strategies to reduce the effects of deforestation by the respondents in the study area.

Table 2 Parameters analysed on the adaptation strategies to reduce the effects of deforestation.

Parameters	Frequency	Percentage (%)
Other economic activities engage outside farming		
Fishing	61	23
Animal rearing	99	38
Poultry	88	33
Other activities	16	6
Types of labour use in the farm		
Owner / family member	43	16
Hire	13	5
Both owner / family member and hire	208	79
Reason for the use of type of labour in the farm		
For maximum production output	238	90
Because of limited capital	26	10
Mode of production		
Labour intensive	38	14
Capital intensive	12	5
Both Labour intensive and Capital intensive	214	81
Type of fertilizer used in the farm		
Natural (animal dome)	13	5
Artificial (chemical)	169	64
Both Natural and Artificial	82	31
Use of power saw machine in the farm		
Yes	9	3
No	255	97

Source: Field Survey, 2021

3.2.1 Adaptation strategies other than forest or crop production

The analysis of other agricultural related activities engaged by the respondents as part of adaptation strategies to caution the effect of deforestation in the study area is presented in 3(a); the result reveals that 23 percent of the respondents are into fish farming, 38 percent are engaged in animal (goat, sheep and cow) rearing. Poultry farming accounted for 33 percent, while 6 percent of the respondents are engaged in other agricultural farming like: rabbit keeping, horse and pig rearing.

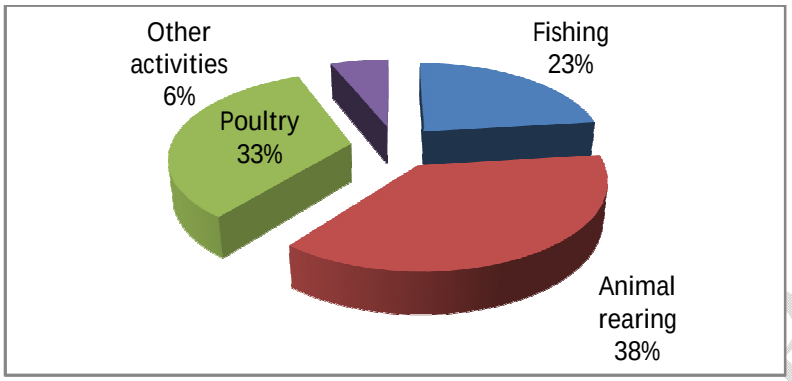

Fig 3 (a) Other agricultural related activities other than forest or crop production
Source: Field Survey, 2021

This result implies that majority of the respondents are engaged in animal rearing to compliment the income from farming activities. This result is similar to the work of Abubakar, (2014) on deforestation and its effects on livelihood patterns of forest fringe communities in the Asunafo North municipality of Ghana; who reported that majority of the farmer are engage to other agricultural related activities other than forest/crop production like fishing and poultry keeping.

3.2.2 Types of labour used in the farm

The analysis of the types of labour employed in the farm as part of adaptation strategies to caution the effect of deforestation is presented in Fig 3(b); the result indicates that 16 percent of the respondents use self or family members. 5 percent of the respondents use hired labour, while 79 percent of the respondents use both family members and hire labour for farming in the study area.

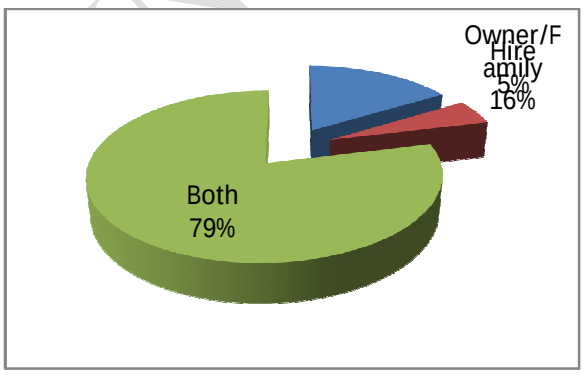

Fig 3(b) Types of Labour used in the Farm
Source: Field Survey, 2021

This implies that majority of the respondents are employing the services of both family members and hire labour for farming. This result is similar to the earlier report of Jeminiwa, *et al*., (2020) on the assessment of forest degradation indices in Mokwa forest reserve, Niger state, Nigeria; who reported that majority of the farmers in the area use either self or family member and hire labour for production.

3.2.3 Reason(s) for type of labour used in the farm

Fig 3.(c) Present the reason(s) for using the selected type of labour in the farm. The result reveals that 90 percent of the respondents said that they used both family members and hire labour to maximize the output yield. However, 10 percent of the respondents said that they are limited by capital and hence the choice of only family members.

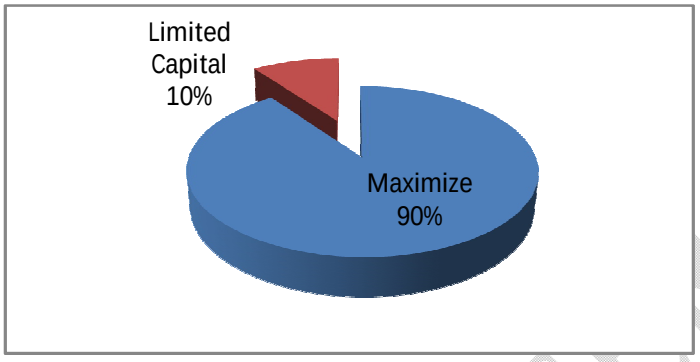

Fig 3(c) Reason(s) for Type of Labour used in the farm
Source: Field Survey, 2021

The implication of the result is that majority of the respondents have to use both family members and hire labour to cope with the effect of deforestation in the study area.

3.2.4 Mode of production of farming activities

Fig 3 (d) Present the mode of production of farming activities. The result indicates that labour intensive account for 14 percent, while capital intensive accounted for 5 percent. However, 81 percent of the respondents said that their modes of production of farming activities are both labour and capital intensive.

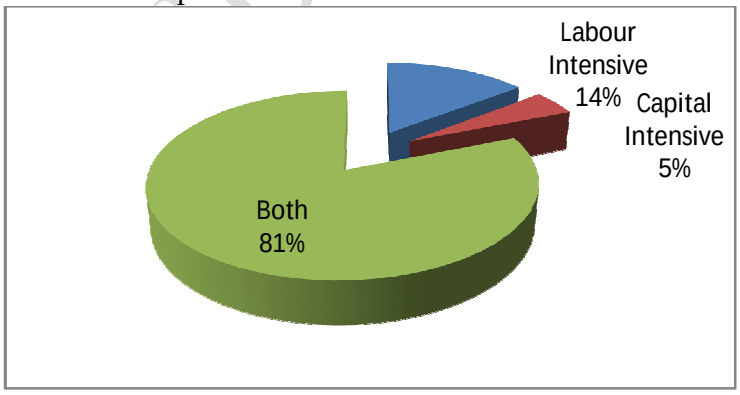

Fig 3(d) Mode of Production of farming activities
Source: Field Survey, 2021

This implies that majority of the respondents interview has adopted both labour and capital in their farming activities.

3.2.5 Type of fertilizer used in the farm

As part of adaptation strategies to caution the effect of deforestation in the study area, various types of fertilizers are being used by the farmer for maximum production as presented in Fig 3 (e); the result reveals that only 5 percent of the respondents uses natural (Animal feces) fertilizer in their farms. 64 percent of the respondents uses artificial (modern chemical) fertilizer in their farms. However, 31 percent of the respondents use both natural and artificial fertilizer in their farms.

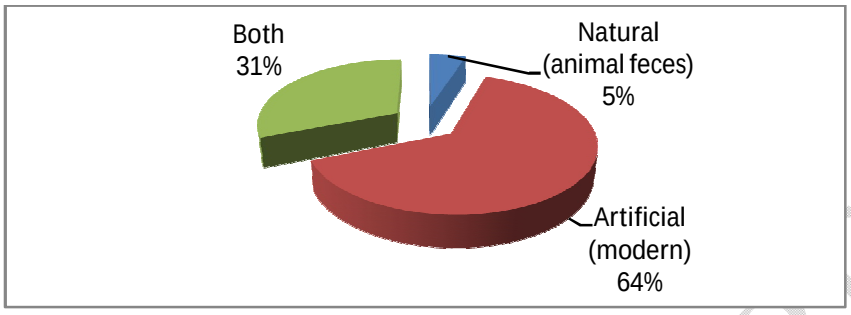

Fig 3(e) Type of Fertilizer used in the farm
Source: Field Survey, 2021

The result implies that majority of the respondent uses artificial chemical fertilizer to cope with the effect of deforestation. This result is in agreement with the study of Bishir *et al* (2018) on the impact of desertification on livelihoods in Katsina state, Nigeria; who reported that majority of the farmers uses artificial fertilizer to maximize their farm production output due to poor soil fertility as a result of deforestation.

3.2.6 Do you use Power saw Machine in your farm?

The analysis of use of power saw machine in the farm during land clearing is presented in Fig 3(f); the result shows that 97 percent of the respondents said that they do not use power saw machine during land clearing in their farms. However, 3 percent of the respondents agree that they use power saw machine in their farms during farm clearing.

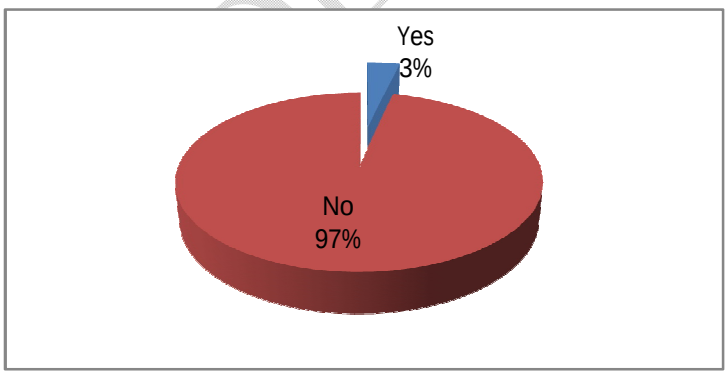

Fig 3(f) Analysis of use of Power saw Machine in the farm
Source: Field Survey, 2021

The result implies that majority of the respondents have resolved not to use power saw machine

in their farms. This decision is taken so as to stop further deforestation and as a strategy to cope with the already impact on their livelihoods.

4.0 Conclusion and recommendations

In conclusion, the study established that deforestation impacts the lives of the respondents in many areas including affecting crop production in the areas of delayed commencement of planting seasons, pest and diseases infestation as well as reduction in the income levels of farmers. Although several effort have been initiated to mitigate these impacts of deforestation in the study area, the people of the study has engage in other agricultural related activities as part of adaptation strategies to caution the effect of deforestation in the study area.

The study recommendations that:

i. Gas and kerosene prices should be subsidised by the government so as to discourage the use of fire wood and charcoal for domestic uses.
ii. Again to help ensure effective mitigation of the impacts of deforestation on crop production it recommends that resource capacity of the institutions be strengthened to enable them function effectively.
iii. Promotions of active research for mitigating the impacts of climate change on crop production in the study area.

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