

# DETERMINANTS OF ADAPTATION TO DEFORESTATION AMONG FARMERS IN MADAGALI LOCAL GOVERNMENT AREA OF ADAMAWA STATE, NIGERIA.

Mustapha S.B.<sup>a</sup>, Undiandeye U. C.<sup>b</sup>, Abdullahi, A.<sup>c</sup>

<sup>a, b, c</sup> Department of Agricultural Extension Services,  
University of Maiduguri, Maiduguri, Nigeria.

Corresponding author: shettimabulama @ yahoo. com

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**Abstract:** The study examined the determinants of adaptation to deforestation among farmers in Madagali Local Government Area of Adamawa state, Nigeria. Structured interview schedule were used to obtain information from 200 respondents selected through simple random sampling techniques. The data collected were analyzed using descriptive (frequencies and percentages) and inferential (chi-square test) statistics. The result indicated that majority (84%) of the respondents were male with 21-40 years of age representing 58.50%. The study also showed that most (45%) of the respondents had attained post primary education with majority (80%) having 6 and above years of farming experience. The respondents perceived fuel wood extraction as the major (42%) cause of deforestation in the study area. The result showed that the most (30.50%) frequently employed adaptation strategy against deforestation was reducing quantity of fire wood consumption. The study further showed that the factors which significantly influenced adaptation to deforestation among the respondents were age, farming experience and educational status with  $X^2=9.216$ , 8.697 and 11.238 at  $P \leq 0.05$  respectively. While those factors which did not influence adaptation to deforestation among the respondents were gender, access to agricultural credit and access to extension services with  $X^2=1.286$ , 7.923 and 5.862 at  $P \leq 0.05$  respectively. The major constraints faced by respondents in adaptation to deforestation were lack of capital and lack of accessible alternative energy.

The study recommends that awareness campaign should be mounted to increase the level of knowledge of respondents on the significance of adaptation to deforestation. Respondents should also be encouraged towards establishment of adaptation cooperative societies in order to take advantage of some government policies and programmes.

**Keywords:** Adaptation, Deforestation, Determinants, Farmers, Nigeria.

## INTRODUCTION

### Background to the study

Forest is one of the main natural resources of Nigeria. Apart from the economic importance of the forest resources in the national economy, the forest resources also play an important role in the livelihoods for the majority of the rural population of the country. However, forest depletion is one of the most serious environmental issues in Nigeria. In the last few decades, forest have been under tremendous pressure from an increasing human population and their ever growing demands for shelter, land for cultivation as well as their demands for fire wood, timber, and other forest products necessary for livelihoods. In addition, the forest areas have also been used for industrial and other development and construction activities such as roads, building and electricity gridlines. As a consequence, Nigeria has the highest rate of deforestation in the world [4].

Deforestation is defined as the indiscriminate felling of trees without their replacement [4]. In other words, deforestation is the removal or damage of vegetation in a forest to the extent that it no longer supports its natural flora and fauna [7]. According to the United Nations Framework Convention on Climate Change (UNFCCC), the overwhelming direct cause of deforestation is agriculture; with subsistence farming responsible for 32%, logging 14% and fire wood removal makes up 5% [10]. Adamawa state is believed to be naturally affected by deforestation because sparsely covered by vegetation which deviates from its natural formation. The human factor also contributes immensely to deforestation in the study area. Studies showed that 84% of the populace relies solely on fire wood for cooking [10]. This observation also reveals that 57% of the total population have been using fire wood for over 10 decades, which was an indication that the activity of deforestation has been taking place for quite a long time. Such an alarming scenario of deforestation has posed a growing threat to the natural as well as socio economic environment of the farming households of Adamawa state as a whole.

In an attempt to reduce the effects of deforestation on livelihoods in Adamawa state, farming households were compelled to develop some adaptation strategies, as farming households responds to changing environmental circumstances in a variety of ways. Thus, it has been observed that the survival attitudes caused by deforestation have encouraged the development of local people consciousness about environment and its conservation [5]. Adaptation in this regard, is the evolutionary process whereby population becomes better suited to its habitats. In other words, adaptation is learning to cope with the impacts of climate change (deforestation) as reported by [6].

Tropical deforestation plays a central role in many of the most acute environmental threats, including global climate change, habitat degradation and unprecedented species extinction. Scientific and public concerns about these and other potentially massive ecological disruptions have incited a growing number of studies that aims to quantify adaptation to deforestation process among farmers. Therefore, this study sought to assess adaptation to deforestation among farmers in Madagali Local Government Area of Adamawa state.

### Statement of the problem

In Nigeria, the greatest problem facing human existence has been deforestation and environmental degradation. As a result of deforestation, trees have undergone substantial deterioration, particularly in

the northern part of Nigeria. The vegetation of Adamawa State is a characteristic of habitat that has been altered due to human interference with its previous natural climate formulation. The cultivation, grazing activity, cutting of trees for fire wood and other purposes have a demonstrable effect on the livelihoods of the farming communities.

Some attempts have been made to study the effects of deforestation in Nigeria [9, 10]. However there has not been any empirical study into the adaptation of deforestation among farmers implied in the study area. This study was therefore, conducted to provide empirical information on adaptation to deforestation among farmers in Madagali Local Government Area of Adamawa State. The study was carried out to address the following research questions: (a) what were the socio economic characteristic of the respondents? (b) What were the perceived causes of deforestation among the respondents? (c) What were the adaptation strategies employed against deforestation among the respondents? (d) What was the relationship between socio-economic characteristics of the respondents and their adaptation to deforestation in the study area? and (e) What were the constraints faced by respondents in adaptation to deforestation in the study area?

### Objective of the study

The main objective of the study was to assess the adaptation strategies employed against deforestation by farmers in Madagali Local Government Area of Adamawa State. The specific objectives of the study were to: (a) examine the socio-economic characteristic of the respondents, (b) identify the perceived causes of deforestation by the respondents, (c) determine the adaptation strategies employed against deforestation by the respondents, (d) examine the effect of socio-economic factors on adaptation to deforestation by the respondents, and (e) Investigate the constraints faced by respondents in adaptation to deforestation in the study area.

## METHODOLOGY

### The Study Area

The study was carried out in Madagali Local Government Area (LGA) of Adamawa State. Madagali LGA is located between latitudes  $10^{\circ}$  and  $11^{\circ}$  and longitudes  $12^{\circ}$  and  $15^{\circ}$  of the Greenwich meridian and covers approximately an area of  $903 \text{ km}^2$  [2]. The area has an estimated population of 134,827 [8]. The vegetation is made up of grasses and some stunted trees in some parts of the area. The rainfall lasts for about 4-5 months in a year with an average rainfall of 700-1000mm per annum [2]. The dry season begins in November and terminates in early June of the following year. Farming is the principal economy of the people in the area. The

climate and the rich alluvial soil of the area favours the cultivation of food crops such as sorghum, millet, maize, rice and cassava. It also favours the production of local cash crops such as cowpea, groundnuts, sesame and sugar cane on a large scale basis. Livestock production is also very important in the study area and is one of the largest concentrations of cattle in Adamawa state. Fishing is a common practice among those living around riverbank areas.

#### Sources Of Data

Primary data was mainly used for the study. These were generated from farming households head through the use of structured and protested interview schedules. The interviews were conducted by enumerators from Borno State Agricultural Development Programme (BOSADP) who were trained for the purpose. Secondly, information from Areas Extension Officers (AEOS) of BOSADP and Area Forestry Officers (AFOS) of the ministry of environment were used to complement the primary data. Other sources of secondary information includes, textbooks, journals and other write up that were relevant to the study.

#### Sampling Procedure and Techniques Of Data Analysis

Simple random sampling techniques were employed to select the respondents of the study. To ensure effective coverage of the study area, respondents were randomly selected from each of the districts that constituted the study area (Duhu, Culak, Kirchinga, Madagali and Sukur). Five villages were chosen randomly from each district because of the fair distribution of villages among the districts, making a total of 25 villages selected from the districts. Eight respondents were selected at random from each of the selected 25 villages making a total of 200 respondents as the sample size of the study. The data were analyzed using descriptive (frequency distribution and percentages) and inferential (chi-square test) statistics. The frequency distribution and percentages were used to achieve specific objectives (i),(ii),(iii), and (v). While the chi-square test was used to achieve objective (iv). The chi-square statistics was used as expressed below:

$$X^2 = \sum [(O_i - E_i)^2 / (E_i)^{-1}]$$

Where:

$X^2$  = chi-square statistic

$O_i$  = observe value of variable

$E_i$  = expected value of variable

$\sum$  = summation sign

The variable used as determinants in the study were:

Gender (GD) = 1 if male, 0 otherwise

Age (AG) = 1 if  $\leq 40$  years, 0 otherwise

Marital status (MS) = 1 if married, 0 otherwise

Farming experience (FE) = 1  $\geq$  6 years, 0 otherwise

Educational status (ES) = 1 if  $\geq$  WAEC/SSCE/TC 0 otherwise

Household size (HS) = 1 if up to  $\geq 6$  in number, 0 otherwise

Access to agricultural credit (AC) = 1 if acquired credit, 0 otherwise

Access to extension services (AE) = 1 if had contact with extension agents, 0 otherwise

Access to mass media (am) = 1 if had access to mass media, 0 otherwise

#### RESULTS AND DISCUSSION

##### Socio-Economic Characteristics of Respondents

The distribution of respondents by socio – economic characteristics is presented in Table 1. The socio – economic variables studied include gender, age, marital status, farming experience, educational status, household size and extension contact of the respondents. Table 1 shows that majority (84%) of the respondents were male, while female constitutes only 16% in the study area. This implies that gender is a significant factor in agriculture because of its vital role in determining farming activities in the study area. This could also influence the adaptive capacity to deforestation. In addition, majority (85%) of the respondents were married and were in their active and economically productive age (21-40 years) representing 58.50%, therefore labour demanding strategies could also be employed.

On the level of education, the result shows in Table 1 that most (45%) of the respondents had attained post primary education. This implies that the respondents could apprehend the techniques of adaptation strategies against deforestation. The result also shows that majority (80%) of the respondents had 6 years and above farming experience. The implication could be that they employ adaptation strategies against deforestation out of their experience. Table 1 indicated that majority (81%) of the respondents had household size of 6 in number and above, while only 19% of the respondents had less than 6 in number. This implies that adaptation strategies that demands more hands/labour could be met by the respondents. The study, also indicates that most (44%) of the respondents had no contact with extension agents over the year. However, 38% attested that they had 1-3 contacts with extension agents per annum. The study implies that there was low level of extension services which affects the awareness and use of adaptation strategies against deforestation in the study area.

**Table 1:** Distribution of respondents by socio-economic characteristics (N=200).

<b>Socio-economic variable</b>	<b>Frequency (No.)</b>	<b>Percentage (%)</b>
<b>Gender</b>		
Male	168	84.00
Female	32	16.00
<b>Age (years)</b>		
20 and below	42	21.00
21-30	55	27.50
31-40	62	31.00
41 and above	41	20.50
<b>Marital Status</b>		
Married	171	85.50
Single	29	14.50
<b>Farming experience(years)</b>		
Less than 6	40	20.00
6-10	57	28.00
11-15	63	31.50
16 and above	40	20.00
<b>Educational status</b>		
Illiterate	19	09.50
Quranic education	23	11.50
Primary education	68	34.00
WAEC/SSCE/TC	70	35.00
Tertiary education	20	10.00
<b>Household size (number)</b>		
Less than 6	38	19.00
6-10	72	36.00
11-15	65	32.50
16 and above	25	12.00
<b>Extension contact (per year)</b>		
No contact	88	44.00
1-3	76	38.00
4-6	30	15.00
7 and above	06	03.00

Source: Field survey, 2010

**Table 2:** Respondents perception on causes of deforestation (N=200)

<b>Causes</b>	<b>Frequency (No.)</b>	<b>Percentage (%)</b>
Farming activities	55	27.50
Fuelwood extraction	85	42.50
Bush burning	25	12.50
Road/building construction	8	04.00
Overgrazing	15	07.50
Drought	12	06.00

Source: Field survey, 2010

**Table 3:** Distribution of respondents by adaptation strategies employed against deforestation (N=200).

Causes	Frequency (No.)	Percentage (%)
Use of fuel efficient wood stoves	07	03.50
Protection of economic trees	27	13.50
Reducing quantity of firewood consumption	61	30.50
Practice of zero tillage	46	23.00
Use of alternative energy (kerosene)	10	05.00
Participation in farm forestry	21	10.00
Use of cow dung for cooking	16	08.00
Use of corn straw for cooking	12	06.00

Source: Field survey, 2010

**Table 4:** Chi-square results of the determinants of adaptation to deforestation in the study area.

Causes	Degree of freedom	Calculated x2	P-value	Remark
Gender	1	1.286	3.841	SN
Age	3	9.216	7.815	SS
Farming experience	3	8.697	7.815	SS
Educational status	4	11.238	9.488	SS
Access to agricultural credit	4	7.923	9.488	SN
Access to extension service	3	5.862	7.815	SN

Source: Field survey, 2010

x2 = calculated chi-square

P-value = Tabulated x2 (critical value)

SS = Statistically significant at  $P \leq 0.05$

SN = Statistically insignificant at  $P \leq 0.05$

**Table 5:** Distribution of respondents by constraints adaptation to deforestation (N=200).

Causes	Frequency (No.)	Percentage (%)
Lack of awareness	37	18.50
Lack of sufficient labour	25	12.50
Lack of accessible alternative energy	48	24.00
Lack of capital	50	25.00
Poor extension services	40	20.00

Source: Field survey, 2010



### Perceived causes of deforestation by respondents

Table 2 shows the perception of respondents on the causes of deforestation in the area. The study reveals that most (42%) of the respondents perceived fuel wood extraction as the major cause of deforestation. This was closely followed by farming activities (27.50%) and bush burning (12.50%). While, the least perceived cause of deforestation was road/building construction with only 4% of the respondents attesting to it. The study shows that the root cause of deforestation was among the rural communities as perceived by the respondents. The implication could be that adaptation strategies against deforestation that could be targeted towards farming communities might effectively yield the desired result with the support of extension services. This was because, the deforestation was perceived to cause by human activities rather than natural as only 6% of the respondents claimed that deforestation is caused by drought.

### Adaptation Strategies employed by respondents

Table 3 indicated the adaptation strategies employed against deforestation by respondents. The result shows that the most (30.50%) frequently employed adaptation strategy against deforestation was reducing quantity of firewood consumption among the respondents. This was followed by the practice of zero tillage (23%) in the study area. While, the least employed adaptation strategy was the use of fuel efficient wood stoves (3.50%), which was closely followed by the use of alternative energy (kerosene), represented by 5% of the respondents. The study implies that the respondents might be ready to use alternative sources of energy if given the opportunity (availability and affordability), this could be attributed to the impact of deforestation in the study area.

### Determinants of adaptation to deforestation among respondents

The chi-square results of the determinants of adaptation to deforestation among respondents were presented in Table 4. The variables studied include gender, age, marital status, farming experience, educational status, household size, access to agricultural credit and access to extension services. The result showed the significant variables which include age, farming experience and educational status;  $X^2 = 9.216, 8.697$  and  $11.238$  at  $P \leq 0.05$  respectively. The age of the farmer affected the farmer's knowledge and the awareness of the activities in the surrounding environment among other farmers. This indicates that the age influences the farmers capacity to adapt deforestation. The finding supports that of Krishna [7], that age significantly influence the adaptive capacity of

farmers against deforestation. Farming experience affected the farmer's knowledge and awareness of deforestation and its impact in the farming communities. This shows that farming experience influences the farmer's adaptive capacity to deforestation. Also, an educated farmer could readily access information on deforestation and how it could be adapted. Formal education could therefore be a critical factor influencing the effectiveness of farmer's adaptive capacity to deforestation; as reported by Oladusu et al [9].

Table 4 shows that gender, access to agricultural credit and access to extension services;  $X^2 = 1.286, 7.923$  and  $5.862$  at  $P \leq 0.05$  respectively were statistically insignificant variables. Gender was thus not a significant factor to influence adaptation against deforestation among the respondents. Also agricultural credit and extension services did not influence adaptation to deforestation by respondents. This could be due to inaccessibility of respondents to extension and credit services. The implication could be that the respondent's level of adaptation to deforestation could be affected negatively.

### Constraints of adaptation to deforestation by respondents

The constraints of adaptation to deforestation were presented in Table 5. The result reveals that lack of capital was asserted by most (25%) of the respondents as constraint to adaptation against deforestation. This could not be unexpected, due to the fact that most of the farming households in the study area are peasant farmers with low income earnings. The second most important constraint was lack of accessible alternative energy, as asserted by 24% of the respondents. This could be due to partly to , as a result of the high prices associated with most of the alternative sources of energy e.g kerosene, and therefore respondents could not afford to use. This implies that the respondents level of adaptation against deforestation could be affected negatively which does not augur well for the environment and the society as well. Other constraints faced by the respondents in adaptation to deforestation were poor extension services, lack of awareness and lack of sufficient labour with 20%, 18.50% and 12.50% of the respondents claiming respectively.

### CONCLUSION AND RECOMMENDATIONS

The study indicated that the respondents employed a variety of adaptation strategies against deforestation. The notable ones include reducing quantity of firewood consumption, the practice of zero tillage and the protection of economic trees among others. The determinants of adaptation to deforestation which had a significant influence among the respondents were age, farming experience and their

educational status. While, on the other hand the variables which did not have any significant influence were gender, access to agricultural credit and access to extension services. The major constraints facing the respondents towards adaptation against deforestation was lack of capital which was closely followed by lack of accessible alternative energy.

Based on the findings of the study, the following recommendations were made: (a) Awareness campaign should be mounted to increase the level of knowledge of the respondents on the significance of adaptation to deforestation. (b) Adequate extension services should be provided on adaptation strategies against deforestation among the respondents; extension of cheap and affordable energy options could be a well come development. (c) Government should make adequate provisions for credit facilities with a view to encouraging respondents adapt to the impact of deforestation; credit facilities could be in the form of energy sources (kerosene) or cash. (d) Encouragement of respondents should be made towards establishment of adaptation cooperative societies in order to take advantage of some government policies and programmes.

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