

**DETERMINATION OF DRIVERS OF DEFORESTATION AND FOREST DEGRADATION IN NORTH-WESTERN PART OF BENUE STATE, NIGERIA'**¹*Mbasaanga, S.S., ¹Aondoakaa, M.A., ¹Origbo, B.U., ¹Sambe, L.N., and ⁵Nyiekpoughul, T.¹Department of Social and Environmental Forestry, Joseph Sarwuan Tarka University, Makurdi, Nigeria⁵Department of Geography, Nassarawa State University, Keffi*Corresponding author: mbasaangasesugh@gmail.com +2347035995515**Keywords:**

Determination,
Drivers,
Deforestation,
Forest,
Degradation.

ABSTRACT

The study was carried out to determine drivers of deforestation and forest degradation in North-west ecological zone of Benue state, Nigeria. A multistage and sampling techniques were used, data were collected from 391 respondents across selected communities within Buruku and Gwer-East Local Government Areas with 30% sampling intensity. Descriptive statistics was used to describe the socio-economic characteristics of the people, Spearman rank correlation analysis was used to test for significant relationship between socioeconomic variables of the people and level of deforestation, participatory index was used to assess the participation of the people in deforestation and five-point Likert scale format was used to measure the effects of deforestation in the study area. The result showed, 49.9% of the respondents were males while 50.1% were females. Farming was the dominant occupation (95.9%), and a large proportion of respondents (54.2%) were aged above 60 years. Correlation analysis revealed that age and income significantly influenced tree felling, while household size showed a strong negative correlation. Participation in deforestation was notably high, with 100% involvement recorded in Gwer-East (0.69) and Buruku (0.67). Major human factors such as fuelwood extraction, poverty, and land-use change were found to significantly contribute to deforestation. Administrative lapses, including poor forest management and failure to enforce environmental laws, were also identified as major drivers. While natural factors had minimal impact, legislative inconsistencies and lack of enforcement significantly exacerbated forest degradation. Conclusively, the consequences of these activities included diminished forest resources, loss of biodiversity, erosion, and climate change impacts. The findings recommend the urgent need for policy reforms, improved enforcement mechanisms, and community engagement in sustainable forest management practices.

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INTRODUCTION**Background of the study**

Trees are the oldest, reliable, extremely useful and widely used raw materials that play a crucial role in oxygen supply and absorption of greenhouse gases (Effects of Deforestation, 2010). Thirty per cent of the earth's land area or about 3.9 billion hectares is covered by forests. It was estimated that the original forest cover was approximately six billion hectares (Bryant *et al.*, 1997). According to John (2020), deforestation has caused the loss of 50 to 100 animal and plant species each day. Many of these species are now at the verge of extinction even with their significant importance to humans,

especially in the area of medicine (John, 2020). Deforestation is any activity that disrupts the natural ecology of the forest as a result of agricultural, social and economic activities carried out in the name of development (Ibrahim, 2015). It also affects economic activity and threatens the livelihood and cultural integrity of forest-dependent people by reducing the supply of forest products and causes siltation, erosion, desertification, drought and flooding (Annan, 2013). The social and economic impact of deforestation has triggered the transformation of forested lands and represents a great force in global environmental change and drivers of biodiversity loss. Forests are cleared,

degraded and fragmented by timber harvest, conversion to agriculture, road- construction, and human-caused fire. Mankind's activities on the environment in his quest for development have resulted in a continuous and serious degradation of the ecosystem, thus posing a threat to both his present and future living (Ogunwale, 2015). 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 (Rhett, 2019).

A degraded forest delivers a reduced supply of goods and services from a given site and maintains only limited biological diversity. It has lost the structure, function, species composition and/or productivity normally associated with the natural forest type expected at that site (ITTO, 2002). The degradation of the forest ecosystem has obvious ecological effects on the immediate environment, but it may also affect distant areas (Adeofun, 1999). Forest degradation involves a change process that negatively affects the characteristics of a forest such that the value and production of its goods and services decline. This change process is caused by disturbance, which may vary in extent, severity, quality, origin and frequency. Disturbance may be natural (e.g. that caused by fire, storm or drought), human-induced (e.g. through harvesting, road construction, shifting cultivation, hunting or grazing) or a combination of the two. Human-induced disturbance may be intentional (direct), such as that caused by logging or grazing, or it may be unintentional (indirect), such as that caused by the spread of an invasive alien species (FAO, 2009). Forests in the tropics are being destroyed at an alarmingly high rate in recent years especially in Nigeria (Eboh *et al.*, 2006; Dagba *et al.*, 2005; Chagbe *et al.*, 2013; FAO, 2011). In Nigeria, the rate of deforestation appears to have accelerated in recent years in spite of policy measures to stem the

rate of deforestation it has continued to increase at an alarming rate. For instance, Oseni (1998) and Aruofor, (1999) estimated deforestation rate for the country at approximately 285,000 hectares annually. Ayala, (2010) reported that between 2000 and 2005, Nigeria lost 5.7 percent of its primary forest' as a result of deforestation which continues to increase at a rate of 3.8 percent, which is equivalent to 4,000 hectares per annum. Therefore, this study seeks to determine the socio-economic characteristics of respondents in the study area, assess the socioeconomic factors influencing deforestation, determine the level of participation of the people in deforestation, determine factors influencing deforestation & forest degradation and determine the effects of deforestation in Benue North-West ecological zone Nigeria.

METHODOLOGY

The Study Area

The study was carried out in Benue State, located at longitudes 6°35' E and 10°E and latitudes 6° 30' N and 8° 10' N within the Guinea savanna area of Nigeria with a total land mass of 30,955 km² (National bureau of statistics, 2012). Benue State is bounding with Nasarawa State to the North; Taraba State to the east and Cross river to the south. Enugu and Kogi State share borders to the east and west, respectively. It has an estimated population of about 4.2 million people according to the 2006 National Population Census, (National population commission, National Population Census; 2006.). The climate of Benue State is tropical with two distinct seasons namely rainy and dry seasons. Rainy season starts in April and ends in October while dry season is from November to March. The annual rainfall varies from 1750 mm in southern part to 1250 in the north. The mean annual temperature fluctuates between 23°C to 30°C Dada O. Secondary School Atlas Second Longman Nig. Ltd. (2006; 2007).

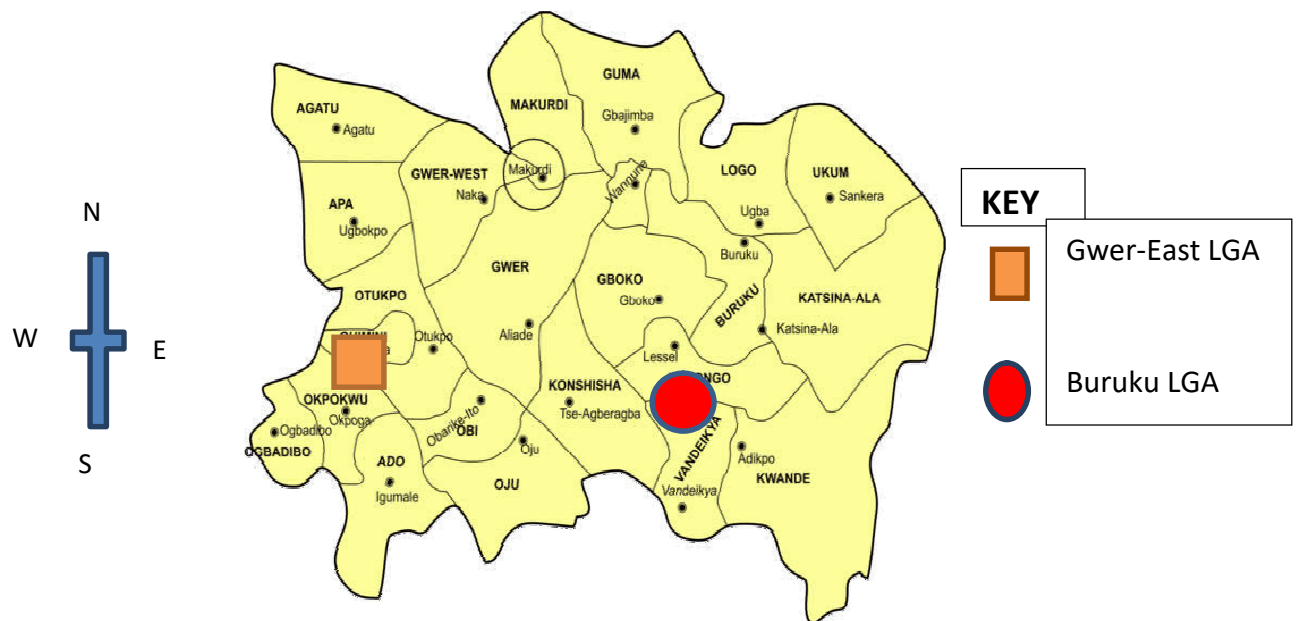


Figure 1: Map of Benue state showing the study areas.
Source: Data: image/jpeg; base64, /9j/4AA. Retrieved on the 10th/06/2020.

Population Sampling and Data Collection

Multistage random sampling with 30% sampling intensity was used to select local governments from the zone. Sample size for the study was determined using Taro Yamen formula as follows:

$$n = N / (1 + N(e)^2) \text{ (Taro, 1967)}$$

Where: n = sample size, N = size of population, 1 = constant, e = error degree of freedom (0.05). Using the population of each of the Local Government Area, the sample size for each of the Local Government was determined using the formula:

$$nh = \frac{n \times Nh}{N}$$

Where: nh = local government sample size, n = population sample size, Nh = local government population, N = total population of the study.

Respondents were drawn across the randomly selected communities to form the source of data and information. Therefore, the sample size for the study was 391 as shown in Table 1.

Table 1: The Study Area and Sample Size

Locations	Sample Areas	Sample size	Percentage
Local Government Area	Buruku	243	62.1
	Gwer-East	148	37.9
	Total	391	100.0
Council ward	Mbayaka	24	6.1
	Mbaakura	25	6.4
	Shorov	38	9.7
	Mbatyough	17	4.3
	Mbaatirkyaa	31	7.9
	Mbaazagee	35	9.0
	Mbaapem	13	3.3
	Mbaade	60	15.3
	Kyonov	38	9.7
	Mbakyaan	16	4.1
	Ugee	49	12.5
	Shough	45	11.5
	Total	391	100.0
Community	Anshav	25	6.4
	Gbeleve	24	6.1
	Mbaikya	38	9.7

Mbaakuta	17	4.3
Mbaavar	31	7.9
Mbatseva	35	9.0
Mbaiwar	13	3.3
Mbaakumshi	15	3.8
Mbaghum	45	11.5
Mbamune	38	9.7
Abeda	16	4.1
Mbadinya	8	2.0
Mbagenda	41	10.5
Mbaje	45	11.5
Total	391	100.0

Data Analyses

Data analysis was carried out based on the objectives of the research. Descriptive statistics such as frequency, mean and percentages were used to analyze data for socio economic characteristics of the people and identify factors

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

Where: r_s = Spearman Rank Correlation Coefficient, d = the difference between the two ranks of each Participatory Index (PI) as adopted by (Alhassan, 2010) was used to assess the participation of the

$$PI = \frac{(f_a \times 1) + (f_o \times 0.8) + (f_r \times 0.4) + (f_n \times 0.2)}{N}$$

Where, PI = Participatory index for deforestation, f_a = frequency of respondent always participating in deforestation, f_o = frequency of respondent often participating in deforestation, f_c = frequency of respondent occasionally participating in deforestation, f_r = frequency of respondent rarely participating in deforestation, f_n = frequency of respondent never participating in deforestation
N = Total number of respondents participating in deforestation in the study area.

Where: f = Summation of the five-point rating scale and n = Number of points

$$MS = \frac{\sum f}{n}$$

$$MS = \frac{1 + 2 + 3 + 4 + 5}{5}$$

$$MS = 3.0$$

The *Likert* Weighted Mean Score (WMS) of effect of deforestation was expressed as:

$$WMS = \frac{\sum f_i x_i}{N}$$

Where: f = frequency of respondent, x = Likert scale point, N = Total Number of respondents. Using the interval scale of 0.05, the Upper Limit

affecting degradation of natural resources in the study area. The Spearman Rank correlation analysis was used to test for significant relationship between socioeconomic variables of the people and level of deforestation. The Spearman Rank correlation is expressed as:

observation, n = Number of observations, 6 = Constant of the formula.

people in deforestation in the study area. The PI is expressed as:

A Five-point Likert scale format was used to measure the effect of deforestation and forest degradation in the study area. The weighting scale was derived from the following values with respect to effects of deforestation; Very High effect (VHE) = 5, High Effect (HE) = 4, Moderate Effect (ME) = 3, Low Effect (LE) = 2, Very Low Effect (VLE) = 1.

The Likert rating Mean Score (MS) of effects of deforestation was expressed as:

Therefore, for a five point Likert scale, MS is expressed as:

(UL) cut-off is $MS + 0.05$ ($3.0 + 0.05 = 3.05$). The Lower Limit (LL) cut-off is $MS - 0.05$ ($3.0 - 0.05 = 2.95$). Based on these two extreme limits any variable with WMS below 2.95 ($WMS < 2.95$) was considered 'Low'. Variable with MWS between 2.95 and 3.05, 'Moderate' any variable MWS greater than 3.05 ($MWS > 3.05$), 'High'.

RESULTS

Socio economic characteristics of respondents in North-West Ecological Zone of Benue State

Based on the result, 49.9% of the respondents were males while 50.1% were females. The result

revealed that the ages of the respondents ranged from 31 to 96 years, with majority (54.2%) within the age category of 60 years and above, followed by those with 51 to 60 years (23.5%), while 18.9%

of respondents were within the age bracket of 41 to 50 years as shown in table 2.

The result on the educational level of the respondents showed that 36.8% of the respondents attained secondary school, 34.3% of the respondents attained primary school with 19.4% of the respondents had no formal education while 9.5% attained tertiary level education. The major occupation of the respondents was recorded as farming (95.5%), followed by 1.8% who were civil servants and traders while 0.3% of the respondents were students in the area. On marital status, 53% of the respondents were married, 34.3% were single

with 6.1% reported to be divorced and 5.9% of the respondents were widows and widowers. This work reveals that 6.6% has the lowest household size range from 1-5 persons while 27.9% had the highest household size of between 6-10 persons. For period of residence, 30.4% resided for more than 50 years while 1% stayed for the shortest time (less than 11 years). The income category of respondents ranged from less than ₦21,000 to greater than ₦100,000 with 2.9% having income category of less than ₦21,000 while 63.2% had income greater than ₦100,000.

Table 2: Socio economic characteristics of respondents in the North West Ecological Zone of Benue State, Nigeria

Characteristics	Category	Frequency	Percent
Gender	Male	195	49.9
	Female	196	50.1
Age	31-40	13	3.3
	41-50	74	18.9
	51-60	92	23.5
	>60	212	54.2
	Total	391	100.0
Educational level	Non-formal	76	19.4
	Primary	134	34.3
	Secondary	144	36.8
	Tertiary	37	9.5
Major Occupation	Civil servant	7	1.8
	Farming	375	95.9
	Hunting	1	0.3
	Trading	7	1.8
	Student	1	0.3
	Total	391	100.0
Marital Status	Married	210	53.7
	Single	134	34.3
	Divorced	24	6.1
	Widow	9	2.3
	Widower	14	3.6
	Total	391	100.0
Household size category	1-5	26	6.6
	6-10	109	27.9
	11-15	101	25.8
	16-20	78	19.9
	>20	77	19.7
	Total	391	100.0
Period of residence Category	<11	4	1.0
	11-20	42	10.7
	21-30	82	21.0
	31-40	60	15.3
	41-50	84	21.5
	>50	119	30.4
	Total	391	100.0
Income Category (₦) per annum	<21,000	9	2.3

	21,000-40,000	60	15.3
	41,000-60,000	37	9.5
	61,000-80,000	15	3.8
	81,000-100,000	23	5.9
	>100,000	247	63.2
	Total	391	100.0
Distance to forest (km)	<2	165	42.2
	2-3	169	43.2
	4-5	57	14.6
	Total	391	100.0

Source: Field survey, 2020

Socio-economic Factors Influencing Deforestation in the North-West Ecological Zone of Benue State

Table 3 shows the result of spearman's correlation test on socio-economic attributes of the respondents and factors influencing tree felling in the study area. Based on the findings, there was a weak correlation between socioeconomic attributes and factors influencing tree felling in the study area. The correlation relationship between tree felling and age category was recorded to be 0.110 (11%) with a significant *p*-value of 0.030; followed by education level of the respondents which had a

non-significant (*p*=0.523) weak relationship of 0.032 (3.2%). This was followed by years of residence, which had a non-significant (*p*=0.846) weak correlation of 0.010 (10%). Household size and income categories had a significant negative correlation of -0.961 (-96.1%) and -0.125 (-12.5%) respectively, with tree felling in the study area; while distance to forest category had a significant (*p*=0.129) negative relationship of -0.077 (-7.7%) with tree felling.

Table 3: Spearman Rank Correlation Test on Socioeconomic Attributes and Tree felling in the North-West Ecological Zone of Benue State

Spearman's rank test vs attributes	Correlation Coefficient	P-values	Decision
Age Category vs. Tree felling	0.110	0.030	Sig
Educational level vs. Tree felling	0.032	0.523	NS
Household size category vs. Tree felling	-0.961	0.057	NS
Period of residence vs. Tree felling	0.010	0.846	NS
Income Category vs. Tree felling	-0.125	0.013	Sig
Distance to forest Category vs. Tree felling	-0.077	0.129	NS

Correlation is significant at the 0.05 level (2-tailed), NS = Not significant, Sig. = Significant.

Source: Field survey, 2020

Table 4: Level of Participation in Felling Trees in the North West Ecological Zone of Benue State

Local Govt. Area	Rate of participation	Frequency	Percent	Participatory index
Buruku	Always	52	21.4	0.6733
	Often	58	23.9	
	Occasionally	80	32.9	
	Rarely	33	13.6	
	Never	20	8.2	
	Total	243	100.0	
Gwer-East	Always	6	4.1	0.6905
	Often	66	44.6	
	Occasionally	65	43.9	
	Rarely	11	7.4	
	Total	148	100.0	

Source: Field survey, 2020

Participation of the People in Deforestation in the North West Ecological Zone of Benue State

The findings on participation in tree felling in the area showed that there was high level of participation in deforestation in Buruku LGA with

91.8% and 8.2% claimed they never participated in felling trees while in Gwer-East 100% participated in felling trees for different reasons (as shown in Table 4)

Factors Influencing Deforestation and Forest Degradation in the North West Ecological Zone of Benue State, Nigeria

The factors influencing deforestation and forest degradation in the study area were human, administrative, natural and legislative factors as presented on table 5,6 and 7. Human factors comprised of uncontrolled grazing of livestock, land use for residential purpose, deforestation, poverty, unemployment, illiteracy and fuel wood production (Table 5) and the respondents reported that these factors have a significant ($wms > 3.00$) effect in their lives.

Administrative factors such as improper behavior of rangers or forest guard, poor participation of villagers in forest management, over exploitation and failure to address violations of offenders in court of law were the key factors reported by the respondents in the study area. All the key factors as administrative factors were evaluated and the result showed that, these factors have very serious effects on influencing forest degradation in the study area. (Table 6)

Respondents reported that, natural factors (such as storm, floods, forest pests and disease outbreaks) and legislative factors (such as weak laws and regulations of natural resources, inconsistency of forest laws and non-implementation of existing forest laws and policies) were the key factors influencing deforestation and forest degradation in the area. These factors were evaluated to determine their level of effect in influencing deforestation and forest degradation, and the result showed that, inconsistency of forest laws and non-implementation of existing forest laws and policies (legislative factor) have significant ($wms > 3.00$) serious effects while, storms, floods and forest pests and disease outbreaks (natural factor) had no significant ($wms < 3.00$) effects (low effect) in influencing deforestation and forest degradation in the area (Table 7).

Table 5: Human Factors Influencing Forest Degradation in the North-West Ecological Zone of Benue State

Factors	VLE (1)	LE (2)	ME (3)	SE (4)	VSE (5)	N	WS	WMS	DEC
Uncontrolled grazing of livestock	16	95(190)	135(405)	84(336)	61(305)	391	1252	3.20	Sig.
Land use for residential purpose	14(14)	75(150)	120(360)	96(384)	86(430)	391	1338	3.42	Sig.
Timber smuggling	9(9)	61(122)	122(366)	108(432)	91(455)	391	1384	3.54	Sig.
Early grazing of livestock in forest	5(5)	44(88)	92(276)	118(472)	131(655)	391	1496	3.83	Sig.
Poverty and unemployment	6(6)	40(80)	87(261)	140(560)	118(575)	391	1482	3.79	Sig.
Illiteracy of people around resource	8(8)	49(98)	99(279)	120(480)	115(575)	391	1440	3.68	Sig.
Providing fuel and traditional uses of wood to forest dwellers	5(5)	42(84)	84(252)	113(452)	147(735)	391	1528	3.91	Sig.

VLE=Very Low Effect; LE= Low Effect; ME= Medium Effect; SE=Serious Effect; VSE= Very Serious Effect; Sig. = Significant.

N= total Number of Respondents; WS= weighted Score and WMS= Weighted Mean Score

Source: Field survey (2020).

Table 6: Administrative Factors Influencing Forest Degradation in the North West Ecological Zone of Benue State

Factors	VLE (1)	LE (2)	ME (3)	SE (4)	VSE (5)	N	WS	WMS
Lack of application of research results	0(0)	4(8)	64(192)	154(616)	169(845)	391	1661	4.25 sig.
Improper behavior of rangers	0(0)	1(2)	32(96)	278(1112)	80(400)	391	1610	4.12 sig.
Failure of security officers to perform protective duties	1(1)	5(10)	54(162)	244(976)	87(435)	391	1584	4.05 sig.
Lacking the participation of villagers in forest management	6(6)	49(98)	92(276)	139(556)	105(525)	391	1461	3.74 sig.
Over exploitation	0(0)	0(0)	13(39)	97(388)	281(1405)	391	1832	4.69 sig.
Failure to address violations by offenders in courts	0(0)	1(2)	25(75)	250(1000)	115(575)	391	1651	4.25 sig.

VLE=Very Low Effect; LE= Low Effect; ME= Medium Effect; SE=Serious Effect; VSE= Very Serious Effect; N= total Number of Respondents; WS= weighted Score and WMS= Weighted Mean Score Sig=Significant

Source: Field survey (2020).

Table 7: Natural and Legislative Factors Influencing Forest Degradation in the North West Ecological Zone of Benue State, Nigeria

Factors	VLE (1)	LE (2)	ME (3)	SE (4)	VSE (5)	N	WS	WMS
Storms	278(278)	111(222)	0(0)	0(0)	0(0)	389	500	1.28 NS
Floods	182(182)	163(326)	39(117)	7(28)	0(0)	391	653	1.67 NS
Forest pests and diseases outbreaks	351(351)	40(80)	0(0)	0(0)	0(0)	391	431	1.10 NS
Legislative Factors								
Weak laws and regulations of natural resources	11(11)	67(134)	106(318)	121(484)	86(430)	391	1090	2.79 NS
Inconsistency of forest laws	15(15)	56(112)	113(339)	111(444)	96(480)	391	1390	3.55 Sig.
Non-implementation of existing forest laws and policies	19(19)	60(120)	90(270)	108(432)	113(565)	390	1296	3.31 Sig.

VLE=Very Low Effect; LE= Low Effect; ME= Medium Effect; SE=Serious Effect; VSE= Very Serious Effect; N= total Number of Respondents; WS= weighted Score and WMS= Weighted Mean Score sig=significant; ns=not significant.

Source: Field survey (2020).

Effects of Deforestation and forest degradation in the North West Ecological Zone of Benue State, Nigeria

Based on the result presented in table 8, forest degradation has very severe effects on the environment. Some of these effects identified in the study area were: low availability of forest resources, ineffective provision of forest services, decline in forest jobs and erosion problems. These effects all had significant ($wms > 3.0$) effects on the people and environment. The effects of deforestation on the environment in the study area were assessed and the result of this finding is

presented in Table 9. Based on this result, destruction of wildlife habitat, erosion, floods, climate change and desertification encroachment are some of the identified effects of deforestation in the study area. Flooding issues as an effect of deforestation has no significant ($wms = 1.28$) effect on the environment in the northeast ecological zone of Benue state. Also, desertification encroachment has no significant ($wms = 2.39$) effect on the environment; while destruction of wildlife habitat and climate change have significant ($wms > 4.00$) effects.

Table 8: Effects of Forest Degradation on Environment in the North West Ecological Zone of Benue State

Effects	VLE (1)	LE (2)	ME (3)	SE (4)	VSE (5)	N	WS	WMS
Low availability of forest resources	0	0	1(3)	55(220)	335(1675)	391	1898	4.85 Sig
Ineffective provision of forest services	0	0	51(153)	204(960)	136(680)	391	1793	4.59 Sig
Decline in forest job opportunities	9(9)	29(58)	95(285)	120(480)	137(685)	390	1517	3.88 Sig
Erosion problem	2(2)	18(36)	83(249)	122(576)	166(830)	391	1693	4.33 Sig

VLE=Very Low Effect; LE= Low Effect; ME= Medium Effect; SE=Serious Effect; VSE= Very Serious Effect; N= total Number of Respondents; WS= weighted Score and WMS= Weighted Mean Score sig=significant; ns=not significant.

Source: Analyzed result (2020).

Table 9: Effects of Deforestation on the Environment in the North West Ecological Zone of Benue State, Nigeria

Effects	VLE (1)	LE (2)	ME (3)	SE (4)	VSE (5)	N	WS	WMS
Destruction of wildlife habitat	0(0)	2(3)	46(138)	91(364)	252(1260)	391	1765	4.51 Sig.
Erosion issues	167(167)	110(220)	61(183)	41(164)	12(60)	391	794	2.03 NS
Flooding issues	282(282)	109(218)	0(0)	0(0)	0(0)	391	500	1.28 NS
Climate change	1(1)	17(34)	117(531)	133(532)	123(615)	391	1713	4.38 Sig.
Desertification	0(0)	246(492)	138(414)	6(24)	1(5)	391	935	2.39 NS

VLE=Very Low Effect; LE= Low Effect; ME= Medium Effect; SE=Serious Effect; VSE= Very Serious Effect; N= total Number of Respondents; WS= weighted Score and WMS= Weighted Mean Score, Sig=Significant; NS=Not Significant.

Source: Analyzed result (2020).

DISCUSSION

Socio economic characteristics of Respondents in the North West Ecological Zone of Benue State, Nigeria

The number of females randomly sampled for this study was slightly higher than the males, this is line with Aondoakaa *et al.*, (2023), who reported that more females were involved in livelihood activities in the forest reserve than men. It is noticed that women constitute major actors in forest resource utilization not only males. This finding focused on the age bracket from 31 years and above. This age class was believed to be mature and can take social responsibility, and able to understand the environment. About 75% of the respondents were

above the age of 50 years. This could have a great impact in participation in tree planting the area. Due to advances in age, majority of the respondents may hardly be actively involved in tree planting. The zeal to safeguard and plant more trees for sustainable forest management won't be their priority due to old age. The educational level of the respondents could influence their perception towards tree planting and climate change mitigation in the area. A greater proportion of respondents knew the adverse effects of bare lands. In a related study, Selby *et al.*, (2003) found that tree planting was considered by all especially to land abandonment leading to natural regeneration by woody plants of low or no value.

Farming was the major occupation of the respondents with fewer of them engaging in hunting, civil service, trading and schooling. These findings reveal that, the respondents in the study area were mostly full time farmers with a source of income from farm produce. Thus, when there was low farm produce in any year, this could lead to more pressure on forest products and deforestation of the available forest estates in the area. When there was any alternative source of income other than farm produce. The result on household size and marital status of the respondents signifies the area was densely populated. This could lead to more pressure on forested lands over a period of time with forest lands converted to farmlands as a result of population growth, high food consumption and housing development. This result is in line with the report of Barana *et al.*, (2020), he reported that over the past century, many scholars maintained thinking that rapid population growth is the major cause of many environmental concerns especially in developing countries. The result on period of residence in the area by the respondents could be a factor that influences deforestation because of over familiarity between the respondents and the forest. The result on income category of the respondents showed that, the respondents generated their income from farm produce and/or other sources such as craft making, timber and fuel wood etc.

The result on descriptive statistics of socio-economic attributes of the respondents implied that, the mean age of the respondents were adults which could be regarded as post service age in developing countries like Nigeria; while the minimum age fell within the youth category. Household size of 14 persons with a minimum of 2 persons per household signified a fast growing household size. This implied that there was a tendency that the communities in the study area will grow at an alarming rate, which means more pressure to the forests and forest resources in the study area. Most of the respondents were indigenes of the area, conversant with the forest and the terrain. This could be one of the reasons why laws, regulations and policies guarding the forest areas were violated and ineffective. The result of the findings showed that deforestation and forest degradation could be influenced by socio-economic attributes of sampled households differently. Different socio-economic factors have aggravated deforestation and forest degradation in the area.

Socioeconomic Factors Influencing Deforestation in the North West Ecological Zone of Benue State

The result of spearman's correlation test on socioeconomic attributes of the respondents influencing tree felling implies that, positive correlation between socioeconomic attributes and tree felling indicated that the attributes move in the

same direction with tree felling; thus, increase in age category of the respondents could lead to a significant increase in tree felling. This was followed by income category of the respondents which had a significant negative correlation with tree felling in the area. This signified that, income and tree felling moved in the opposite direction, i.e. a significant increase in income category resulted to a decrease in tree felling. Household size and distance to forest categories had a non-significant negative correlation with tree felling in the area. This result implied that increase in household had no significant decrease in tree felling. So also, increase in distance to a forest in the area could lead to no significant decrease in tree felling. This was in line with the findings of Aklilu *et al.*, (2020), who reported that socio-economic characteristics (sex, family size, and education level) of respondents at Duguna Fango Woreda in Ethiopia were significantly associated with the forest status of the woreda. Since the forest has a direct and indirect role in the community's livelihood, the dependency on forest and forest products for both income generation and home consumption resulted in massive deforestation and forest degradation. Also, Aondoakaa *et al.*, (2023), reported most of the respondents were married with four children and above implying that livelihood activities and utilization of forest resources could be high in the study area in order to support their household needs.

Participation of the People in Deforestation in the North West Ecological Zone of Benue State

The participatory Index (PI) as adopted by (Alhassan, 2010) was used to assess the participation of the people in deforestation in the study area and an index of 0.67 and 0.69 was recorded. The level at which the respondents participated in tree felling was assessed to determine the trend of forest estates and the resources in the study area. The result implied that, more than 75% of the respondents participated (always, often and occasionally) in felling of trees and majority of the respondents collected forest resources from the forests estates without actively participating in tree planting or campaign in the area. This result reveals that in the future, most of the forested areas in the area will become bare lands thereby exposing the soil and microorganisms to erosion, soil and environmental degradation and increase in climate change effects. The role of tree cover cannot be over emphasized because of the numerous importance to man and his environment. The high level of participation in tree felling could be as a result of the respondent's socio-economic attributes such as educational, income and occupational statuses.

Factors Influencing Deforestation and Forest Degradation in the North West Ecological Zone of Benue State, Nigeria

This finding suggested that, uncontrolled grazing of livestock, land use for residential purposes, timber smuggling, poverty, unemployment, illiteracy and fuel wood production were the major influencers of forest degradation in most communities in Benue North-West ecological zone. These key factors were emancipated from anthropogenic activities that took place within and around the forests. When there was low interest on forest protection and tree planting among people, then unhealthy activities to the forest surviving should always be expected; and such activities (anthropogenic) tended to have the most severe effect on the environment. The effect of the administrative factor on the livelihood of the respondents in the study area was assessed to ascertain the level of their effect in influencing forest degradation, their responses were evaluated and the result implied that, administrative factor had serious effect when it comes to influencing forest degradation in the area.

The result on natural and legislative factors influencing forest degradation in the study area indicated that, natural factors (such as storm, floods and forest pests and disease outbreaks) had no serious effect (significant effect) in influencing forest degradation. This could be so as a result of rare occurrences of such problems (i.e. storm, floods and forest pests and disease outbreaks) in such a significant rate. Legislative factors which were common in our forests in most areas had a significant effect. These factors could be as a result of Government priority which is lacking in the forest sector as widely observed and speculated among the respondents in the study area.

The factors responsible for tree felling were poverty, ignorance, settlement, agricultural expansions and income generations. Among all the factors identified by the respondents in the study, agricultural expansion was the most devastated factor responsible for deforestation and environmental degradation. This is so because agricultural expansion recorded the highest percent of respondents (34.9%) from Buruku and Gwer-east (34.3%). This is in line with Nyagba (1995), who reported that since the economy of Benue State is agrarian dependent, more than 70% of the state's population engages in one form of agriculture or the other. Also, Nigeria Environmental Study Team (NEST) in 1991 estimated that over 350,000 ha of vegetative land in the country were lost annually due to farming alone.

Ignorance was not a factor responsible for tree felling in the area. This showed that, all the respondents had knowledge of the effects of tree felling. Income generation was very low in terms of

influencing tree felling. Though, income from forest activities makes up about one fifth of total household income for rural households living in or near forests (Manfre and Rubin, 2012). This finding is in time line with of Madulu (2004), who reported that, agriculture is not the only factor that contributes to the dynamics of vegetation change; population pressure, logging, fuel wood gathering/charcoal production, changes in land tenure system, and climate change are among the other factors.

The result on participation in tree felling in the study area implied that majority of the respondents engaged in felling of trees while fewer of the respondents did not participate in felling of trees. Those respondents who participated in tree felling in the study area had different reasons which they perceive more important to them than the implications such activities would cause in future time. This perception could be as a result of low level of education on impacts of forest and environmental degradation; or it could even be as a result of poverty which is ravaging most rural communities due to communal crisis.

This finding is in line with John (2020), who opined that, poverty and urbanization were strong factors leading to deforestation, stating that lack of awareness on the adverse effects of deforestation caused the destruction of over 8.5 million hectares of tropical forests yearly, used for the construction of buildings and new urban areas. The reasons for tree felling in the area were timber harvesting, crop farming, fuel wood production, craft making and carving and charcoal production. Craft making could be on the increase due to the rate of unemployment and poverty. Poor agricultural practices such as slashing and burning of trees in forested areas could contribute to deforestation (Terminski, 2012). About 60% of Nigerians use fuel wood for cooking due to the high cost of kerosene (Akinbami, 2003). According to FAO, developing countries from the tropics suffered most from deforestation between 2000 and 2005. This suggested a relationship between poverty and deforestation (John, 2020). Poverty induced human activities were the major causes of deforestation in Nigeria (Terminski, 2012). Other causes of deforestation in Nigeria include: housing development, clearing of forest for industrialization, farming activities, felling of trees by rural dwellers for fuel wood and charcoal productions with the aim of generating income due to poverty. These activities caused negative impacts on rural and urban livelihoods. Trade in wood products is an obvious source of substantial income for national and local governments, traditional rulers and individuals. This often comes in the form of export earnings, taxes, royalties and personal income for those engaged either directly

or indirectly in the exploitation of these forest products (John, 2020).

Effects of Deforestation in the North West Ecological Zone of Benue State

Forest degradation occurs when the ecosystem functions of the forest are degraded. (Anon., 2010). Environmental problems that are termed degradation collectively, such as desert encroachment, erosion, flooding and drought, all have a strong link with deforestation. High deforestation rate leads to increased temperature, which reduces the rate of rainfall thus leading to increase in desertification. Over a period of time, human health and life becomes adversely affected by high rate of deforestation. Deforestation impacts socially, economically and agriculturally on the overall quality of life of any nation (Sahney *et al.*, 2010). Deforestation is considered as a recurring problem in Nigeria; this might be connected with the high poverty level in the midst of abundant natural resources (Fakoya, 2010). Deforestation on lowland plains moves cloud formation and rainfall to higher elevations (Lawton *et al.*, 2001). Deforestation disrupts normal weather patterns creating hotter and drier weather thus increasing drought and desertification, crop failures, melting of the polar ice caps, coastal flooding and displacement of major vegetation regimes. Deforestation affects wind flows, water vapor flows and absorption of solar energy thus clearly influencing local and global climate (Chomitz *et al.*, 2007). Tropical deforestation is responsible for the emission of roughly two billion tonnes of carbon dioxide (CO₂) to the atmosphere per year (Houghton, 2005).

The result on the effects of deforestation on the environment in the study area implies that destruction of wildlife and its habitat and climate change has very serious effects on the environment and mankind. This result is in line with the report of John (2020), who reported that, deforestation has caused the loss of 50 to 100 animal and plant species each day. Many of these species are now at the verge of extinction even with their significant importance to humans, especially in the area of medicine (Effects of Deforestation, 2010). Other effects identified were erosion and desertification encroachment which also has insignificant effect (low effect). Flooding had a very low effect on the environment due to deforestation. Deforestation rate in Nigeria is put at 3.5% and 400,000 hectares every year (International Institute of Tropical Agriculture (IITA) (2011). About 400 out of every 1,000 forestlands are deforested every year and only 26 hectares of these are reforested thus leaving 374 hectares deforested (Babalola, 2012). Illegal logging causes economic sabotage to government and also exposes a nation to an unavoidable scarcity and low quality of forest

products (Tunde, 2017). Nigeria could face the possibility of timber and fuel wood scarcity towards the end of the century (John, 2020). It has been predicted that within the next fifty years, unless adequate measures are taken, most humid tropical forestland area in Africa could be transformed into unproductive land and the deterioration of the savannah into desert will be accelerated (Hunter *et al.*, 2005; Medugu, 2010).

With extensive deforestation, villagers are compelled to walk long distances to fetch fuel wood and eventually tempted to substitute dried animal dung and crop residues for fuel wood. This tends to have serious consequences for local agricultural production and productivity because the rural communities also rely on this substituted resource for improving soil fertility (John, 2020).

CONCLUSION

According to the study, a mix of socioeconomic, administrative, and legislative causes are primarily responsible for deforestation and forest degradation in Benue State's North-West Ecological Zone. Throughout the research area, there was a high degree of community involvement in deforestation, mostly due to poverty, reliance on farming, fuelwood, and a lack of other sources of income. Forest loss has been made worse by inadequate forest governance, lax enforcement of forest regulations, and low levels of public involvement in forest management. Even though natural occurrences like floods and storms were noted, their impacts were comparatively little in comparison to institutional and human influences. The negative effects of these activities, including dwindling forest resources, biodiversity loss, erosion, and climatic variability, highlight how urgently a multifaceted approach to forest protection is needed. Stronger environmental laws, persistent enforcement, and greater public awareness are required to stop additional deforestation and advance sustainable resource management. Prioritization should also be given to alternative livelihood opportunities and community participation in forest governance. If successfully carried out, these initiatives will help restore ecological balance and guarantee the sustainability of Benue State's Forest resources.

RECOMMENDATIONS

Based on the results from this research, it is recommended that:

1. Further study should be carried out on the strength and weakness of existing policies and regulations guiding the forest estates and its resources for sustainable forest management.
2. There should be skills acquisition program for rural women and youth dwelling in the study area in order to curtail the rate of deforestation

and forest degradation due to poverty and unemployment.

3. Multiple land use systems should be encouraged among the people as a paramount factor for sustainable forest management in the area.

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