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EFFECTS OF DEFORESTATION ON NATURAL BIO-DIVERSITY IN DELTA NORTH REGION OF DELTA STATE

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Abstract

The study examines the effects of deforestation on natural biodiversity in Delta North Region of Delta State, with the aim of determining the extent of tree species loss. Vegetation physiognomy of tree height, tree diameter and tree species population were measured in forested and deforested areas. Two experimental sites namely are forested and deforested areas were used for the study. Eight (8) equidistant plots were marked out at 60m x 60m apart and subdivided into quadrants of 1m x 1m for data collection. Tree height was determined by abney level, tree diameter was ascertained by girthing tape and tree species population were enumerated and recorded. The

result revealed that deforestation is responsible for loss of valuable tree species in Delta North region. The result of the t-test analysis showed t value of 7.162, indicating significant effects of deforestation on natural bio-diversity in Delta North region. The study therefore recommended enforcement of strict government legislation to improve the natural bio-diversity in Delta North region of Delta State, Nigeria.

Key words: Deforestation, Tree, Loss, Natural bio-diversity, Delta North Region.

Introduction

Tropical rainforest is one of the most valuable ecosystems in the world, which forms a veritable base from which substantial proportion of the populace derive their source of livelihood (Fuwape, 2004). Apart from timber resources, the tropical rainforest is also very rich in variety of other plant and animal products that provide food, energy, medicine, shelter and recreational facilities for people in the region. The forest plays an important role in the amelioration of weather conditions and patterns, protection of soil and food crops (Akinbode, 2002). However in recent years, this valuable ecosystem with precious biological diversity has been threatened by man induced (anthropogenic) activities of uncontrolled logging, fuel-wood exploitation, sand excavation and bush firing resulting in deforestation.

Deforestation constitutes a major cause of land degradation. According to Global Assessment Bongfen (2006), asserts that deforestation constitutes about 43% of soil degradation in Africa in which 5-7 million hectares of agricultural land is lost annually.

In Delta North region of Delta State, forest resources are undergoing depletion as a result of active deforestation for food crop cultivation, establishment of commercial tree plantations, lumbering, sand excavation, road construction and fuel-wood exploitation in the area. Moreso, pressure on the land due to high population density

occasioned by influx of people to the area, the practice of shifting cultivation and annual bush burning all combine to degrade the forest (Peters, 2001).

These have impacted negatively on the forest ecosystem. Once the forest is exploited of its trees, the soil physical and chemical properties are greatly affected. The increasing trend of deforestation for many agricultural and non-agricultural activities with total disregard of its consequence on soil fertility and the environment and need to conserve our eco-biodiversity, becomes an issue of concern. This study is therefore aimed at evaluating the effects of these anthropogenic activities on natural bio-diversity in Delta North region of Delta state, Nigeria.

Study area

The study area is located in the South eastern part of Delta state in the South-South zone of Nigeria. It lies between latitude $6^{\circ}45'N$ to $6^{\circ}02'N$ and longitude $6^{\circ}02'E$ to $6^{\circ}30'E$. It is bounded by River Niger on the east, Isoko North and Isoko South local government areas in the South, Edo state in the North. Delta North region lies in the coastal plain of Southern Nigeria (see fig. 1). The grassland is gently undulating plain without even a single hill rising above the general land surface. The mean elevation of the area is generally below 50 meters above sea level (Okpor, 2002).

The study area is part of Niger Delta and it is underlain by sedimentary rocks, consisting mainly of yellow and white sand with pebbles, clay and sandy clay occur in lenses (Aweto, 1998). Three geological formation of Benin, Agbada and Akata formations occur in the area and they lay one below the other. The soil is deeply weathered, deeply leached, friable, and they lack distinct and well defined horizons. The soils have low silt and clay content, low cation exchange capacity and consequently low pH (Okpor, 2002). The annual mean temperature is about $27^{\circ}C$ and mean annual rainfall is 2540mm with September being the wettest month (485.39mm) and

January is the driest month (33.27mm). Relative humidity of the air is high throughout the year. During the wet season, it is about 80%, and 60%-70% during the dry season (Okpor, 2002).

Fig. 1: Map Showing Study Area



Sources: Ministry of Land, Surveys and Urban Development, Asaba, (2004)

The natural vegetation of Delta North region is the tropical rainforest. The plant community is basically of evergreen species that yield hardwood e.g. *Entandrophragma ssp.*, *Melicia excelsa*, *khaya invorensis*, *lovoa trichiliodes* etc, but because of anthropogenic

activities occasioned the emergence of grassland vegetation in many areas in Delta North region, mainly in patches. The natural vegetation in Delta North region has been seriously disturbed over the years due to deforestation.

Materials and methods

A survey was adopted in collecting data from the study area, two experimental sites namely a forested area measuring about 100 x 120m² which served as control and a deforested area of about 100 x 50 m² were used for the study. The experimental sites were located in four (4) zones in Delta North region namely Akwukwu-Igbo, Ubulu-Ukwu, Emu-Uno and Okpai. From each of the zones, one (1) study location was selected and eight (8) equidistance plots, four (4) each from the treatments (forested and deforested sites). The plots were marked out at 60m x 60m apart and sub-divided into quadrants of 1m x 1m for data collections, for a period of one (1) year. Vegetation physiognomy of tree height was determined by using abney level, tree diameter was ascertained by measuring their girths at breast height using a girthing tape, and all tree population of $\geq 10\text{m}$ tall were identified by species enumeration and was recorded. Four hundred (400) questionnaires was administered to respondents in deforested areas in order to ascertain the perceive causes of deforestation in Delta North region of Delta State.

Data collected were analysed statistically using the paired t-test and percentage analyses.

Result and discussion

Data collected are presented in tables 1-5 and discussed below. As indicated in table 1, the listed trees are the dominant tree species $\geq 10\text{m}$ tall that were enumerated and recorded at the time of establishment at the sample sites.

Table 1: Tree Species loss

Species	Common names	Forested sites (A)	Deforested sites (B)	Species loss (A-B)	Species % loss
<i>Anitiaris Africana</i>	False iroko	35	16	19	20.4
<i>Milicia excelsa</i>	Iroko tree	42	18	24	25.8
<i>Pentaclethra macrophylla</i>	Oil bean tree	35	12	23	24.2
<i>Irvingia gabonensis</i>	Bush mango	22	14	8	8.16
<i>Khaya spp</i>	Mahogany tree	36	17	19	20.4
	Total	170	77	93	

Source: field survey, 2011.

Table 1 indicated tree species loss in both deforested and forested areas, with *milicia excelsa* as the highest and the least tree species loss is *Irvingia gabonensis*. It also revealed a total of 18 *milicia excelsa* as against 42 in forested area. This shows that 25.8% of *milicia excelsa* has been loss to active exploitation. Others showed 24.2%, 20.4%, 20.4% and 8.16% degradation for *pentaclethra macrophylla*, *Anitiaris Africana*, *kyhaya spp* and *Irviggia gabonensis*. The tree species in deforested areas has been destroyed by man's activities leading to high rate of deforestation. Thus this finding corroborates the study of Lambin et al, (2003) that anthropogenic factors of deforestation can be categorized broadly as proximate and underlying causes. All trees were identified by species and reach height of up to 30-50 meters and attain a girth of 2.8 meters. The tree species found in forested area consist of tall trees, many of which do not appear to reach maturity before rotting away. This is attributed to extremely poor anaerobic soil condition (Areola, 1991). While the trees found in deforested areas have been destroyed by anthropogenic activities of man. This finding corroborates the view of Lambin et al, (2003).

Table 2: species variation in deforested sites

Species	A	B	C	D	Total
<i>Anitiaris Africana</i>	5	3	2	4	14
<i>Milicia excelsa</i>	10	6	6	5	27
<i>Pentaclethra macrophylla</i>	2	3	2	2	9
<i>Irvingia gabonensis</i>	6	3	2	2	13
<i>Khaya spp</i>	2	3	2	7	14
<i>total</i>	25	18	14	20	77

Source: field survey, 2011.

Table 2 showed the species distribution in deforested areas in Delta North region of Delta State. The locations are A: Akwukwu-Igbo, B: Ubulu-Ukwu, C: Emu-Uno and D: Okpai. The dominant tree species available in deforested areas is *milicia excelsa* (Iroko tree) and the least tree species available is the *Pentaclethra Macrophylla* (Oil bean tree). It also revealed that more varieties of tree species are found in Akwukwu-Igbo while very few varieties of species are found in Emu-Uno. While in forested areas the dominant tree species available is the *Malicia excelsa* (Iroko tree) and the least tree species available is the *Pentaclethra Macrophylla* (oil bean tree).

Table 3: Species variation in forested sites

Species	A	B	C	D	Total
<i>Anitiaris Africana</i>	10	6	4	6	26
<i>Milicia excelsa</i>	13	12	14	16	55
<i>Pentaclethra macrophylla</i>	7	8	4	6	25
<i>Irvingia gabonensis</i>	9	8	6	4	27
<i>Khaya spp</i>	6	8	9	14	37
<i>Total</i>	45	42	37	46	17

Source: Field survey, 2011.

Table 3 also revealed that more varieties of tree species are found in Okpai while very few varieties of species are found in Emu-Uno. These variations in the distribution in Delta North region can be attributed to anthropogenic activities in the areas (Lambin et al, 2003).

Table 4: Deforestation in Delta North region

Study sites	No. of tree available in deforested area	No. of trees available in forested area	Total no. of trees in both deforested and forested area	% of available trees
A: Akwukwu-Igbo	25	45	70	28.3
B: Ubulu-Ukwu	18	42	60	24.4
C: Emu-Uno	14	37	51	20.6
D: Okpai	20	46	66	26.7
Total	77	170	247	100

Source: field survey, 2011

Table 4 shows the number of available trees in both deforested and forested areas in Delta North region of Delta State. However, the number of tree per quadrant found in the entire area is less than those of the forested area and this is evidence from 77 trees and 170 trees observed in both degraded and forested area. Emu-Uno has a lesser percentage of 20.6% of the trees available in both forested and deforested areas, while Akwukwu-Igbo has the highest percentage of 28.3% of the available trees in both deforested and forested areas. This variation in tree species could be attributed to anthropogenic activities of man in the area, which is in line with the findings of (Areola, 1991). Thus, deforestation in the area is attributed to an increase urbanization process and this finding corroborates with the work of Lambin et al, (2003) that wood extraction, agricultural expansion, urbanization and infrastructural development are proximate causes of deforestation. It reduces the area, quality and quantity of woody vegetation cover and alter the spatial structure of

landscape through the process of fragmentation which is also related to deforestation and loss of forest cover (Nagendra et al, 2004).

Table 5: Perceive causes of Deforestation

Causes of deforestation	Scale severity							
	1	%	2	%	3	%	4	%
Farming	123	37.2	-	-	253	48.2	34	4.6
Population pressure	-	-	160	23.4	196	57.6	144	19
Infrastructural development	240	70.1	116	29.9	-	-	44	47
Lumbering	57	6.4	122	22.4	-	-	221	40.7
Fuel wood	77	20	-	-	110	33	223	30.5

Source: Field survey, 2011

Table 5 shows the order of severity on causes of deforestation where 5- very high, 4- high, 3-moderate, 2- low, 1- extremely low. According to the expression of the inhabitants on causes of deforestation, population pressure accounted for 57.6% as the major cause of deforestation and 30.5% of respondents sees fuel wood as the least cause of deforestation. This finding is in line with the view of Lambin et al, (2003) who posited that wood extraction, population pressure as a result of urbanization and infrastructural development are proximate causes of deforestation. Other causes are farming which accounted for 48.2%, lumbering accounted for 40.7% and infrastructural development accounted for 47%.

Table 6 shows the mean value of forested plots as 34.61 (SD = 5.329) while that of forested plots is 17.92 (SD= 7.316), indicating the effect of deforestation on tree species loss.

Table 6: Paired sample statistics

	Mean	N	Std. deviation	Std. error
Pair 1				
Forested	34.61	4	5.329	1.863
Deforested	17.92	4	7.316	2.584

Table 7 shows that the calculated t value of 7.162 is greater than the critical table value of 2.318 at $P < 0.05$ and thus, the model is significant. The result reveals that deforestation is responsible for loss of valuable tree species in Delta North region of Delta State.

Table 7: Paired sample statistics

	Mean	Std. Deviation	Std. error	95% confidence interval of the difference		t	df	Sig. 2 tailed
				Lower	upper			
Pair 1	1			9.896	22.51	7.642	8	
Forested								
Deforested								

Conclusion

The study has examined the effects of deforestation on natural biodiversity in Delta North region of Delta State, Nigeria. The study revealed that deforestation has a significant effect on natural biodiversity. And similarly the study further recommended enforcement of strict government legislation against uncontrolled logging, bush firing, fuel wood exploitation and sand excavation, that will foster the maintenance of the natural bio-diversity.

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