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EFFECT OF HUMAN ACTIVITIES ON YANDEV FOREST PLANTATION, GBOKO, BENUE STATE, NIGERIA

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ABSTRACT

This study examined the socio-economic attributes of people living around Yandev Forest Plantation to determine the influence of their livelihood activities on the forest and ranked them according to the degree of severity. The paper estimated the size of deforested areas in the plantation. Two hundred respondents were randomly chosen from five plantation fringe communities and administered with a semi-structured questionnaire. Stratified Random Sampling method was used to determine species density while size of deforested area was estimated through aerial photography. Result revealed that 65% of the respondents were male, 35% females. Young people (49%) of the sampled population were within the age bracket of 20-35 years. Eighteen percent were above 40 years old. Respondents (64%) earned less than ₦300,000 per annum. Maximum of 96% used firewood and charcoal as their main sources of energy. Illegal logging, urbanization, and fuelwood harvesting with mean value of 6.13, 5.38 and 5.27 ranked 1st, 2nd and 3rd respectively. Effect of illegal logging and urbanization on the depletion of wood species in the plantation were significant at both ($P < 0.01$) and ($P < 0.05$) while that of fuelwood harvesting and farming were significant at ($P < 0.05$). Fourteen hectares representing 40% of the plantation original size of 35ha has now been deforested. Human activities were therefore threatening the existence of Yandev forest plantation especially the expansion of Tar Ukpe market. The researcher, therefore, recommended adequate security around the plantation and strict enforcement of forest laws in State to curtail illegal logging activities among others.

Keywords: Human Activities, Yandev Forest Plantation, Deforestation.

INTRODUCTION

Yandev Forest Plantation also known as Tar Ukpe Forest Plantation is one among the 52 gazetted Forest Reserves in the Benue State. Established in 1935 by the colonial administration, the plantation situates between Yandev Round-About and Tar Ukpe market and extends up to 500 meters along the Gboko-Katsina Ala road from the round-about. Available records from Ministry of Water Resources and Environment Makurdi revealed that the plantation originally covered about 331 hectares as of the time of reservation and was divided into four compartments namely; *Tectona grandis*, *Gmelina arborea* and *Cassia* spp. However, a field survey of the forest in 2013 and

2016 satellite imagery (fig.2) of the plantation from Google Earth Map have indicated that the plantation now occupies only 36 hectares.

According to Ikper (1986), the policy thrust behind the establishment of Yandev Forest Plantation along with others in Benue State was to ensure steady production of industrial timber, conservation of wildlife resources as well as provision of vegetative cover for protection of soil erosion and water catchment areas. Other objectives included creation of employment opportunities in rural areas to check rural-urban migration and to ensure that Nigeria met the international standard which stipulates that

countries must reserve at least 25% of their total land mass under forest cover.

Today, the success or otherwise of this policy in Nigeria is in doubt due to high level degradation of forest resources across the country. According to Mbakwe (1986), the Nigeria forest estimated at 36 million hectares as of 1951 had depleted to 15.5million hectares by 1979. Popoola (2000) noted a further depletion of Nigeria total forest plantation from 10% in 1970 to about 5% in 1999. While Umeh (2005), attributed the annual forestry loss of about 3% to human activities, Ladipo (2010), put the rate of deforestation in Nigeria at between 250,000-350,000 ha or 3.5% per annum. The problem of deforestation in the country today is being aggravated by desertification especially in Northern Nigeria where the Sahara Desert is reported to have taken over more than 50% of arable land cultivated 50 years ago in eleven states (Alao 2008). The desert which is said to be encroaching southward at the rate of 1km per annum has also caused the Lake Chad to shrink from 25,000sqkm in 1972 to 1500sqkm by 1999.

A report by the United Nation's Food and Agriculture Organization, FAO (2010) on deforestation trend in Africa, revealed that Nigeria has lost more than half of her forestland within the last fifty year making it one the countries with the highest rate of deforestation in the world.

In Benue State, the situation could be said to be the same, Sorkwagh (2012) reported that many Forest Reserves and plantations established in the state during the colonial era have overwhelmingly been deforested and degraded, as a result of an increase in demand for farmland and expansion of urban centres.

Regrettably, Benue State government appeared unperturbed even as its forestland keeps

diminishing yearly due to human encroachment. It seems the State does not have records about the present status of her forest plantations in terms of species diversity and abundance. The area under forest cover and the size of deforested areas in most forest plantations and reserves are also not known. This research is therefore aimed at providing this essential data that is necessary for proper planning and sustainable management of Yandev forest plantation in particular and other forest reserves in the State in general. The paper assessed the socio-economic characteristics of people living around Yandev Forest Planation, determined the influence of their livelihood activities on the forest and ranked them according to degree of severity.

MATERIALS AND METHODS

Study Area

Yandev Forest Plantation is located in Gboko Local Government Area (LGA) Benue State. The Plantation which situates between Latitude 7° 21' 34.94" N and Longitude 8° 02' 31.14" E, lies in the open grassland savannah vegetation of the state. The climate of Benue State is tropical with two distinct seasons- rainy and dry seasons. The raining season starts in April and ends in October while the dry season is from November to March. Annual rainfall varies from 1,750mm in southern part to 1.250 mm in the north. Mean annual temperature fluctuates between 23 °C and 30 °C (Dada, 2006). The state shares boundaries with Nasarawa State to the North, Taraba to the east, and Cross-River to the south, Enugu to the south-west and Kogi to the west. The State has an estimated population of about 4.2 million people occupying a land mass of 33,955sqkm National Population Census (NPC 2006)

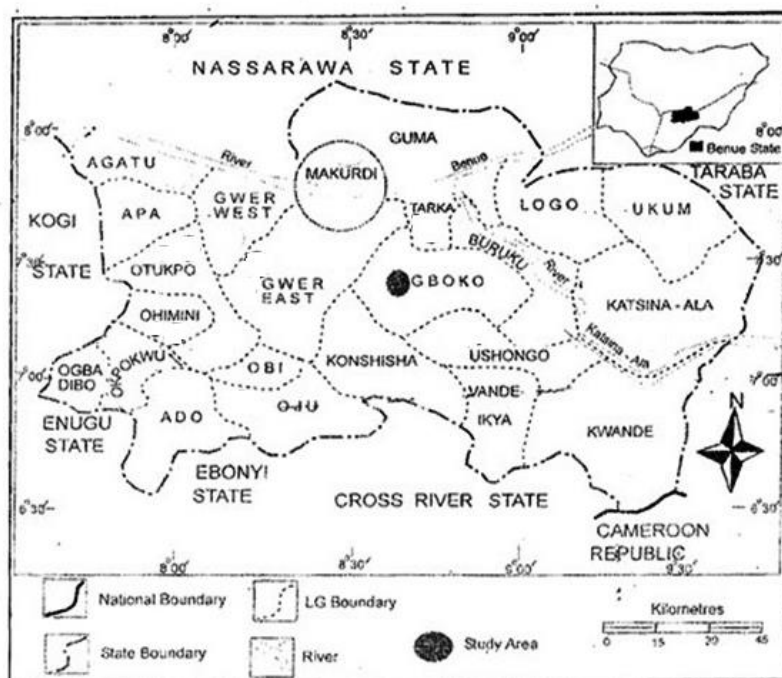


Fig. 1: Map of Benue State showing the location of Yandev Forest Reserve

Source: Ministry of Land and Survey Makurdi, 2013

Data Collection

Forty (40) household heads each were randomly chosen from five plantation fringe communities and administered with a semi-structured questionnaire bringing to two hundred (200) the total number of respondents sampled for assessment of socio-economic attributes (Gillinghamet *et al.*, 2003). The questionnaire had seven factors of deforestation namely; farming, urbanisation, logging, bush burning, and fuel wood collection, as well as mining and grazing. Respondents were asked to rank or grade the factors according to degree of severity using a 7-point Likert scale rating with range 1 to 7. The most serious factor was ranked 1st and the least 7th. Vegetative survey of the forest was also carried out using stratified random sampling method (Omeja *et al.*, 2004) to determine species densities of *Tectona grandis*, *Gmelina arborea* and *Azadirachta indica*. Two plots of 25 m x 25 m were randomly laid in each compartment of the plantation. The plots were located at least 50 m apart. A total of eight sample plots of 25 m x 25 m totalling 5000 m² were laid. In each study plots, trees > 20 cm girth at diameter breast height (dbh) were identified, counted and recorded. The total deforested area in the plantation was estimated through ground surveying and photo interpretation

of satellite imagery the plantation obtained from Google Earth Map. The aerial photograph was interpreted by an expert (Surveyor Ason Bem).

Data Analysis

At the point of data analysis, 191 set of questionnaires were returned. Mean, frequency distribution and percentage were used to analyze and present data on socio-economic characteristics of respondents. Regression equation was used to check the nexus between livelihood activities and their influence on species densities in the forest. The model is expressed as follows:

$$Y = B_0 + B_1 \text{ income} + B_2 \text{ Edu.} + B_3 \text{ logging} + B_4 \text{ urbanization} + B_5 \text{ farming} + B_6 \text{ wood} + B_7 \text{ burning} + B_8 \text{ grazing,}$$

Where:

Y- Tree species density,

Income - amount of income in naira,

Edu - level of education in years.

Similarly, mean grade of the seven livelihood activities by the respondents were used as basis for ranking of the factors on the Likert Scale according to degree of severity (Koutsoyisannis, 1977). This was achieved by converting the ratings of individual respondents to points as follows; 1st = 7 points, 2nd = 6 points, 3rd = 5 points, 4th = 4 points, 5th = 3 points, 6th = 2 points, 7th = 1 point.

The points were summed and mean for each process calculated. Average of the 7 factors was calculated as 4.0. Mean of the 7 factors was used as a basis for comparison. Any livelihood activity with mean value of 4.0 and above was considered as a major factor of deforestation while factors with mean score less than 4.0 were considered as minor. Also, regression equation was used to check the relationship and level of significance of each factor to deforestation.

RESULTS

Socio-economic Attributes of Respondents

The result of the socio-economic attributes of the respondents as presented in Tables 1 shows that 65% were males and 35% females. About 8% of the respondents were between the age brackets of 20-25 years, followed by those between 26-30 years (17%) while 24% were between 31-35 years old. Those 40 years old were 18%. Out of the 191 respondents, 8% attended non-formal education, 21% had primary school certificate, 40% secondary school while those that acquired higher education were only 31% of the sampled population. The result also revealed that 53% were farmers, 21% civil servant while 20% were traders. Those who earned a living through other sources were only 6%. About 64% of the respondents earned less than ₦300,000 per annum.

Energy source and type used by Respondents

The result of frequency distribution showing source of energy used by the respondents show

that 96% used firewood/charcoal as their main sources of energy, 21% kerosene while 2% used gas. Those that use firewood/charcoal (81%) claimed they did so because of their low cost and availability. Though only 17% of the respondents confirmed illegal entry into the plantation for collection of firewood.

Effect of Socio-Economic attributes and livelihood activities on Yandev Forest Reserve

Result from Table 3 ranked illegal logging, urbanization, and fuel wood harvesting with mean value of 6.13, 5.38 and 5.27 as 1st, 2nd and 3rd respectively, on the Likert Scale as most contributory factors to deforestation in Yandev Forest Plantation.

The reliability of ratings by respondents in table 3 was further tested using regression equation. The result as presented in table 4 revealed that illegal logging and urbanisation significantly contributed to depletion of wood species in the plantation at 1% and 5% probability levels ($P < 0.01$, 0.05), while effects of fuelwood collection and farming were significant at 5% ($P < 0.05$). The P-value (3.956) was significant ($P < 0.01$) meaning that the estimated regression model was dependable in explaining the effects of socio-economic variables on tree density. Coefficient of determination (R^2) value of 75.5% shows that the socio-economic factors collectively accounted for 75.5% loss of vegetation in Yandev Forest Plantation as seen in table 5.

Table 1: Frequency distribution of socio-economic attributes of respondents.

Parameters	Frequency	Percent
Sex		
Male	124	65
Female	67	35
Total	191	100
Age		
20-25	16	8
26-30	33	17
31-35	45	24
36-40	62	33
Above 41	35	18
Total	191	100
Level of education		
Non-formal education	15	8
Primary	40	21
Secondary	76	40
Tertiary	60	31
Total	191	100
Occupation		
Farming	102	53
Civil service	39	21
Trading	38	20
Others	12	6
Total	191	100
Income per annum (₦)		
< 300,000	121	63
301,000- 350,000	30	15
351,000-400,000	20	11
401,000-450,000	12	6
451,000-500,000	5	3
>500,000	3	2
Total	191	100

Table 2: Frequency distribution of energy source/ type used by respondents

Parameters	Frequency	Percent
Energy used		
Firewood/charcoal	184	96
Kerosene	40	21
Gas	3	2
Electricity	0	0
Reasons for using firewood		
low cost /availability	155	81
Tradition	36	19
Total	191	100
Where do you get firewood/charcoal?		
Direct purchase from sellers	120	63
From my farm	62	33
From Yandev Forest Plantation	32	17
From nearby bushes	68	36
Others	26	14

Table 3: Mean Statistics of ranked human activities by respondents

Human activities	Number	Sum	Mean	Std deviation	Ranks
Illegal logging	191	1165	6.10	0.961	1 st
Urbanization	191	1028	5.38	1.789	2 nd
Fuelwood collection	191	1007	5.27	0.924	3 rd
Farming	191	779	4.08	1.452	4 th
Bush Burning	191	766	4.01	0.741	5 th
Over Grazing	191	437	2.29	0.961	6 th
Mining	191	214	1.12	0.606	7 th

Source: Field data, 2017

Table 4: Regression analysis showing the effects of socio-economic attributes/ livelihood activities on tree densities Yandev Forest Reserve

Independent Variables	Standard Error	Standardize coefficient (Beta)	t-statistic	P-Value
Level of Education	0.005	0.107	1.037	0.303
Annual income	0.000	0.114	1.090	0.279
Illegal logging	0.066	-0.111	-1.199	0.000***
Fuelwood collection	0.196	-0.142	-1.564	0.012**
Overgrazing	0.50	0.506	4.486	0.234
Urbanization	0.075	- 0.277	-2.783	0.007***
Farming	0.048	-0.049	0.455	0.011**
Burning	0.084	-0.047	-0.510	0.612

$R^2=75.5\%$, $F=3.965$, $\text{Prob}(F)=P=0.000$

Legend: *** significant at 1% probability level. ** Significant at 5% level.

Source: Field Survey 2013

Exotic tree species in Yandev Forest Plantation and their estimated densities

Vegetative survey of the forest (table 5) indicated that the species densities per hectare of the four exotic trees in the plantation have declined considerably over the year. With initial stock density of 1,111 per hectare for the four species,

the average number of stand with diameter at breast height (dbh) >20cm in the four compartments have declined considerably to 77 for *Cassia* spp, 152 for *Arzadirachta indica*, 208 and 266 for *Tectona grandis* and *Gmelina arborea* respectively.

Table 5: Densities of exotic trees species in Yandev Forest Plantation

Species compartment	Number of plots						Total	Mean	Species density/ha= (Meanx16)
	1	2	3	4	5	6			
<i>Gmelina arborea</i>	18	25	22	14	8	13	100	16.7	266
<i>Tectona grandis</i>	6	13	8	11	18	22	78	13	208
<i>Arzadirachta indica</i>	45	9	16	5	13	17	57	9.3	152
<i>Cassia</i> spp	5	6	3	7	8	2	28	4.6	77

Source: Field data, 2013

Estimates of deforested area in the reserve.

Fig.2 showed size of low deforested area indicated by light red colour as 10.70 hectares while high deforested area indicated in dark red colour was estimated at 4.77 hectares.

Note that points (P1 - P12) in fig 2 show coordinates and boundary of the plantation while the deep and light red colours represent low and high deforested areas.

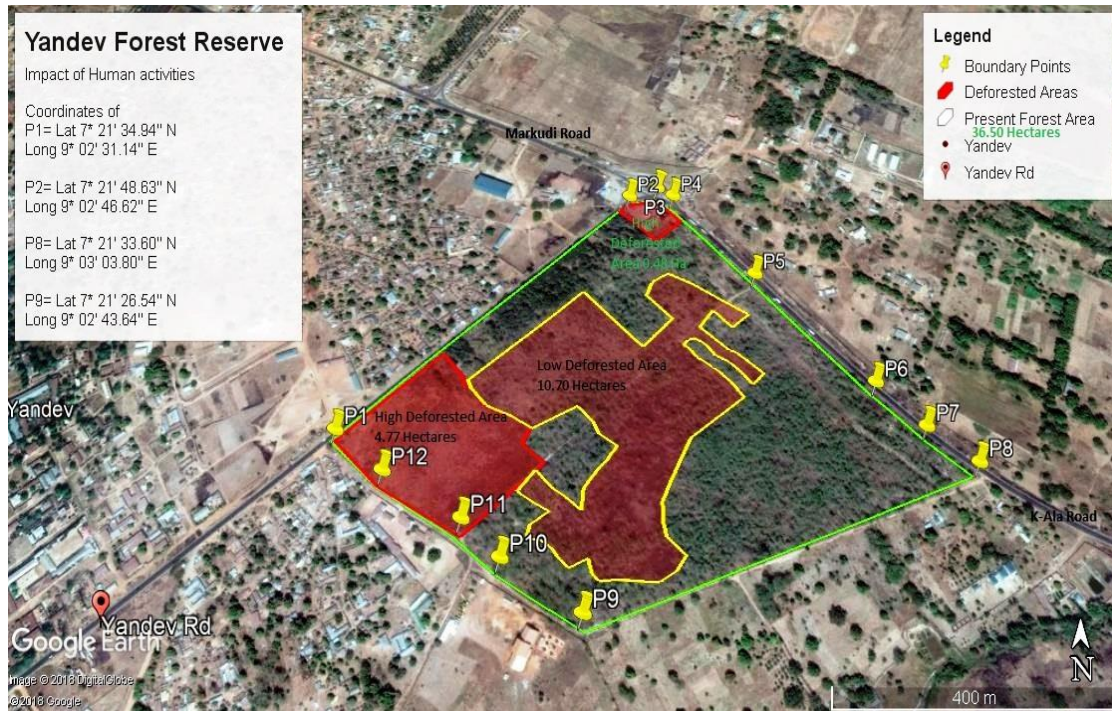


Fig 2. Aerial photograph of Yandev Forest Plantation showing the size of deforested areas



1a

1b

Plates 1

1a and b showed stump of tree left after 3ha of Yandev Forest Plantation were cleared in 2013 to pave way for expansion of Tar Ukpe Market.

Source: Fields photographs, 2013



2a

2b

Plate 2: A heap of firewood and bags of charcoal on display for sale at Pever Ge Street and Ahmadu Bello Way, Gboko East, 2013. Though the wood products above were not obtained from the reserve, the plates meant to show the general impact of fuel wood collection forest.

DISCUSSIONS

The result from socio-economic attributes indicates that a good number of people living around Yandev Forest Plantation were youth within the active age bracket of 20-35 years. Most of them were low-income earners. The implication of a low income but active population living around a forest is that they may exert pressure on the forest in term of high demand for forestland for farming, logging and other activities capable of depleting forest resources. In case of Yandev forest plantation with low average income of about ₦25, 000 per month translating to less than ₦ 1, 000 per day, the people may be left with no choice than to rely on fuelwood as a source of energy particularly now that kerosene which used to be an alternative source of energy is increasingly becoming scarce with high price. This explained why fuelwood collection and logging were among the leading factors of deforestation in the study area. The influence of these factors on Yandev Forest Plantation is being manifested in the declined in densities of the four exotic tree species. From initial stock density of 1111 per hectare, the average number of stand with diameter at breast height (dbh) >20cm in the four compartments have declined considerably to 77 for *Cassia* spp, 152 for *Arzadirachta indica*, 208 and 266 for *Tectona grandis* and *Gmelina arborea* respectively . This finding agrees with

Eboh *et al.*, (2005) who noted that low-income earners in Nigeria usually depend on fuelwood as their major source of energy for heating. Similarly, Oyun (1994) observed that young people tend to engage in forestry activities more than the aged due to the strenuous nature of most forestry activities. Ogunleye *et al* (2007) also found out that percentage of young people within the age bracket of 25-40 involved in conversion of woodland to arable in Enugu State was more than that of old people.

Yandev Forest Plantation is equally threatened by urbanization. For instance in 2013, I witnessed the clearing of about 3ha of Yandev Forest Plantation by the Yandev community to pave way for expansion of Tar Ukpe market. The exercise which led to destruction of over 3,000 stands of *Tectona grandis* and other tree species was carried out without due process. Information from the Divisional Forestry Office Gboko, revealed that the community had actually approached the then Governor Gabriel Suswam for permission, no official approval was granted before the illegal felling operation took place. According to the Benue State Forest Law 2010 as amended, the permission to completely clear whole or part of any gazette forest in the state lies with the Benue State House of Assembly. However, in most cases this due process is not always followed. The most unfortunate aspect about the destruction of a large

portion of Yandev Forest Plantation it is that no single shop is being built on the site since the portion was cleared more than years ago. The threat faced by Yandev Forest Plantation from expansion of Tar market is common to plantations that are situated within or closed to urban centres. For instance, Njoku (2000), reported that in 1896, the then famous Lagos Botanical Garden was cleared for construction of rail-way lines while; the Olokomeji, Calabar and Onitsha Botanical Gardens were at various times in the 1950s cleared for the development of communication lines.

CONCLUSION

The study concluded that human activities are threatening the existence of Yandev Forest Plantation particularly the expansion of Tar Ukpe market which has already taken over the western part of the plantation. Illegal logging activities by some host community members are other challenges that must be tackled. That if adequate conservation measures are not put in place, the plantation will completely be deforested and degraded in the nearest future.

RECOMMENDATIONS

To prevent further degradation of the plantation and other forest reserves in the Benue State, the following measures must be taken.

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- i. That since the portion of the plantation cleared for expansion of Tar Ukpe market is yet to be developed; government should immediate re-afforestation of the site.
- ii. That Tar Ukpe market should be relocated to a bigger site. The present location of the market is not good enough to warrant future expansion and development.
- iii. Adequate security be provided around the plantation to check activities of illegal timber dealers
- iv. That adequate enlightenment campaign should be carried out for the general public to know and always appreciate the micro benefits of having a forest around their community/ village. The age-long notion that a forest is only reservoir of land for farming and collection of fuelwood should be discouraged.
- v. That the Benue State Forestry Law 2010 as amended be Strictly enforced and implemented to ensure full involvement of host communities in sustainable management of forest reserves and plantations in the state.
- vi. Use of renewable energy should be encouraged to reduce the over-dependence on fuelwood as sources of energy which has caused the depletion of forest resources over the years,

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