Effects of Illegal Forest Activities on Sustainable Forest Management in Ayegun-Opara Forest Reserve, Oyo State, Nigeria

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ABSTRACT

Background and Objective: Ayegun-Opara forest reserve has experienced different forms of illegal activities over the years leading to loss of its biodiversity. Hence, the study on the effects of illegal forest activities on sustainable forest management was carried out in Ayegun-Opara forest reserve, Oyo State. Nigeria. **Materials and Methods:** A total of 101 respondents were selected for the study. The primary data was collected using a structured questionnaire and interviews. The questions were designed to identify illegal forest activities in the area, access factors contributing to illegal forest activities in the area, and socio-economic impacts of illegal forest activities in the study area and results were analyzed using descriptive, chi-square, and logistic regression analysis. **Results:** The results showed that the majority of the respondents were male (59.4%), 35-44 years old (37.0%), married (86.1%), 46.5% had secondary education and 63.4% were non-natives. The main occupation was trading in forest products with 41.6%. Major illegal activities include logging of timber without a license (98.0%), excessive logging (95.0%), and logging of unauthorized volumes (93.1%). Factors contributing to illegal activities in the study area gave an overall significant fit to the data judging from the Chi-square value that was significant at $p<0.05$. Major ways of mitigating illegal activities in the area are; the arrest of illegal loggers, awareness campaigns, regular patrol and restriction into the forest reserve, and imposition of dues for forest production with 98.0%, respectively. **Conclusion:** To ensure the sustainability of the reserve, there is a need for planned management, utilization and conservation of the resources.

INTRODUCTION

In Nigeria, most rural areas depend on forests for their livelihood and security[1]; in doing so they engage in various illegal activities. Illegal logging activities have generally caused significant environmental damage, cost governments billions of local currencies in lost revenue, fuelled corruption and undermined the rule of law and good governance[2]. They also hinder sustainable forest development in many countries. Actions carried out for unlawful purposes in the forest reserves have caused major damage to biodiversity

conservation. These actions result in violations of property rights, such as the extraction of stock from protected areas or private lands without authorization, illegal land occupation of land and violation of resource-use regulations.

Illegal activities can be defined as any act of commission or omission committed in or outside the forest in violation of the forest laws and regulations[3]. This can also be said to be making profits from the forest in such a way that violates forest regulations[4]. According to Aluko *et al.*[1], illegal actions are carried out in forest areas without the approval of the authorities in charge of the reserves. Illegal forest activities can be defined as all illegal actions that are connected to the forest ecosystems; industry, wood, and non-wood forest products. They range from acts of corruption related to the supply chain of goods, and planning stages, to harvesting and transportation of raw materials and finished products and financial management[5]. Olawuyi[6] also define illegal forest activities as all illegal practices related to the harvesting, processing, and trading of timber. It is also noted that this includes the illegal cutting of forests for other land uses (a practice known as illegal forest conversion).

In addition, the world has lost almost half of its forest to agriculture, development, or resource extraction through illegal logging activities. However, the value of the benefits that forests provide is great[7]. Nigeria, which is too tropical rainforest, has seen a sharp decline in its forest cover. The exploitation of the forest belt that supports timber, wildlife, and other products is subjected to various forms of illegal activities due to intensive logging, vegetation degradation, land clearing for agriculture, industrialization, and urban development leading to a huge loss of our forest and its forest products[1]. As a result of these activities, almost half of Nigeria's forest cover as of the end of 2012 is now rapidly declining. According to the U.N., Nigeria lost almost 80% of its ancient forests between 1990 and 2005, giving the sardonic impression of having the highest rate of deforestation on the planet during this period[8]. The illegal logging activities in some parts of the country also contribute to the rate of deforestation in Nigeria[1].

The causative factor of illegal activities in forests in Nigeria is related to the unemployment rate and the increase in the population of citizens in the country. However, in recent times, the area marked as forest lands has been steadily decreasing due to indiscriminate felling of trees, and various illegal activities which have continued in almost all parts of the country and are now increasing uncontrollably. This study, therefore, seeks to investigate the effects of illegal activities on sustainable forest management in Ayegun-Opara Forest Reserve, Oyo State to suggest ways of mitigating this threat.

MATERIALS AND METHODS

Description of the study area: The research was carried out in Ayegun-Opara Forest Reserve, Oyo state, Nigeria for 12 months i.e., 20th September, 2023 to 15th August, 2024. Ayegun-Opara forest reserve is located between Latitudes 7°3'0.26"N and 9°11'6.10"N. Opara Forest Reserve (248,640 ha) was the largest of all the forest reserves in the State, occupying about 72.6% of the total forest reserves in the State. It extended to Atishbo, Saki West, and Iwajowa Local Government Areas. Agriculture is the traditional occupation of the residents of the region. The tropical nature of the climate favors the growth of a variety of food and cash crops. The trees and other living things in the area have been disturbed by annual forest fires and other human activities.

Sampling procedure and sample size: Ayegun-Opara forest reserve was specifically selected for this study. The reason for this selection is based on the fact that many forestry activities are carried out in the reserves. A simple random sampling procedure was used to select 7 communities from the twelve rural communities identified around the forest reserves. These are Ayegun, Sama, Osori, Aba-Alamo, Oba, Abule-Igbo, and Podoro. The estimated population for each community selected is as follows; Ayegun (460), Sama (120), Osori (20), Aba-Alamo (20), Oba (15), Abule- Igbo (15), and Podoro (20). Furthermore, a sampling intensity of 10% adopted by Aluko *et al.*[1] was used to select the respondents. Therefore, a total of 101 respondents were selected for this study.

Data collection and analysis: Primary and secondary data were used for this study. The primary data were collected using a structured questionnaire and interviews with the residents of the study area. The questions were designed to identify illegal forest activities in the area, access factors contributing to illegal forest activities in the area, socio-economic impacts of illegal forest activities in the study area, and methods for mitigating illegal forest activities in the study area. However, the secondary data was collected from the National Population Commission document to supplement the primary data. Data were analyzed using descriptive statistics, logistic regression analysis, and Chi-square at a 5% level of significance.

RESULTS

Demographic characteristics of the respondents: The result in Table 1 shows that out of a total of 101 respondents sampled, 59.4% were male while 40.6% were female. This is an indication that more men than women were involved in forest activities in the area. It also implied that the men folks contribute more to illegal forest activities than women in the study area. The result also revealed that the majority (37.0%) of the respondents in the study area fell within the age range of 35-44 years while the lowest number of respondents fell within the age range of 65-74 years with 2.0%. Also, the active participants in these activities are found within 35-54 years covering about 66.3%. This indicated that young and energetic people play a major role in illegal forest activities. This result also revealed that participation in forest activities is age-dependent and that they are less likely to get involved once they attain the age of 65 years.

The marital status of the respondents shows that 86.1% were married which implies that the key players in forest activities are married. This might be because the married are saddled with the responsibilities of taking care of their homes as a result; depend on the forest for their sustainability. With regards to household size, 1-5 and 6-10 household sizes were more in the study area covering 64.4 and 33.6%, respectively while 11 and above is the least covering only 2.0%. This indicated that respondents with households of 1-5 contributed more to forest illegalities than other household sizes. The occupation statistics show that 41.6% were traders who sell timber and other forest products while 36.6% were farmers. Table 1 also showed that only 36.6% were indigenes while the remaining 63.4% were non-indigenes. This implied that the majority of the residents migrated into the study area from neighboring towns and villages and they constitute the major group carrying out illegal activities within the reserve areas. The level of education shows that the majority of respondents (46.5%) had secondary school education while the least was recorded as those with no formal education with 4.0%. This is an indication that secondary education was the highest level of education attained by respondents, as a result, respondents may not be well informed on the need to conserve the forest rather they seek easy means to sustain their daily livelihood.

Identification of illegal activities in Ayegun-Opara forest reserve: The result in Table 2 shows the illegal activities that are prominent in the area. It was revealed that excessive logging was the most illegal activity carried out in the reserve with 95.0% of the respondents stating in the affirmative, 93.1% submitted that logging of unauthorized volumes, sizes, and tree species took place in prohibited areas and 98.0% agreed that logging of timber as well as other forest operations were conducted without license or authorization. As 94.1% also supported that some portions of the forest were cleared for agricultural use by farmers while 96.0% confirmed that non-timber forest products were usually harvested from the forest.

Factors responsible for illegal forest activities in the study area: The result in Table 3 showed that 84.2% of respondents in the area linked political influence to the cause of illegal forest activities, 87.2% associated the cause with unemployment level, 93.1% related it to population growth, 97.0% attributed it to poverty and lack of fund for patrol mechanism, 98.0% connected it to lack of manpower while 99.0%

of the respondents attributed the cause to inadequate forest guards to secure the forest reserve. The factors highlighted above might be attributed to the fact rural communities in most developing countries such as Nigeria are often seen as poor and vulnerable and lack basic requirements for rural sustenance.

Table 1: Demographic characteristics of the respondents

Characteristics	Frequency	Percentage
Gender		
Male	60	59.4
Female	41	40.6
Total	101	100
Age		
25-34	11	10.9
35-44	38	37.6
45-54	29	28.7
55-64	21	20.8
65-74	2	2.0
Total	101	100
Marital status		
Single	5	5.0
Married	87	86.1
Widowed	2	2.0
Divorced	7	6.9
Total	101	100
Household size		
1-5	65	64.4
6-10	34	33.6
11 and above	2	2.0
Total	100	100
Occupation		
Farming	37	36.6
Forest officials	4	4.0
Hunting	4	4.0
Sawmilling	4	4.0
Logging	3	3.0
Trading	42	41.6
Teaching	6	5.9
Immigration officer	1	1.0
Total	101	100
Education		
No formal education	4	4.0
Primary	37	36.6
Secondary	47	46.5
Tertiary	13	12.9
Total	101	
Nativity		
Indigene	37	36.6
Non-indigene	64	63.4
Total	101	100

Table 2: Identification of illegal forest activities in the study area

Illegal activities	No frequency (%)	Yes frequency (%)	Total frequency (%)
Logging of timber	2 (2.0)	99 (98.0)	101 (100)
Logging in excess cuts	5 (5.0)	95 (95.0)	101 (100)
Logging in prohibited areas	7 (6.9)	94 (93.1)	101 (100)
Logging of unauthorized volumes, sizes and species	7 (6.9)	94 (93.1)	101 (100)
Transporting Logs without authorization	5 (5.0)	96 (95.0)	101 (100)
Clearing of some parts of the forest for agricultural use	6 (5.9)	94 (94.1)	101 (100)
Harvesting of non-timber product	4 (4.0)	97 (96.0	0101 (100)

Table 3: Factors responsible for illegal forest activities in the study area

Factors	No frequency (%)	Yes frequency (%)	Total frequency (%)
Poverty	3 (3.0)	98 (97.0)	101 (100)
Population growth	7 (6.9)	94 (93.1)	101 (100)
Political Influence	16 (15.8)	85 (84.2)	101 (100)
Level of Unemployment	13 (12.9)	88 (87.1)	101 (100)
Lack of Fund for Patrol Mechanism	3 (3.0)	98 (97.0)	101 (100)
Inadequate Forest Guards	1(1.0)	100 (99.0)	101 (100)
Lack of Manpower	2 (2.0)	99 (98.0)	101 (100)

Table 4: Logistic binary nature for factors contributing to illegal activities in the study area

Independent variables	Coefficient	Odds-ratio
Population growth (PG)	37.06	1249218.28*
Poverty (P)	23.00	969284.73*
Political influence (PI)	-30.56	0.00
Level of Employment (LE)	0.29	1.33
Lack of funds for patrol mechanisms (LFPM)	11.83	1370.12*
Inadequate forest guards (IFG)	22.69	71394.06*
Lack of manpower (LM)	10.93	10.15

Model χ^2 (df = 11) = -56.025* p=0.000

Dependent variable (FCIA) = Factors contributing to illegal activities in the study area (Yes = 1; No = 0) and *Significant at p<0.05

Binary regression model obtained for factors contributing to illegal activities in the study area:

$$FCIA_{(Ayegun-Opara)} = -56.03+37.06PG+23.00P-30.56PI+0.29LE+11.83LFP+22.69IFG+10.93LM \quad (1)$$

N = 101, Final loss = 2015.95, Chi-square (df, 6) = 50.76, p = 0.000

Odds-ratio (Unit change): Constant (0.00); PG (1249218.28); P (969284.73); PI (0.00); LE (1.33); LFP (1370.12); IFG (71394.06); LM (10.15)

Where:

PG = Population growth (PG)
P = Poverty
PI = Political influence
LE = Level of employment
LFPM = Lack of funds for patrol mechanisms
IFG = Inadequate forest guards
LM = Lack of manpower

Model 1 presented above for factors contributing to illegal activities in the study area gave an overall significant fit to the data judging from the Chi-square value that was significant at p<0.05. Population growth (PG) was the most significant variable with an odds-ratio of 1249218.28 followed by poverty (P), inadequate forest guards (IFG), lack of funds for patrol mechanisms (LFPM), lack of manpower (LM) with odd ratios of 969284.73, 71394.06, 1370.12, and 10.15, respectively (Table 4). The result shows that the roughly calculated coefficient for the factor was not zero. This also implied that the regression parameters were statistically significant at p<0.05. In other words, as the value of the odds-ratio gets higher, the more likely the factors will contribute to illegal activities in the area. The confirmed by Gavin *et al.*[4] that the logistic model provides information on the consequences of one variable on the other.

Socio-economic impacts of illegal forest activities in the study area: Table 5 shows that illegal forest activities have a significant impact on the socio-economic life of the respondents, among these impacts were: The high cost of living (χ^2 = 42.75, p = 0.00), loss of forest lands (χ^2 = 85.95, p = 0.00), rural-urban migration (χ^2 = 5.95, p = 0.02), increased cost of wood, timber and non-timber forest products (χ^2 = 35.44, p = 0.00), loss of revenue by the government (χ^2 = 85.95, p = 0.00), etc. The result shows that illegal forest activities have significant impacts on the socio-economic sustenance of rural people.

Table 5: Socio-economic impacts of illegal forest activities

Socio-economic impacts	Chi-square	Df	Significance
High cost of living	42.75	1	0.00
Loss of forest lands	85.95	1	0.00
Rural-urban migration	5.95	1	0.02
Increased cost of wood, timber, and non-timber forest products	35.44	1	0.00
Loss of revenue by the government	85.95	1	0.00
Reduction in soil fertility and crop output	45.34	1	0.00
Occurrence of disputes and crisis over land and compensation	5.03	1	0.03
Loss of biodiversity	89.61	1	0.00

Table 6: Methods used for mitigating illegal forest activities in the area

Methods of mitigating illegal activities	No frequency (%)	Yes frequency (%)	Total frequency (%)
Awareness campaign	2 (2.0)	99 (98.0)	101 (100)
Arrest of illegal loggers	2 (2.0)	99 (98.0)	101 (100)
Regular patrol of reserve	2 (2.0)	99 (98.0)	101 (100)
Payment of fines by defaulters	10 (9.9)	91 (90.1)	101 (100)
Imprisonment	10 (9.9)	91 (90.1)	101 (100)
Imposition of law	4 (4.0)	97 (96.0)	101 (100)
Community participation	6 (5.6)	95 (94.1)	101 (100)
Imposition of dues	2 (2.0)	99 (98.0)	101 (100)

Methods used for mitigating illegal forest activities in the area: The methods used to mitigate illegal forest activities in the region, Table 6 shows that major ways of mitigating illegal activities in the area are; arrest of illegal loggers, awareness campaigns, regular patrol and restriction into the forest reserve, as well as the imposition of dues for forest production with 98.0%, respectively; imposition of laws against illegal activities (96.0%), community participation (94.1%) and imposition of dues for forest protection (90.1%).

DISCUSSION

Illegal activities on forests in some parts of the country, also contribute to the rate of deforestation in Nigeria[2]. Nigeria, home to rainforests, has seen a sharp decline in forest cover. The forest belt that supports timber, wildlife, and other products is subjected to various forms of illegal activities due to intensive encroachment, vegetation degradation, clearing for agricultural purposes, industrialization, and urban development, leading to the loss of the forest and its products[3].

The main causative factor of illegal activities in forests in Nigeria is attached to the rate of unemployment; custodian of community farmland engaged themselves in such illegalities to meet their livelihood. Also, the growing population has a huge relationship with the rate of unemployment in the country, with little or no employment opportunities for the citizens; this negligence of the government gives room for rural dwellers to connive with the illegal wood exporters. The over-reliance of the rural dwellers on timber and other forest resources has further led to their engagement in these illegal acts and has resulted in a great challenge both economically and socially. The social effects are observed to result in the high cost of farm labor, the occurrence of disputes and crisis, and the high cost of living. Also, economically, there are: loss of forest land, increased cost of wood and timber products, and loss of revenue to the government[8]. According to Reboredo[9] illegal logging affects human or societal well-being in the following ways which include; desertification, drought, erosion/flooding, loss of income, reduction in soil fertility, disruption of human rights, and higher rate of homeless people. Because forests are the native land of a large number of people, illegal activities pose a threat to their lifestyle and needs which gives rise to conflicts.

As a way of controlling illegal activities, strict laws that rightly specify which forests may not be exploited, offer an opportunity to protect intact forests or forests with biologically important ecosystems. Studies have demonstrated enforcement of strong laws helps to safeguard the loss of protected forests[10]. A clearance permit that provides the right to log timber to use forested land for another purpose must be

enforced[11]. Clearance permits can include a requirement to develop the land within a certain time frame. Companies who violate these laws may be made to face a penalty. The protection of the environment must reduce forest loss and mitigate the environmental impacts of agricultural, mining or infrastructure projects[7].

CONCLUSION

The research shows that different illegal activities were carried out in the study area which includes illegal logging of timber without authorization among others. The major socio-economic impacts of these activities were; loss of biodiversity, loss of revenue to the government, loss of forest lands, high cost of living, etc. Major ways by which illegal activities can be curtailed in the study area include the setting of proper forest legislation, community participation, and employment of forest guards. Rural members should be involved in the management of the forest to ensure its sustainability.

SIGNIFICANCE STATEMENT

Illegal activities in Nigerian forest reserves are far becoming a major threat to biodiversity conservation hence, this study aimed to assess the effects of illegal forest activities on sustainable forest management in Ayegun-Opara forest reserve, Oyo State. This paper further focuses on the factors that contribute to illegal activities in the study area and can help provide information that will assist the government in formulating and implementing policies geared towards curtailing illegal activities in forest reserves. Policies, strategies, and interventions that aim at reducing people's dependence on forest and forest resources should be given due attention. This will reduce the tendency of the people to be involved in illegal activities in the reserve areas.

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