JOURNAL OF AGRICULTURAL ECONOMICS, EXTENSION & SCIENCES
Official Journal of the College of Agricultural Economics and Extension
www.jaees.org
www.uam.edu.ng
JAEES Vol.11 No.1 2024, Page 176-188
ISSN (Print) 2545-5179, ISSN (Online) 2714-5018

EFFECTS OF LAND FRAGMENTATION ON DEFORESTATION AMONG SMALL SCALE FARMERS IN IFE EAST LOCAL GOVERNMENT AREA OF, OSUN STATE, NIGERIA

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Abstract

The study analyzed effects of land fragmentation on deforestation among small scale farmers in Ife East Local Government Area of Osun State, Nigeria. The data were sourced mainly from primary sources using structured questionnaire. A multi-stage random sampling technique was used to select 100 small scale farmers from the study area. Data for the study were analyzed using both descriptive statistics and Ordinary Least Square regression. The result of the analysis revealed that on the average, the respondents felled up to 16 trees in the past 3 years. The results further showed that the respondents cleared an average forest area of about 2 hectares in the past 3 years for farming. Result of regression analysis revealed that farm size (1.994), number of plots farmed (3.221), hectares of forest land cleared (2.029) and plot size (0.522) were significant and positively influenced deforestation in the study area. Results also revealed that most (53.0%) of the respondents identified poverty (mean = 2.35) as the major negative effect of deforestation on small scale farmers. It was recommended that Government and Non-Governmental Organizations should implement programmes that would help in reduction of poverty, which is the main push behind deforestation amongst others.

Keywords: Effects, land, fragmentation, deforestation, small scale farmers.

1.0 Introduction

The contribution of agriculture to the Nigeria's Gross Domestic Product (GDP) cannot be under-estimated. In 2021, the agricultural sector (crop production, livestock, forestry and fishing) generated about 24% of the Nigeria's Gross Domestic Product. The largest contribution was from crop production, which covered nearly 21% of the GDP. Agriculture accounts for a significant portion of Nigeria's GDP as a key activity for the

country's economy after oil. Nevertheless, agricultural activities provide a livelihood for many Nigerians, whereas the wealth generated by oil reached a restricted number of people (Sasu, 2024). It is noteworthy that agriculture has not reached its highest potential due to inherent constraints. One of these is the degraded form of soil fertility caused by deforestation, resulting in nutrient deficiency, low organic matter, moisture stress, and high erosion (Chazdon *et al*., 2009).

Land fragmentation is the existence of several spatially separate plots of land which are farmed as single. According to Balogun and Akinyemi (2017), land fragmentation is a phenomenon that exists when a household operates several owned or rented noncontiguous plots at the same time. Demetriou *et al*. (2013) observed that some major characteristics believed to be associated with land fragmentation are the small size, irregular shape and dispersion of parcels. Kadigi *et al*. (2017) pointed out that due to the current trend of rural development, land use for farming is becoming scarce as against what is obtainable in the past years when land fragmentation was declining, with farm size and parcels located closer to homestead were more fragmented than the ones located afar. Deforestation refers to indiscriminate felling of economic trees or destroying a forest land because of human activities, especially for agricultural purposes, mining, urbanization or construction purposes (Hosonuma *et al*. 2012). Over the years and in the recent time, agriculture has always been considered as the main agent of deforestation in most developing countries including Nigeria (Lambin and Meyfroidt, 2011). Often, when issues of human interventions on environment are being discussed, particularly deforestation, farming activities are usually the first thing that comes to mind (Adekunle *et al.,* 2011). From previous studies, it is very clear that forest losses can be attributed to both human and natural causes (MacFarland *et al.,* 2015). But the former is far more widespread than the latter, with deforestation occurring when people clear forests and use

the land for other purposes, such as agriculture, infrastructure, human settlements and mining (Food and Agriculture Organization, 2016).

Since the 1990s, several forest resources such as trees, land and other endowments in South-western Nigeria have been subjected to intense clearing and deforestation for industrial, housing and non-agrarian commercial activities. Meanwhile, rural forest resources constitute an important factor in engendering food security, rural livelihoods and environmental sustainability. Nowadays, humankind has greater technological capacity than ever before to bring about rapid land use changes on a very large scale. According to some estimates, agricultural expansion is the proximate driver of about 80% of deforestation worldwide (Kissinger *et al.,* 2012), albeit with differences in geographical distribution (FAO, 2016; Borokini *et al.,* 2012; Mfon *et al.*, 2014). Forest land available in each social formation was maximized solely for the production of agricultural products such as yam, cassava, plantain, kolanut, palm products among others for the purposes of sustaining food security (Adetoye *et al*., 2017).

The main causes of land fragmentation in Nigeria are partial inheritance and land shortage among others. Traditional inheritance practices of transferring property especially land to all children in each generation has, over time, divided land in Nigeria into increasingly smaller holdings. Furthermore, Nigeria faces acute food shortage because government and millions of people, living in the rural areas, have exploited natural resources in irrational ways to promote consumption, urbanization, industrialization and modernity.

1.0 Objectives of the Study

The broad objectives of this study was to analyse effects of land fragmentation on deforestation among small scale farmers in Ife East Local Government Area of Osun

State, Nigeria. Specifically, the study sought to:

i. estimate quantity of trees felled and the size of forested area cleared for farming purposes in the last three years;
ii. determine effects of land fragmentation on deforestation; and
iii. identify perceived negative effects of deforestation on small scale farmers in the study area.

3.0 Methodology

The study was conducted in Ife East Local Government Area of Osun State, South-West geopolitical zone of Nigeria. Ife East has its administrative seat located in the town of Oke-Ogbo. It has an area of 172 km^2 and a population of 188,087 as at the last Census in 2006 (NPC, 2006). Ife East LGA hosts the Ife Northeast Local council Development Area and comprises towns and villages such as Modakeke, Adanrin, Edunabon, Morayin, Adekunmi, Baale, Salako, and Alapata and it falls under the Tropical Savannah Climate and witnesses two major seasons, which are the dry (November – March) and the rainy seasons (April – October). The average humidity level of Ife Eastl LGA is 59 percent (https://www.manpower.com.ng/places/lga/651/ife-east).

Farming is a major economic activity in Ife east LGA, with crops such as yam, vegetables, varieties of fruits, cassava and pepper grown in the area. The area hosts several markets such as the Idi-ose and the Ife East central market, where a plethora of commodities are bought and sold by the dwellers of the area. Other important economic enterprises engaged in by the people of Ife East LGA include wood carving, textile weaving and craftsmanship.

The Primary data were collected and used for the study. The data were collected using structured questionnaire. Analysis of data was done with the combination of inferential and descriptive statistics. Statistical tools like percentages, frequency

distributions and mean were employed to analyse objectives i and ii, while objective iii was analysed using Ordinary Least Square (OLS) regression.

The population for this research consists of all small scale crop farmers in Ife North East Local Government Area of Osun State. The sample size of 100 respondents was 100 selected using multi-stage random sampling procedure. The first stage involved purposive selection of five (5) council wards (Ilode , Modakeke , More, Yekemi, and Okerewe) in the Local Government Area due to high concentration of agricultural activities and forest reserves. The second stage involved selection of two (2) rural communities from each of the selected council wards using simple random sampling technique. Finally, sampling frame was developed for each rural community and using proportional allocation of 4% (0.04) across board, a total sample size of 100 small scale crop farmers was selected for the study.

Ordinary Least Squares Regression (OLS)

OLS regression is one of the major techniques used to analyze data and forms the basis of many other techniques e.g. ANOVA and the Generalized Linear Models (Rutherford, 2001). The OLS model can be written as:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + U_i$ Use equation editor for all your equations

Where:

Y= Deforestation (Number of trees felled)

α = Intercept

β = Slope

X_1 = Total size of land (hectares)

X_2 = Size of forest area cleared (hectares)

X_3 = Plots of land (numbers)

X_4 = Forest land (hectares)

X_5 = Plots size (hectares)

U_i = disturbance or error term

Three functional forms (linear, semi-log and double log) were used to analyzed the data and lead equation was selected for the analysis. The criteria for the selection of the lead equation were based on the value of coefficient of determination (R^2) Significance of *F* value, where appropriate, low standard error and number of significant independent variables according to *a priori* expectation.

4.0 Results and Discussion

4.1 Quantity of Tress Felled and Area of Forest Cleared for Farming Purposes in the Last Three Years

Table 1 revealed that majority (80.0%) of the respondents felled 20 or less trees within the period of the past three years. 21-40 trees were felled by 14.0% of the respondents, 5.0% of the respondents were involved in felling between 41-60 trees within three years, while 1.0% of the respondents were involved in felling more than 60 trees in the past three years. The mean of the trees felled within the past three years in the study area is approximately 16 trees. This implies that small scale farmers are involved in felling of trees for agricultural purpose or as sources of energy in the house. This is in agreement with Olagunju (2015) who reported that since the 1990s, several forest resources such as trees, land and other endowments in South-western Nigeria have been subjected to intense clearing and deforestation for farming, industrial, housing and commercial activities.

Furthermore, it was found that most (63.0%) of the respondents were involved in clearing less than 2 hectares of forested area within the last three years. Also, 20.0% of the respondents cleared 4 or more areas of forest land, while 17.0% of the respondents cleared three hectares. The mean of the area of forest land cleared within the last three years is

2.28 hectares. This is in line with the report of Global Forest Watch (2021) which report that in 2010, Osun State had 691km square of trees cover, extending over 75% of its land area and in 2020, it lost 7.05km/ha of tree cover. Rudel (2013) also observed that forest conversion to other land uses makes Nigeria lost more than 90 percent of its primary forest due to practices initiated in the colonial era, such as the mechanized logging of forest reserves, the establishment of State-owned agricultural plantations (such as cocoa and oil palm), and mining

.

Table 1: Quantity of Tress Felled and Area of Forest Cleared for Farming Purposes in the Last Three Years

Variables	Frequency (F)	Percentage (%)	Mean (x)	Standard Deviation
Trees Felled (Stands)				
≤ 20	80	80.0		
21 – 40	14	14.0	16.29	13.412
41 – 60	5	5.0		
61+	1	1.0		
Hectares of Forest Land Cleared (ha)				
≤ 2	63	63.0		
3	17	17.0	2.28	1.198
4+	20	20.0		

Source: Field survey (2023)

4.2 Effects of Land Fragmentation on Deforestation

The result of the effects of land fragmentation on deforestation is shown in Table 2. Linear regression (with superscript a) was chosen as the lead equation because it had higher R^2 and the conformation of the significant coefficients to expectation. The coefficient of determination (R^2) was 0.178 indicating that 17.8% of the variation in the dependent variable (deforestation) is explained by the independent variables (hectare of land, total land size, hectare of forest land cleared and plot size) included in the model. Table 2 also shows that the F-statistics (4.084) was positive and significant at 1%,

indicating the goodness of fit for the model and overall significance of the variables used in the model.

Table 2 further shows that coefficient of hectare of land (1.994) was positive and significant at 5% level of significance, which implies that for every unit increase in hectare of land, it will increase deforestation by 1.994. The coefficient of the hectare of forest cleared (2.221) positively and significantly influenced deforestation at 5% level, implying that every unit increase in hectare of forest cleared, leads to increase in deforestation by 2.221 trees. Furthermore, the number of plots farmed (3.221) was positive and significant at 1% level to deforestation; this implies that for every 1% increase in plots farmed, deforestation will increase by 3.221 number of trees.

This study agrees with Demetriou (2014) who observed that fragmentation of land leads to distance among parcels and farmstead, which will consequently bring about deforestation as farmers will want to make intensive use of the small parcel of land for other farming purposes.

Acoording to Laurance (2014), roads and trails to previously unreachable wooded areas are made possible by fragmentation. This facilitates illicit activities like poaching, mining, and logging, all of which worsen forest degradation and encourage deforestation. Fahrig (2003) pointed out that smaller forested areas resulting from land fragmentation are less able to withstand environmental stresses such as invasive species, climate change and human encroachment. Deforestation results from the gradual degradation of these regions and their frequent conversion to other land uses contributing to deforestation. Inefficient agricultural techniques or small-scale subsistence farming are frequently linked to fragmented lands, and farmers may remove more forested areas to make up for the decreased output on fragmented plots, which results in incremental deforestation.

Table 2. Effects of Land Fragmentation on Deforestation

Variables	Linear[a]	Double Log	Semi log
Hectare of Land	1.994(0.049**)	2.601(0.011**)	1.652(0.102)
Hectare of Forest Cleared	2.029(0.045**)	1.019(0.311)	2.018(0.046)
Plots Farmed	3.221(0.002***)	-1.747(0.084)	-1.010(0.315)
Hectare of Forest	-1.328(0.187)	0.498(0.620)	-0.511(0.611)
Plot size	0.522(0.603)	0.907(0.367)	0.607(0.546)
Constant	0.862(0.391)	4.374(0.000)	1.199(0.233)
F	4.084	5.75	3.363
P<F	0000	0000	0000
R^2	0.178	0.253	0.152

** = significant at 5%, *** = significant at 1%, Values in parentheses represent p-values
Source: Field survey, (2023)

4.3 Perceived Negative Effects of Deforestation on Small Scale Farmers

Table 3 shows the major negative effect of deforestation on small scale crop farmers. Table 3 shows that most (53%) of the respondents identified poverty as the major effect of deforestation on small scale farmers. According to Lambin and Meyfroidt (2011), deforestation leads to removal of tree cover, which protects the soil from erosion and maintains its fertility. Without trees, the topsoil becomes prone to erosion, leading to reduced agricultural productivity. This affects the income and food security of small-scale farmers, pushing them further into poverty. Furthermore, deforestation contributes to climate change by increasing greenhouse gas emissions and disrupting local weather patterns. Small-scale farmers, who rely heavily on predictable rainfall and stable climates, face reduced yields and crop failures, driving them deeper into poverty (IPCC, 2022). This agrees with Ajiola and Ilesanmi (2019) who observed that the growing rate of deforestation in South Western Nigeria is a major obstacle to the goal of achieving food security and environmental sustainability, therefore bringing about low quality of life, low life expectancy, epidemics, hunger, poverty and climate change.

Table 3. Perceived Negative Effects of Deforestation on Small Scale Crop Farmers

Variables	Not severe	Severe	Very severe	Mean
Poverty	18(18.0)	29(29.0)	53(53.0)	2.35
Global Warming	59(59.0)	40(40.0)	1(1.0)	1.42
Loss of Biodiversity	71(71.0)	19(19.0)	10(10.0)	1.39
Soil Erosion	68(68.0)	30(30.0)	2(2.0)	1.34
Destruction of Natural Habitat	67(67.0)	32(32.0)	1(1.0)	1.34
Wind Erosion	63(63.0)	29(29.0)	8(8.0)	1.45
Destruction Of Shade	59(59.0)	36(36.0)	5(5.0)	1.46

Cutoff meanscore = 2.00

Source:Field survey(2023).

5.0 Conclusion and Recommendations

5.1 Conclusion

This study concluded that most small-scale crop farmers are involved in felling of trees and clearing of forest lands for agricultural purpose or as sources of energy in the house, hence land fragmentation has a significant effect on deforestation. The negative impacts of deforestation on small-scale crop farmers, included soil degradation, reduced forest resources, and climate variability, which created a cycle of poverty. Addressing these challenges require policies that balance development with forest conservation, as well as support systems for affected farmers.

5.2 Recommendations

The Governments (Federal, State and Local) and non-Governmental Organizations should implement programmes that will help in reduction of poverty, which is the main push behind deforestation.

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