

FACTORS INFLUENCING FARMERS' USE OF LAND RECLAMATION PRACTICES IN ANAMBRA STATE, NIGERIA: APPLICATION OF MULTIVARIATE LOGISTIC ANALYSIS

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Abstract

The study analyzed the factors affecting farmers' use of land reclamation practices in Anambra State, Nigeria. Data for the study were obtained with a structured questionnaire from 172 food crop farmers selected through a multistage sampling procedure. Descriptive statistics was used to determine the level of used land reclamation practices, while inferential statistical technique (Logit model) was used to estimate the factors affecting farmers' use of land reclamation practice ($X = 15$) among the farmers, and land filling was better practiced than the other land reclamation practices. Factors affecting farmer's use of land reclamation practices were level of education, farm size, extension contact, annual farm income, social organization membership, availability of land reclamation technology and access to information. In order for land reclamation practice to mitigate the land degradation and soil fertility loss experienced in Anambra State, government should adequately motivate the extension personnel to follow up the use of the introduced land reclamation practices by the farmers.

1. Introduction

Agriculture is the main stay of the Nigerian economy, contributing more than 40 percent of Gross Domestic Product (GDP) (NBS 2021). Increased soil and sand ejection in Anambra State has led to the most important environmental and productivity problem (UkponSun, 2019; Nkonvia 2018). This has become a great menace, as it lands and environment, and poses a great threat to economic development as its results in land degradation, destruction and soil infertility. In Nigeria, soil erosion, air and water pollution, crop and environmental productivity constitutes one of the greatest problems of the moment, causing an estimated 30 million tons of soil loss annually (Ofomate, 2015; Osuji, 2013). Most of the severe and frightening soil erosion problems and catastrophes in Nigeria are found in many parts of South Eastern region where population densities and least land per capita rank among the highest in rural Africa (Ony, 2008; Anaeto, 2010). The erosion problem is highly pronounced in Anambra State, thus about 30 percent of Anambra state land has been rendered useless by soil and gully erosion, as well as other forms of land degradation (Akamugbo 2015; Oformata, 2015). Some of the erosion problems in Anambra emanates from the fact that the hitherto rain-forest belt found in some parts of the state has given way to derived savannah (grass land) vegetation because of uncontrolled human activities of urbanization, competitive and unregulated housing, indiscriminate cutting down of trees, uncontrollable movement of heavy duty vehicles across the state, and indiscriminate soil and sand ejection across the state.

According to Nzokwu (2022), the state has already lost over 20 percent of her land mass to erosion, and over 68 communities in the state are facing threats from erosion. The massive soil loss in Anambra State

results in severe ecological damage, severe soil fertility depletion, loss of soil structure, decline in agricultural productivity and famine (acute food shortage) (Anaeto, 2012). Increasing food production to keep pace with the demand, while retaining the quality of land and the ecologic balance of the productive system, is a current challenge to agricultural research and policy in Nigeria today. In order to address the agricultural intensification problems and ensure sustained productivity and land quality in Anambra State by mitigating the negative consequences of the effect of the soil and sand evacuation service, through mass media, embarked on the dissemination of innovation developed research on land reclamation practices to Anambra State. The land reclamation includes: fertilizer application, re-vegetation, removal of wastes, land filling, use of organic soil amendments, planting deep rooted perennial grasses and trees (4,5). These land reclamation practices have been disseminated to farmers in Anambra State several years ago using the extension innovation delivery mechanism, but the pace of use of the land reclamation practices are very scanty, thus creating a gap in knowledge on what the situation is. Unfortunately, there have been relatively few attempts in the past to test explanatory influences of factors affecting farmers' use of land reclamation practices, especially at micro-level, in Nigeria. Few available evidence from macro-level studies, nevertheless, indicates that these factors are significant determinants of farmers' use of land reclamation practices (Onu, 2015). But macro-level studies cannot provide an adequate picture of contemporary micro-level conditions, and as such do not pass as substitutes for specific micro-level studies.

This study is therefore designed to provide empirical information on the level of use of land reclamation practices and the factors influencing the use of such practice by farmers in Anambra State, Nigeria. The following objectives guide this study:

Objectives:

- Identify the factors influencing the use of land reclamation practices among farmers in Anambra State.
- Assess the level of land reclamation statistics used by farmers in Anambra State.

2. Methodology

This study was conducted in Anambra State, Nigeria, comprising two local government areas (LGAs), namely Anambra West and Ogbaru, where soil and sand evacuation appear rampant. The LGAs lie between latitude 5, 56, and 76, and longitude 6°, 53°, and 75°E.

There is an abundant sand deposit in the areas, resulting in evacuation which causes environmental degradation and soil fertility loss.

Multistage sampling techniques were employed to select respondents for the study. Food crop farmers in two communities of each LGA with the highest sand exploration activities formed the sampling frame for selection of respondents.

From the sampling frame of 302 food crop farmers, a sample size of 172 farmers was determined, using the sample size model:

$$n = N / (1 + N(e^2)) \quad (1)$$

Where: n = sample size for the study, N = total sampling frame, and e = tolerable error level of 0.05.

Proportionate sampling technique was applied to select 99 and 73 farmers from Anambra West LGAs and Ogbaru LGA respectively, from their sampling frames of 173 and 129 food crop farmers respectively. The proportionate sampling model employed was:

$$N_h = N_i(n) \times NH / N \quad (2)$$

Where: n_h = sampling size selected from each LGA, N_h = sampling frame in each LGA, N = total sampling frame in the two LGAs, and n = sampling size for the study. Random sampling was finally employed to select the 172 food crop farmers for the study. Data for the study were obtained mainly from primary sources, using a validated questionnaire for collection by trained enumerators. The researchers were assisted in the process of data collection by field enumerators who were trained for that purpose. Data collection took place between September and November, 2022.

2.1 Analytical Technique

Qualitative as well as quantitative analytical techniques were used for the analysis of the data. Data that were qualitative in context, like land ownership, patterns and tenural status, were analyzed through deductive reasoning (i.e. observation and drawing inference). Simple descriptive statistics, such as mean, percentage and frequencies, were used to analyze not only quantitative biographic data, but also used to determine how well empirical distribution of variables fit theoretical distribution. In assessing the factors that influence farmers' decision to use land reclamation practice (Obj I), inferential statistic (Logit model) was used to estimate the factors, using descriptive statistics percentage and a mean score.

To assess the level of use of land reclamation, (Obj II) was determined using descriptive statistical percentage and a mean score.

To determine the level of use of land reclamation practices disseminated to the farmers, the following 3-point Likert type scaling procedure was adopted to quantify the variable: low level if use = 1, moderate use = 2, and high level of use = 3. The value of the three responses were added and further divided by 3 to obtain a decision rule. This was stated thus, any mean score equal to and higher than 2.5 shows high level of use, while any mean score less than 1.5 was taken as moderately low level of use.

The logit model framework used was as described by Madala (2019) and Guarati (2018). In formulating the model, it is assumed that P_i is the observed response of formari, (i.e. $P_i = 1$ for use, otherwise $P_i = 0$).

The decision to use the land reclamation by another farmer depends on X_i , which is the vector of factors representing the farmer specific economic, social, land reclamation attributes and farmer perception. The disturbance term is represented by ε and assumed to have a mean of zero. Consequently, the decision model can be stated as follows:

$$P_i = e^{(B_0 + \sum B_j X_{ji})} / (1 + e^{(B_0 + \sum B_j X_{ji})}) \quad (3)$$

$$Z_i = (1/P_i)^n = B_0 + \sum_{j=1}^n B_j X_{ji} + \varepsilon \quad (4)$$

$$P_i = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} = e^{(\quad)} \quad (5)$$

Where:

X_1 = household size (number of household members who work on the farm)

X_2 = level of education (number of years spent in school)

X3 = farm size (hectare)

X4 = extension contact (number of visits per annum)

X5 = access to credit (dummy variable, 1 for access, 0 if otherwise)

X6 = tenure (dummy variable, 1 for permanent land ownership, 0 if otherwise)

X7 = annual farm income (naira)

X8 = social organization membership (dummy variable, 1 for member, 0 for non-member)

X9 = availability of land reclamation technology (dummy variable, 1 if technology is available, 0 if otherwise)

X10 = access to information (dummy variable, 1 for access to information, 0 if otherwise)

It is expected a priori that the coefficients of X1, X2, X3, X4, X5, X6, X7, X8, X9, X10 > 0; X3 < 0.

3. Results and Discussion

3.1 Level of Use of Land Reclamation Practices

The various land reclamation practices disseminated to the farmers and their level of use by the farmers are presented in Table 1. Data in the table shows that land filling was better practiced than other land reclamation practices, with a moderate level of use of 2.3. This could be due to visible erosion sited ditches and gullies that required immediate attention of land filling.

The other land reclamation practices — fertilizer application, use of organic soil amendments, re-vegetation, removal of waste, planting deep rooted perennial grasses and trees — had low levels of use of practices.

The mean level of use among the farmers was 1.5, which implies that there was low level of use of land reclamation practices by the farmers, which could lead to poor farm output and reduced farm income among the farmers in the study area. This could be because of lack of follow-up delivery mechanism by extension personnel that were not adequately performing their roles in the field.

Table 1: Percentage Distribution of Farmers by Level of Use of Land Reclamation Practices

Land Reclamation Practice	Low (1) Freq.	%	Moderate (2) Freq.	%	High (3) Freq.	%	Mean X
Fertilizer application	149	86.6	20	11.6	3	1.8	1.2
Re-vegetation	57	33.1	91	52.9	24	14.0	1.8
Removal of waste	75	43.6	67	39.0	30	17.4	1.7
Land filling	28	16.3	63	36.6	81	47.1	2.3*
Use of organic soil amendments / planting deep rooted perennial grasses and trees	135	78.5	32	18.6	5	2.9	1.1
Mean	106	53.3	509	35.3	7	4.1	1.5

*Land reclamation practice that had moderate level of use.

3.2 Determination of Use of Land Reclamation Practices

The maximum likelihood estimates were used to estimate the empirical model. Estimates of the coefficient and significant levels are presented in Table 2.

The Chi-square goodness of fit test statistics of the model was 79.63 and shows that the model fits the data with significance at 1% level. This shows that the independent variables are 80% relevant in explaining the farmers' decision to use the land reclamation practices. Z-value of parameter estimates indicates that the decision to use land reclamation practices is mainly influenced by seven variables.

The coefficient of the level of education (X2) was positive and significant at 1% level, which implies that farmers possessing high levels of education used land reclamation practices more than illiterate farmers.

The coefficient of farm size (X3) was negative and significant at 1% level. This inverse relationship implies that small farmers, in comparison to large farmers, use improved technologies at a faster rate if additional gains are substantial. This finding is in consonance with those of Shiyanto, et al (2020) and Isrisa, et al (2019).

The coefficient of extension contact (X4) was positive and significant at 5% level, implying that the positive influence of extension personnel led to high use of land reclamation practices.

The coefficient of annual farm income (X7) was positive and significant at 1% level, which implies that the increase in farm income resulting from use of improved practices led to more use of practice.

Table 2: Parameter Estimate of Logit Model of the Factors Influencing Farmers' Use of Land Reclamation Practice in Anambra State

Explanatory variable	Coefficient	Z-value
Constant	0.8916	8.2037**
Household size (X1)	0.1806	1.8728
Level of education (X2)	0.2217	3.0942
Farm size (X3)	-0.1804	-2.987***
Extension contact (X4)	0.0615	2.5618
Access to credit (X5)	0.0314	1.8226
Tenure (X6)	0.0247	1.5708
Annual farm income (X7)	0.3106	4.0397***
Social organization membership (X8)	0.0457	2.5529***
Availability of Land Reclamation technology (X9)	0.0665	3.0928***
Access to information (X10)	0.038	2.8871***
Log likelihood function	-59.032	
Chi-square	79.63**	

*Significant at 5% **Significant at 1%

The coefficient of social organization membership (X8) was positive and significant at 5% level. This direct relationship implies that farmers who belong to social organizations use land practices more than farmers who do not belong to social organizations. This could be because membership of social organization brings about cross-fertilization of ideas and sharing of experiences among the farmers on introduced technologies, which leads to more use of technologies if found profitable.

The coefficient of availability of technology (X9) was positive and significant at 1% level, which implies that if the introduced technology packages are available, the farmers will use them as expected, more than when technology packages or components are not available.

The coefficient of access to information (X10) was positive and significant at 1% level, indicating that if information on introduced practices is available and accessible to the farmers, they will be highly used by

the farmers than when the practices are not available and accessible. These seven variables are therefore the factors affecting farmers' use of land reclamation practices in the study area.

The coefficients of household size (X1), access to credit (X5), and tenure (X6) were not significant at 5% level, implying that they are not important determinants of farmers' use of land reclamation practices in the study area.

Conclusion and Recommendations

This paper showed that education, farm size, extension contact, farm income, social organization membership, availability of technology and access to information are factors affecting farmers' use of land reclamation practices. Results demonstrated further that there was a low level of use of land reclamation practices by the farmers. Technical guidance, in the form of regular extension training, will enhance the use of land reclamation practices to mitigate the land degradation and soil fertility loss of the lands in Anambra State. Government practices by the farmers, technical guidance in form of regular extension training will enhance the use of land reclamation practices among farmers in Anambra State.