FACTORS INFLUENCING THE USE INTENSITY OF LAND MANAGEMENT PRACTICES BY FARMERS IN OSUN STATE NIGERIA

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ABSTRACT

Land Management is an important area of productive agriculture to look into especially now that we have the problem of insurgence and farmers unable to reach their farmlands. Effective land management practices can boost crop productivity leading to food security and the factors that will help achieve this need to be identified. The objective of this study was therefore to identify factors influencing the use intensity of land management practices of farming households in Osun State, Nigeria taking their food security into consideration. Multi-stage random sampling technique was used to select two hundred and forty households in sixteen local government areas spread across the three ADP zones of Osun State. Data were collected with the aid of structured questionnaire and analysed using Food Security Index and Fractional Multinomial Logit Model. The result of food security index showed that 18.33percent of the farmers in the study area are not food secured and 81.67percent are food secured. The land acquisition methods and land management practices positively influenced the use intensity of land management practices and food security respectively all at 1%. The research therefore recommended more awareness on the effective use of land management practices and formulation of policies that would make more land available to farmers.

KEYWORDS: Land Management Practices, Food Security, Osun State.

1.0 INTRODUCTION

Land according to World Encyclopedia of Law (2012) is a natural resource which in the term of real property is made up of the earth surface, the land which is below the surface nearest to the earth's centre, and the air that is situated above it. Land ownership could be by inheritance or actual purchase. The government can take over land from the original owner to use it to meet public need through the power of eminent domain while the owners are compensated duly. The time we are in now points to the fact that land must be

put to maximum utilization by satisfactory and efficient arrangement especially with the rapid population growth and urban expansion which are making available agricultural land scarce (Oyekale, 2007). The population of Nigeria as at March, 2022 is estimated to be 214,881,328 which is equivalent to 2.64percent of the total world population. The total land area according to the report is 910,770 km^2 while 52.0percent of the population is urban, totalling about 107,112,526 people and the median age at the moment is 18.1years (United Nations, 2022).

Land is an asset of enormous importance to billions of rural dwellers in the developing world, Nigeria inclusive. In nations like Nigeria where the main economic activity is agriculture, land access is a primary means through which the poor can guarantee household food supply and generate profits. This is also applicable to societies whose practice of agriculture is profit oriented, providing money to buy food and societies where subsistence farming is common and access to land is the determinant of household food security. Even where farming and land are becoming negligible to the growth of other sources of income, protected land rights provide an expensive source of income for investment, retirement or safety in case of joblessness (Cotula *et al*, 2006).

This is the era of Sustainable Development Goals (SDGs) when countries adopted a set of goals on September 25th, 2015 to end poverty, protect the planet, and ensure prosperity for all as part of a new sustainable development agenda. There are a total of seventeen goals with each having definite targets to be actualised over the next 15 years but of prominence are Goals 1 and 2 which target no poverty and zero hunger. Goal 2 which is a major concern aims to end hunger, achieve food security and improved nutrition and promote sustainable agriculture within the next fifteen year starting from 2016.

As the country witness economic development, the comparative size of the agricultural sector decreases. The farming sector contributed over 60 percent of the "The Gross Domestic Product" (GDP) in the 1960s, in 2010 30 percent, in 2014, GDP in Nigeria was worth 568.51 billion US dollars. The GDP value of Nigeria represents 0.92 percent of the world economy. It jumped to 3477845.24 NGN Million in the second quarter of 2015 from the initial 3176598.13 NGN Million in the first quarter of 2015. (NBS, 2015). In the early months of 2018, GDP from agriculture in Nigeria lowered to 3487312.92 NGN Million in the first quarter from 4859436.87 NGN Million in the fourth quarter of 2017. The GDP from the sector was 3762583.50 NGN Million on the average from 2010 till 2018, reaching a peak of 5189365.99 NGN Million in the third quarter of 2017 (NBS, 2018)

It is believed that if the agricultural sector is well managed and improved, it would significantly increase the country's GDP as against what we have in the oil sector considering the vast area of fertile land that is unused in Nigeria. A sturdy and a competent agricultural sector would enable any country to feed its increasing population, create employment, earn foreign exchange and make raw materials available to

industries. The agricultural sector has a multiplier effect on any nation's socio-economic and industrial framework because of the multidimensional nature of agriculture.

Adamade and Jackson (2014) affirmed that of the 98.3million hectares of Nigeria's arable land mass, 72 percent has cultivation potential but only 35% of the arable land is under cultivated. Most of this land was cultivated using bush fallow, a method in which an area much outsized than that under cultivation is left unused for some periods to allow natural rejuvenation of soil fertility. Another 18 million hectares were grouped as permanent paddock, but much of this land had the potential to support crops. About 20 million hectares were covered by forests. Majority of this land also had agricultural capabilities. The country's remaining 19 million hectares covered by buildings or roads were considered wasted land. Nigeria's soil is ranked from low to medium in productivity. The Food and Agriculture Organization of the United Nations (FAO) in 2011 then concluded that most of the land in the country would have medium to good productivity if this resource was well managed.

Land management is the process of managing the use and development of land resources in both urban and rural communities. Sustainable land management (SLM) is the adoption of appropriate land management practices that affords land users to maximize the economic and social benefits from the land while enhancing the ecological support functions of the land resources (FAO, 2015).

Pinstrup-Anderson (2009) define food security to mean when sufficient food is accessible, whether at the international, national, village, or family level. Important areas to be well thought-out in food security issues are the availability of food items, the quality of the diet, the steadiness of supplies over time and space and access to food produced. According to Nwaniki (2007). These are food availability, food access and food adequacy. All these must be present before it can be said that a particular country or area is food secured.

The effect of land use and management practices on the health of human beings can be direct and indirect as it affects fauna and flora, contributes to home, area, and international climate changes and which is also the primary source of soil, water and land degradation (Sala *et al*, 2010). Land which is the most important factor in agricultural production is becoming relatively scarce due to urbanization. There has been a significant decline in national domestic food production which is made up by importation of food items from other countries.

Farmers have adopted some methods of managing their land in order to preserve the rich organic nutrients and maintain a high level of fertility on the soil used for agricultural purposes. This includes planting of cover crops, tillage, bush fallowing, crop rotation, contour farming, alley cropping, application of herbicides, fertilizer application, liming, chemical control, pest control and mulching. Sheng (1989) and Awoyinka *et al.*, (2009) all reiterated that the common land management practices (LMPs) in Nigeria are generally grouped as follows;

1. Structural and Mechanical Erosion Control Practices (SMECP) including contour bund/terraces and construction of ridges across the slope, soil erosion control
2. Agronomic Practices (AP) constituting multiple cropping, mulching, cover crop and crop rotation, agro-forestry, shifting cultivation, land fallow.
3. Soil Management Practices (SMP) including fertilizer application, compost and farmyard manure.
4. Cultivation Practices (CP) made up of minimum tillage, conservation tillage and zero tillage, and complete tillage of the farmland.

This grouping has been adopted also by Olarinre and Oladeebo in 2021. Thus Osun State in Nigeria was used for meeting the objective of this research. The objectives are to:

1. assess the food security status of farmers in Osun State Nigeria.
2. ascertain the factors that influence the use intensity of land management practices been used by farmers in Osun State, Nigeria.

2.0 RESEARCH METHODS

This study was carried out in Osun State in South-Western Nigeria with Osogbo as its capital. Osun State was carved out of the old Oyo State in August, 1991 and standing on a land mass of about 8,602 square kilometers. Residents of the State are mostly farmers, artisans and traders. The farmers in Osun State are producers of food crops like yam, maize, rice, cassava, beans and cocoyam. The cash crops produced in the State include cocoa, tobacco and palm produce (NBS, 2020).

2.1 Population, Sampling Procedure and Sample Size

All the farming households in Osun state constituted the population of the study. Multi-stage random sampling technique was used to select the respondents. Osun State has three agricultural development project (ADP) zones, Osogbo, Iwo and Ife/ Ijesha with the headquarters at Iwo. From the three OSSADEP zones in Osun State (Osogbo, Iwo and Ife/Ijesha), two (Iwo and Ife/Ijesha) were chosen purposively at the first stage. At the second stage, 6 Local Government Areas from the 7 Local Government Areas in Iwo zone and also 10 Local Government Areas from the 11 Local Government Areas in Ife / Ijesha zone totaling 16 Local Government Areas were chosen randomly from the 30 Local Government Areas in Osun State. The third stage involved the random selection of 15 farmers each from the randomly selected Local Government Areas. From Iwo ADP zone in Osun State, a total of 90 farmers were selected and from Ife/Ijesha in Osun State a total of 150 farmers were selected making a total of 240 respondents in all. This study

used primary data. This involved the use of structured questionnaires used to collect data from respondents. To make the questionnaire a useful and reliable instrument which will be highly effective, it used both open-ended and closed-ended questions (Mitchell *et al*, 2013). The questionnaires were distributed and individual farming households were interviewed by trained field workers.

2.2 Method of Data Analysis

For objective 1, Food Security Index was used.

For objective 2, Fractional Multinomial Logit Regression model was used.

2.3 Model Specification

Food Security Index

The food security index using expenditure approach was employed to determine the food security status of the households.

The index is given by:

$$F_i = \frac{\text{per capita food expenditure for the i}th\text{ household}}{\frac{2}{3}\text{ mean per capita food expenditure of all households}} \quad \text{.....(1)}$$

Where:

Fi = Food security status

When Fi ≥ 1 = Food secure household

Fi < 1 = Food insecure household

This method was adopted because it is easy to compute and that it has been used by several authors for their study. The same method has been adopted by Olarinre *et al.* (2019) when they worked on the 'Effects of Land Management Practices on Food Insecurity among Farming Households in Osun State, Nigeria". Arene and Anyaeji (2010) also employed this method when they worked on determinants of food security among households in Nsukka Metropolis of Enugu State, Nigeria. This method of household's expenditure on food has found wider application in several empirical studies (Foster *et. al,* 1984; FAO, 2003; Omonona and Agoi, 2007) and thus thought it wise to use as well.

Fractional Multinomial Logit Regression Model

Multinomial logit model is used to model relatioships between a polytomous response variable and a set of regressor variables. These polytomous response models can be grouped into two different types, considering whether the response variable has an ordered or unordered structure. In an ordered model, the response of an individual unit is limited to one of the ordered values. The cumulative logit model presume that the ordinal nature of the observed response is due to methodological limitations in collecting the data that results in lumping together values of an otherwise continuous response variable

(McKelvey and Zavoina 1975). This model was chosen in that it permits the analysis of decisions across more than two categories in the dependent variable and therefore becomes possible to determine choice probabilities for the different land management practices. On the other way round, the binary probit or logit models are restricted to a maximum of two choice categories (Maddala, 1983). The model is expressed as follows:

$$P\left(y=\frac{j}{x}\right)=\frac{\exp(x\beta j)}{[1+\sum_{h=1}^{j}\exp(x\beta h),j=12,\ldots j]} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

$$\mathrm{P}\left(\mathrm{y}=\frac{\mathrm{j}}{\mathrm{x}}\right)=\frac{\exp(\mathrm{x}\beta\mathrm{j})}{\left[1+\sum_{\mathrm{h}=1}^{\mathrm{j}}\exp(\mathrm{x}\beta\mathrm{h}),\mathrm{j}=12,\ldots\mathrm{j}\right]} \quad \text{where,}$$

y in this case denotes land management practices index while x denoted specific household and institutional characteristics of the respondents. The question to answer then is how changes in the household and institutional characteristics have an effect on the response probabilities P(y = j/x), j = 1, 2, …, J . Since the probabilities must sum to unity, P(y = j/x) will be determined once the probabilities for j = 1, 2, …, J are known.

For the parameter estimates of the model in equation (2) to be unbiased and constant, the Independence of Irrelevant Alternatives (IIA) will be assumed to hold (Deressa et al., 2008). The IIA assumption entails that the probability of using one land management practice by a farmer must be independent of the probability of choosing another land management practice, meaning that Pj/Pk is independent of the remaining probabilities. The basis of this assumption is the independent and homoscedastic disturbance terms of the basic model in equation (2).

The parameter estimates of this model will only give the direction of the effect of the independent variables on the dependent variable, making the estimates signify neither the actual magnitude of change nor the probabilities. On the contrary, the marginal effects are used to measure the anticipated change in probability of a particular technique being selected with regards to a unit change in an independent variable from the mean (Greene, 2000). To get the marginal effects for the model, equation (2) will be differentiated with respect to the explanatory variables. This will then become:

$$\frac{\partial P_j}{\partial X_k}=P_j(\beta_{jk}-\sum_{J=1}^{J-1}Pj\beta_{jk})\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

The signs of the marginal effects and respective coefficients are expected to be different since the marginal effects rely on the sign and magnitude of all other coefficients (Hassan and Nhemachena, 2008).

Table 1: Variables to be used in the MNL model and their expected signs

Variables	Definition and measurement	Expected sign
LMPchoice	Choice set of land management practices	
Educ Yrs	Number of years of formal education of the farmer.	±
Age	Age in years of the farmer (continuous)	±
Sex	Sex of thefarmer(Dummy 1 = Male, 0 = Female)	±
Hh Size	Number of household members (continuous)	±
Farm Size	Size of the farm available in hectares (continuous)	±
Fmg Exp	Number of years of farming experience (continuous)	±
Off farm	Amount of off-farm income received in a year (continuous)	±
Land	Land ownership (1= owned, 0 = Otherwise)	+
Credit	Amount of credit access by the farmer in thousands of Naira (continuous)	−
Ext	Number of extension agents visit to the farmer, (continuous)	−
Training	Number of training sessions the farmer attended (continuous)	−
Erosion	Erosion on the land(1 = Yes, 0 = Otherwise)	±
FM	Member of farmer's group and association (1 = belong to a group, 0 = Otherwise)	±
FarmDis	Distance in kilometers of the farm from the farmer's homestead (continuous)	±
Source	Source of information about LMP	±
Income	Income of the farmer through farming activities	±
(5 = strongly agree 4 = Agree 3 = Neutral Undecided 2 = Disagree 1 = strongly disagree)		

The empirical specification for evaluating the influence of explanatory variables that are described in Table 1 above on the choice of land management practices is given by:

$Y_{i=1,\ldots J} = \beta_O + \beta_1$Educ Yrs + $\beta_2 Age$+ β_3Sex + β_4Hh Size + β_5Farm Size +β_6Fmg Exp

+β_7Off farm + β_8Land + β_9Credit + β_{10}Ext + β_{11}Training + β_{12}Erosion + β_{13}FM + β_{14}FarmDis + β_{15}Source + β_{16}Income + μ……..(4)

3.0 RESULTS

3.1 Food Security Status of the Respondents.

Table 2 showed that 18.33percent of the farmers in the study area are not food secured and 81.67percent are food secured. The expenditure approach as proposed by Omonona *et al*. (2007) was employed to ascertain the food security status of the farmers in the study area. This means that the 18.33percent that were food insecured have their monthly per capita food expenditure fall below two-third (2/3) of the mean monthly per capita food expenditure while the 81.67percent that were food secured have their monthly per capita food expenditure fall above two-third of the mean monthly per capita food expenditure. This revealed that majority of the farmers have access to food at all times and are food secured. This outcome is in support of the study conducted by Olarinre *et al.* (2019) and Omonona and Agoi (2007), where the food insecurity incidences are 31.02percent and 39percent respectively.

Table 2: Distribution of respondents by Food Security Status

Food Security Index	Frequency	Percentage	Cummulative Frequency
Non food secured	44	18.33	18.33
Food secured	196	81.67	100.00
Total	240	100.00	

Source: Field Survey, 2021

3.2 Factors influencing the use intensity of Land Management Practices by farmers in Osun State Nigeria

The results of the fractional regression on the use intensity of land management practices by farmers in Osun State Nigeria in Table 3 revealed for the pooled that all the land ownership options (rented, inherited and purchased) are all statistically significant at 1% level. The meaning of this is that irrespective of the means by which the farmers

acquire the land, it will have a direct relationship on the use intensity (Kaliba *et al.* (2000); Asfaw and Admassie, 2004; Odendo *et al.* 2009).

Land ownership through rent has a positive and significant relationship to land management use intensity. This can be traced to the fact that more of the farmers in the study area rented the land and since they will pay rent, they have to use the land to practice any type of land management practice without any interruption. These outcomes are in line with those of Mwirigi *et al.* (2009) and Ayuya *et al.* (2011) where land tenure security influenced adoption of a new technology positively. Land possession with security of tenure raised the probability of adopting and using land management practices.

Also, land ownership through inheritance has a positive significance on the use intensity of land management practices. This implies that the more farmers get access to land the more the use intensity of land management practices. This was supported by Feder *et al*. (1985). In addition, land ownership through purchase has a positive significance on the use intensity of land management practices. This implies that since the farmers have access to land that rightly belongs to them, the more the use intensity of land management practices. This is opposing to the research carried out by Ikechukwu and Nwankwo in 2013 where access to land reduces the use intensity of land management practices. Membership of organization is positively significant to the use intensity of land management practices. These associations are media through which information on land management practices that can boost productivity are disseminated especially by extension agents. This will enable the farmers to use as many land management practices that are available to them. This result is in conformity with a study earlier carried out by Babalola and Olayemi (2013) where they established that membership of community-based organization had a significant and positive relationship with the use of contour bunds among farmers in Ogun State, Nigeria.

For the food secured, all the land ownership options (rented, inherited and purchased) are all statistically significant at 1% level. This means that no matter how the farmers acquire the land, it will have a direct relationship on the use intensity for food secured farming households.

For the food insecured household, all the land ownership options (rented, inherited and purchased) are also all statistically significant at 1% level. This means that in whatever manner by which the farmers acquire the land, it will have a direct relationship on the use intensity for food insecured farming households. Membership of organization is positively significant to the use intensity of land management practices. These associations are media through which information on land management practices that can boost productivity are disseminated especially by extension agents and hence if the farmer did belong to any organisation, it will increase the use intensity of land management practices in the study area.

Table 3: Factors influencing the use intensity of Land Management Practices by farmers in Osun State, Nigeria

	Pooled				Food Secured			Food Insecured		
	Coef.	Std. Err.	Z	P>|z|	Coef.	Std. Err.	P>|z|	Coef.	Std. Err.	P>|z|
Age	0.0050995	0.0200045	0.25	0.799	0.216351	0.0269673	0.422	-0.0019023	0.395545	0.962
Sex	0.1258278	0.2693025	0.47	0.640	0.4390048	0.4458621	0.336	0.2362924	0.4418447	0.593
Marital status	-0.1022161	0.2529302	-0.40	0.686	0.2326197	0.5367538	0.665	-0.0786368	0.3688805	0.831
Rented Land	4.40639	0.6348712	6.94	0.000***	4.559415	0.9434904	0.000***	4.465533	0.8383107	0.000***
Inherited Land	3.085112	0.4589425	6.72	0.000***	3.136155	0.7650141	0.000***	3.293217	0.5850004	0.000***
Purchased Land	2.776548	0.435931	6.37	0.000***	3.005554	0.7021443	0.000***	2.449946	0.4953166	0.000***
Year of education	-0.0217005	0.0258489	-0.84	0.401	-0.0085467	0.0359175	0.812	-0.0226043	0.0588449	0.701
Farming experience	-0.0202124	0.01466	-1.38	0.168	-0.0507423	0.0200764	0.011	0.0453127	0.0275952	0.101
Household size	0.0368494	0.0328442	1.12	0.262	0.0393371	0.0666808	0.555	0.0284398	0.0470995	0.546
Farm size	-0.0292084	0.0473368	-0.62	0.537	0.0248945	0.066467	0.708	-0.0099844	0.106017	0.925
Member of organisation	-1.058409	0.3768299	-2.81	0.005***	-0.9572981	0.5859967	0.102	-1.299264	0.6406916	0.043**
Ext. Agent visit	0.0106349	0.3303165	0.03	0.974	-0.2489079	0.6913738	0.719	0.2103567	0.4665741	0.652
Agric. info	0.0972543	0.2481976	0.39	0.695	0.3631812	0.519707	0.485	0.1198209	0.4439382	0.787
Constant	0.3839589	1.343398	0.29	0.775	-1.05298	2.241029	0.638	-1.901078	3.139452	0.545
Number of observation	379				226			153		
Wald chi2(13)	74.13				270.07			70.59		
Prob> chi2	0.0000				0.0000			0.0000		
Pseudo R2	0.0520				0.0446			0.0980		

Source: Field Survey, 2019

*,**,*** represents 10%, 5% and 1% significant levels respectively

CONCLUSION

The result of food security index showed that 18.33percent of the farmers in the study area are not food secured and 81.67percent are food secured.

The study showed that for all the farmers, all the land ownership options (rented, inherited and purchased) were statistically significant at 1% level as factors influencing the use intensity of Land Management Practices by farmers in Osun State Nigeria. For the generality of the farmers and the food insecured, the study revealed that membership of organisation was significant as factors influencing the use intensity of land management practices in the study area.

Knowing fully that a farmer cannot but adopt at least a form of land management practice in every farming season based on the finding that all farmers in the study area adopted land management practices, there should be more awareness and practical demonstration of these practices by the extension agents to ensure proper use.

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