

Effects of Land Management Practices on Food Insecurity among Farming Households in Osun State, Nigeria

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Abstract The effects of land management practices on food insecurity in Osun State, Nigeria was analysed through multi-stage random sampling technique by selecting two hundred and sixteen respondents and the data was collected with the means of well-structured questionnaire. Data were analyzed using descriptive statistics, food security Index, fractional Logit Model and Logit Regression Model. Descriptive analysis showed that, the mean age of the respondents was 43.9 years. Farming is the major occupation of the respondents (85.19 percent). All the 216 respondents adopted more than one land management practices. The result of food security index showed that 31.02 percent of the farmers in the study area are not food secured and 68.98 percent are food secured. It was discovered that the use of land management practices have a positive relationship with food security, and the more farmers engaged in the practices, the more food secured they were. It is therefore recommended that there should be increased awareness about land management practices and since majority of the farmers rely on the use of fertilizer for production, government should subsidize the price of fertilizer and ensure it gets to the users at the right time.

Keywords: *land management practices, food security, Osun state*

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1. Introduction

The need for putting land to optimum use through adequate and effective planning has never been greatly felt than at present, when rapid population growth and urban expansion are making available agricultural land scarce [1]. Land use is the end to which land is allocated, assuming a conscious decision to use it for a desired end [2]. Adamade and Jackson [3] postulated 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 actual cultivation. Much of this land was farmed under bush fallow, a technique whereby an area much larger than that under cultivation is left idle for varying periods to allow natural regeneration of soil fertility. Another 18 million hectares were classified as permanent pasture, but much of this land had the potential to support crops. About 20 million hectares were covered by forests and woodlands. Most of this land also had agricultural potential. Land management is the process of managing the use and development (in both urban and rural settings) of land resources. Land resources are used for different purposes which includes organic agriculture, reforestation, arable and permanent crops production, building construction, water resource management and

eco-tourism projects just to mention a few. Sustainable land management (SLM) is the adoption of appropriate land management practices that enables land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources [4,5]. Food security, according to Pinstrip-Anderson [6] in its narrowest sense, means that enough food is available, whether at the global, national, community, or household level. Important aspects to be considered in food security issues include the availability of food stuff, the quality of the diet, the stability of supplies over time and space and access to food produced. This then implies that the issue of food security is people-oriented and means a situation in which all households have both physical and economic access to adequate food for all members and where households are not at risk of losing such access. The right and easy access to food means more to households who are food insecure than the right to basic education, participation in political and social life, and so on. As at 2010, an estimated 925 million people in the world were hungry out of which 907 million constituting about 98 percent were in developing countries, Nigeria inclusive [7]. The food security situation in Nigeria has only improved slightly with just 6 percent level of undernourishment between 2006 and 2008. However, both the number and proportion of undernourished persons decreased from 16.3 million

people between 1990 and 1992 to 9.4 million between 2006 and 2008 [8]. Furthermore, the distribution of extreme poverty by occupational category indicates that 67.4 percent of the poor in Nigeria were in agriculture. Food security has three aspects according to Nwaniki [9]. They are food availability, food access and food adequacy. All these three must be present before it can be concluded that a particular nation or region is food secured. In the last few years, there have been a lot of concerns expressed over the looming danger of food crisis in many nations, including Nigeria. The Food and Agricultural Organization, among others have been persistent in expressing these concerns for the global food crisis over the years. The main goal of food security therefore, is for individuals to be able to obtain adequate food needed at all times, and to be able to utilise the food to meet the body's needs. Food security is multifaceted. The World Bank [10] identified three pillars underpinning food security. These are food availability, food accessibility, and food utilization. This means that a nation whose food production level is unable to satisfy these three criteria is said to be food insecure. The effect of land use and management practices on human's health can be direct and indirect as it affects fauna and flora, contributes to local, regional, and global climate changes and is the primary source of soil, water and land degradation [11]. Poverty, hunger and malnutrition have been identified as some of the principal causes of increasing and accelerated migration from rural to urban areas in developing countries. The consequence of which is depletion of labour force required for agricultural sector to play its roles of providing food for the teeming population of Nigeria, and providing raw materials to feed the country's dwindling agro-industries among others. As a result of this, food insecurity emerged and the agro-industries in both the rural and urban centres were unable to sustain production. This has reduced in no small measure the output of food per capita, thus making Nigeria the least in the sub-Saharan Africa.

This study tries to address the following research questions:

- a. What are the socio-economic characteristics of the farmers in Osun State Nigeria?
- b. How food secured are farmers in Osun State Nigeria?
- c. Do land management practices have significant effects on food insecurity of farming households in Osun State?

2. Literature Review

Studies by Okoye [12], Marshall [13] and Rezvanfar *et al.*, [14] have shown that socio-economic characteristics including age, educational background, family size and farm size influence farmers' adoption of land management practices. Therefore, the ability of most crop farmers to adopt sustainable agricultural practices is probably affected by their socio-economic conditions. Imonikhe [15] states that education enhances individual farmer's ability to make accurate and meaningful management decisions as this will go a great way to helping the

concerned farmer know the appropriate land management practice to be involved in at a particular time. Food security has been identified as having food availability, food accessibility, utilization and stability of food access as its elements [16,17,18]. At household level, food security is a subset of the national level and it requires that all individuals and households have access to sufficient food either by producing it themselves or by generating sufficient income to demand for it. According to the state of food insecurity in the world published by FAO [19], around 870 million people out of which 852 million are from developing countries are estimated to have been undernourished between 2010 and 2012. People found to be food insecure generally cannot consume or grow enough food due to limited resources [20]. Food insecurity can be categorized into two based on the duration and they are chronic food insecurity and acute food security. According to Sheng [21] and Awoyinka *et al.*, [22], common land management practices (LMPs) in Nigeria are broadly classified as follows;

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

A study conducted by Olayemi [23] found that household size and food security are negatively correlated; Aidoo *et al.*, in [24] observed that an increase in one additional member of a household generally reduces income per head, expenditure per head and per capita food consumption. The higher the number of inactive individuals in households the higher the burden for active individuals in the provision of food, which in turn increases the likelihood of food insecurity [25]. Research by Carter *et al.*, [26] reported that disposable income had a direct influence on food security. Carter *et al.*, [27] found that incidents of food insecurity are much higher for female-headed households compared to male-headed households. A study by Omonona *et al.*, [28] in Nigeria showed that the prevalence of household food insecurity increases with age, household heads above the age of 60 are usually retired, with large household size and low income, thus this increases their likelihood of food insecurity. Shumiye [29] reported that the educational attainment of the head of the household has positive effect on household food security. Haggblade and Tembo; [30], from their experiments opined that farming with minimum tillage, cover crops, and crop rotation is promising for stabilizing production and ensuring food security in Zambia. According to Lal and Stewart [31] in their study on 'Sustainable management of soil resources and food security', they found out that adoption of recommended soil management practices may improve soil quality, help adaptation to climate change, and is essential to advancing food security.

3. Research Method

The study was carried out in Osun State which is an inland state in south-western Nigeria with Osogbo as its capital. The people of the state are Yorubas and trace their origin to Oduduwa and the town of Ile-Ife with a population of 2,203,016 [32].

3.1. Population, Sampling Procedure and Sample Size

All the farming households in Osun state, Nigeria 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. The ADP headquarters is at Iwo. From the three OSSADEP zones in Osun State (Osogbo, Iwo and Ife/Ijesha), two (Osogbo and Ife/Ijesha) were chosen purposively at the first stage. At the second stage, 10 Local Government Areas from the 12 Local Government Areas in Osogbo zone and also 8 Local Government Areas from the 11 Local Government Areas in Ife / Ijesha zone totaling 18 Local Government Areas were chosen randomly from the 30 Local Government Areas in Osun State. The third stage involved the random selection of 12 farmers each from the randomly selected Local Government Areas. From Osogbo ADP zone in Osun State, a total of 120 farmers were selected and from Ife/Ijesha in Osun State a total of 96 farmers were selected making a total of 216 respondents from Osun State. The study used the data obtained mainly from primary source. The source involved the use of structured questionnaires which were used to collect data from respondents. All the questionnaires were distributed and individual farming households were interviewed by trained field workers. This ensured higher response rates.

3.2. Model Specification

The food security index was used to determine the food security status of the households.

The index is given by:

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

When:

Fi = Food security status

When $Fi \geq 1$ = Food secure household

$Fi < 1$ = Food insecure household

Logit regression model was used to determine whether land management practices have significant effects on food security or not. This model is chosen because having a categorical outcome variable violates the assumption of linearity in normal regression. The only limitation for logistic regression is that the outcome variable must be discrete and this problem will be catered for by using a logarithmic transformation on the outcome variable which will allow us to model a nonlinear association in a linear way. The logit model expresses the linear regression equation in logarithmic terms [33]. The logit regression equation is given by:

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_{10}X_{10} + \varepsilon \quad (2)$$

Where,

Y = Food security Status

a = Regression constant

b_1, b_2, \dots, b_{10} = Regression coefficient attached to variable X_1, X_2, \dots, X_{10} .

X_1 = LMP Index

X_2 = Age (continuous)

X_3 = Sex (Male = 1, Female = 0)

X_4 = Marital Status (Married = 1, Single = 2, Widowed = 3, Divorced = 4)

X_5 = Years of Education (continuous)

X_6 = Farming experience in years (continuous)

X_7 = Household Size (continuous)

X_8 = Farm size in hectares

X_9 = Membership of organization (Yes = 1, No = 2)

ε = Error term.

4. Results and Discussion

4.1. Socio Economic Characteristics of the Respondents Profiled

From Table 1, for the food secured farming households, 85.23 percent were males and only 14.77 percent were females. This implied that more men than women are into farming in the study area than women. For the food insecure farming households, 80.60 percent were males and only 19.40 percent were females. It was revealed that for the food secured farming households, 36.24 percent were aged 31-40 years, 43.62 percent aged 41-50 years and 20.13 percent were aged 51-60 years with the mean age been 45 years. This implied that majority of the farmers were youths transiting to older people. For the food insecure, 43.28 percent of the farmers were aged 31-40 years, 52.24 percent aged 41-50 years and 4.48 percent aged 51-60 years with the mean age been 43 years. It was shown that 91.28 percent of the farmers who were food secured were married, 7.38 percent divorced and only 1.34 percent were widowed. For food insecure farmers, 97.01 percent were married and only 2.99 percent were divorced. revealed that 51.01 percent of the food secured respondents had secondary education, 28.19 percent had primary education and 13.42 percent had tertiary education while 7.38 percent had no formal education; the food insecure on the other hand had 55.22 percent of the respondents with secondary education, 20.90 percent with tertiary education, 14.93 percent had primary education and 8.96 percent had no formal education. For the food secured farming households 83.22 percent of the farmers had between 6 and 10 family members, those that had between 11 and 15 family members were 7.38 percent and those with less or equal to 5 family members were 9.40 percent. This result implied that households with more members will be able to practice many land management practices, thereby increasing their productivity and making them food secured. For the food insecure, household size of 6-10 is 64.18 percent, household size of 11-15 is 31.55 percent while those with 5 family members and less are only 4.48 percent. This study revealed that 81.88 percent of food

secured farmers in the study area operate on 6 to 10 hectares of land, 14.09 percent farm with less or exactly 5 hectares, 3.36 percent have farms that are between 11 and 15 hectares and only 0.67 percent of the farmers have farmlands that are more than 15 hectares. This result showed that majority of the farmers operates on not too large expanse of land which is capable of reducing their output but for the food insecure farming households, 73.13 percent farm on 6 to 10 hectares of land, 22.39 percent with less or exactly 5 hectares and 4.48 percent on 11 to 15 hectares of land. It was shown that the major occupation of majority of the respondents who were food secured is farming (83.22 percent) but for the food insecure it was 89.55 percent. It was revealed also that for the food secured farmers, 62.42 percent inherited their farmlands, 28.19 percent purchased the land and only 9.40 percent rented the land while the food insecure category has 58.21 percent of their land inherited, 20.90 percent of the land purchased, 16.42 percent of the land rented and 4.48 percent leased. It was shown that 51.01 percent of the

food secured farmers have been into farming for about 20 years, 34.90 percent for 21 to 30 years, 6.04 percent for 31 to 40 years, 7.38 percent for over 40 years and 0.67 percent for less or equal 10 years while for the food insecure farmers, 43.28 percent have been into farming from 12 to 20 years, 34.33 percent from 21 to 30 years, 5.97 percent from 31 to 40 years, 2.99 percent for over 40 years and 13.43 percent for less or equal 10 years. All the respondents both secured and insecure farmers all adopted land management practices. The study revealed that 87.92 percent of the food secured farmers relied on the extension agents for information, 7.38 percent got information from the radio, 4.03 percent accessed information through the television and only 1.39 percent through agricultural shows. This revealed that extension service is highly effective in the study area. The food insecure had the most of their agricultural information from the extension agents (95.52 percent), 2.99 percent from agricultural shows and 1.49 percent from the radio.

Table 1. Socio Economic Characteristics of the Respondents

	Food secured Frequency	Percentage	Food Insecure Frequency	Percentage
Sex				
Male	127	85.23	54	80.60
Female	22	14.77	13	19.40
Age Group				
31- 40	54	36.24	29	43.28
41- 50	65	43.62	35	52.24
51-60	30	20.13	3	4.48
Marital Status				
Married	136	91.28	65	97.01
Widowed	2	1.34	0	0
Divorced	11	7.38	2	2.99
Level of Education				
Primary	42	28.18	10	14.93
Secondary	76	51.01	37	55.22
Tertiary	20	13.42	14	20.90
No formal education	11	7.38	6	8.96
Household size				
<=5	14	9.40	3	4.48
6- 10	124	83.22	43	64.18
11- 15	11	7.38	21	31.35
Farm Size				
<=5	21	14.09	15	22.39
6- 10	122	81.88	49	73.13
11- 15	5	3.36	3	4.48
>15	1	0.67	0	0
Major Occupation				
Farming	124	83.22	60	89.55
Artisans	18	12.08	3	4.48
Civil Servants	7	4.70	4	5.97
Land Ownership				
Rented	14	9.40	11	16.42
Inherited	93	62.42	39	58.21
Purchased	42	28.19	14	20.90
Leased	0	0	3	4.48
Years of Farming				
<=10	1	0.67	9	13.43
11- 20	76	51.01	29	43.28
21- 30	52	34.90	23	34.33
31-40	9	6.04	4	5.97
>40	11	7.38	2	2.99
Adoption of LMP				
Adopted	149	100.00	67	100.00
Non adopted	0	0	0	0
Source of Agricultural Information				
Radio	11	7.38	1	1.49
Television	6	4.03	0	0
Extension Agents	131	87.92	64	95.52
Agricultural shows	1	0.67	2	2.99

Source: Field Survey, 2017.

4.2. Food Security Status of the Respondents

Table 2 revealed that 31.02 percent of the farmers in the study area are not food secured and 68.98 percent are food secured. This result was arrived at by using the expenditure approach as proposed by Omonona *et al.* [28] to ascertain the food security status of the farmers in the study area. It means that the 31.02 percent of the farmers that are food insecure have their monthly per capita food expenditure fall below two-third (2/3) of the mean monthly per capita food expenditure. The 68.98 percent that are food secured have their monthly per capita food expenditure fall above two-third of the mean monthly per capita food expenditure. This result shows that majority of the farmers are food secured and have access to food at all times. This outcome is in support of the study conducted by Omonona and Agoi [28] where the food insecurity incidence for the study carried out among the households is 0.39 (39 percent).

Table 2. Food Security status of respondents

Food Security Index	Frequency	Percent	Cumm. Fre.
Non food secured	67	31.02	31.02
Food secured	149	68.98	100.00
Total	216	100.00	

Source: Field Survey, 2017.

4.3. Effects of Land Management Practices on Food Security of Farming Households in Osun State

According to Table 3a and Table 3b, the Structural and Mechanical Soil Erosion Control (SMSECP) practices which include terraces, contour bunds and ridge across slope was statistically significant to food security and that

at 1%. Thus, a household which practices any type of soil conservation measures is more likely to be food secure. Also, Agronomic practices (AP) which includes crop rotation, multiple cropping, planting cover crops, mulching, agro forestry, bush fallow and shifting cultivation is statistically significant to food security in the study area. The relationship between these practices and food security is positive and it means that the more the farmers in the study area practices these methods of land management, the more likely they will be food secured. Household size was statistically significant at 1% for all the land management practices options and the coefficient of the variable was found to be negative. This is in line with the *a priori* expectation that there should be a negative relationship between them. This implies that as the household size increases, there is likelihood that the farmers become more food insecure. Increase in family size necessitates increase in household food expenditure, especially, in a situation where many of the other household members did not generate any income but only depended on the household head. Also from the table, years of farming for Structural and Mechanical Soil Erosion Control Practices (SMSECP) was statistically significant at 10% and the coefficient of the variable was found to be positive. For Agronomic practices (AP), Cultivation practices (CP) and Soil Management practices (SMP), years of farming was statistically significant at 1% and the coefficient is positive. This suggests that the more the years spent in farming by the farmers irrespective of the type of land management practices adopted, the more likely they will be food secured. It can then be concluded upon that the use of land management practices have a positive relationship with food security, and the more farmers engaged in the practices, the more productive they would be and this will make them food secured.

Table 3a. Logit Regression on effects of land management practices on food security of farming households in Osun state

Variables	Coefficient	SMECP			AP		
		Std. Error	P- Value	Coefficient	Std. Error	P- Value	
LMP Index	1.988304	0.6625265	0.003***	-2.088505	0.8092745	0.010***	
Age	0.042976	0.0328542	0.191	0.0393597	0.0335165	0.240	
Sex	-0.5337471	0.4705862	0.257	-0.1059548	0.4458242	0.812	
Marital status	0.5520468	0.5387111	0.305	0.61026	0.5388948	0.257	
Years of Edu.	0.0051855	0.038929	0.894	-0.0068815	0.0375333	0.855	
Years of Farm.	0.0497595	0.0293938	0.090*	0.0665939	0.0294951	0.024***	
Household size	-0.3710055	0.0743223	0.000***	-0.3454	0.0733705	0.000***	
Farm size	0.0707814	0.0873011	0.417	0.0914562	0.0853102	0.284	
Mem. Of Organ.	0.4564375	0.4896416	0.351	0.5655887	0.4863185	0.245	
Constant	-1.473506	1.710776	0.389	0.5553344	1.679094	0.741	

Source: Field survey, 2017.

Table 3b. Logit Regression on effects of land management practices on food security of farming households in Osun state

Variables	Coefficient	CP			SMP		
		Std. Error	P- Value	Coefficient	Std. Error	P- Value	
LMP Index	0.1505199	0.4571827	0.742	-0.6992776	1.11943	0.532	
Age	0.0214001	0.0318227	0.501	0.0232232	0.0319365	0.467	
Sex	-0.1616876	0.4385946	0.712	-0.1649104	0.4388773	0.707	
Marital status	0.6545204	0.5185278	0.207	0.6413018	0.5244926	0.221	
Years of Edu.	-0.0204455	0.0366223	0.577	-0.022736	0.0369667	0.539	
Years of Farm.	0.0663178	0.0288358	0.021***	0.0674598	0.0288281	0.019***	
Household size	-0.3425346	0.0715697	0.000***	-0.3383775	0.0707584	0.000***	
Farm size	0.0810363	0.0841024	0.335	0.0864001	0.0707584	0.306	
Mem. Of Organ.	0.5423219	0.4620129	0.240	0.5725965	0.464336	0.218	
Constant	-0.2181837	1.579651	0.890	0.3812503	1.811839	0.833	

Source: Field survey, 2017

Where *, **, *** means statistical significant at 10%, 5%, and 1% level of significance respectively.

5. Conclusion

Socio-economic characteristics had significant effect on the choice of land management practices in the study area. The common land management practices in the study area are structural and Mechanical Soil Erosion control practices, agronomic practices, Soil management practices and cultivation practices. Majority of the farmers in the study area are food secured and the use of land management practices especially Structural and Mechanical Soil Erosion Control Practices and Agronomic practices have a positive relationship with food security.

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