Full length Research paper

Determinants of land management practice and soil conservation on Maize farmers' production in Ogun State, Nigeria

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The study examined the determinants of various land management practices and conservation methods on maize farmers' output in Ogun state, Nigeria. Multistage sampling technique was used to select 240 maize farmers in the study area. Interview schedule was used to elicit needed information such as age, land conservative/management practice and production characteristics of maize farmer in the study area. Data were analyzed using descriptive statistic and stochastic production function (SPF). The result revealed that 70.8%, 70.5% and 89.2% were male, married and literate respectively with mean household size estimated at 4 persons. About 33.0%, 9.2% and 1.0% adopted planting cover crop, mulching and fertilizer application respectively as means of land management practices while 28.3% and 48.3% of the farmers adopted crop rotation and mixed cropping as land conservation practices. SPF showed that farm size (p<0.01), labour (p<0.01), land management practice (p<0.01) and land conservation practice (p<0.01) have a significant influence on maize production in the study area. The study concluded that land management practice and land conservation practice were determinant factor in maize production. The study recommended that government should encourage research that will be of farmer specific for awareness to be created on how to improve the quality of farm management practices.

keywords: Land Management, Stochastic Production Function, Cover crops

INTRODUCTION

Land is the major resource for the livelihood of the poor. In Nigeria, a typical villager recognizes land in its entirety. Oluwatayo, Sekunade and Adeniji (2016) reported that land to the farmer is like home and work place and shares it with the entire biotic complex. As important as land is to farmers' livelihood, Arimi (2014) observed that subsistent farmers are with a lot integrating constraints on land management practices. These constraint are under three headings; economics obstacles such as capital need and financial incentives; social conditions which include land tenure, availability of infrastructures and educational level of farmers; and ecological consideration such as limited knowledge of inputs and sustainability of some systems. Land use in many African nations have been characterized by a significant amount of land degradation. Moreover, these two processes are clearly related. Many poor African pastoralists and farming household respond to declining land productivity by abandoning existing degraded pasture and cropland, and moving to new land for grazing and crop cultivation. Due to the fact that the pattern of land use will often result into depletion of soil nutrients, appropriate management practices have to be adopted. Oluwatayo *et al.*, (2016) noted the need for appropriate soil management in tropical soil to sustain increased crop yields as cultivation continues on an annual basis. This was traced to the fact that clay in most tropical soil,

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referred to as low activity clay (LAC) does not expand and contract readily with moisture changes and the soil becomes susceptible to soil compaction. Also, LAC soils have a low caution exchange capacity, which means that nutrients are not held by the soil, but quickly leached below the crop roots. This is due to high temperature; which makes organic matters in tropical soil to be susceptible to rapid mineralization.

Furthermore, in an imperfect market setting, the nature of poverty is also important n determining its impact on natural resources management and degradation. Households that are not poor by welfare critera such as minimum levels consumption may still face "investment poverty" that prevents them from making profitable investments in resource conservation and improvement.

Problem statement

The study was informed by the declining food crop production in Nigeria. Food crop production in Nigeria no longer keep with population growth. Thus creating a wide gap between the demand and supply of food (Adebayo, 2014). This is evidence in the observed food crop deficit and the upward trend in the price of foodstuff in the market over the years (Food and Agriculture Organisation, 2012). The growth of Nigeria economy with reference to agriculture has been import driven rather than production driven. Consequently, there is a growing advocacy for improving Nigeria agricultural production so as to achieve sustainable food security. According to Arimi (2014), a lot of effort has been directed at finding appropriate institutions for organizing millions of small scale farmers towards achieving food security (through increased food crops production) and agricultural productivity. Food production could be affected by the farmers age, access to credit, gender, farm size, educational level and farming experience. It is on record that 50% of world's population is dependent on subsistence agriculture. The effect of this is high, underfeeding and malnutrition throughout the nation. Nigeria as a nation only depends on rural inhabitant who constitute over 15% of the total population for the production of foods (FAO, 2012). These farmers are poor subsistence farmers and they spend little on food production, which lead to low productivity.

Moreover, Nigeria is witnessing an upward trend in price of foodstuff, which should not be attributed to inflationary tendencies alone. The price increase is mainly due to decrease in production coupled with rise in demand as a result of increase in population and purchasing power. For example, cassava products was reported to be declining by less than 10% for reasons connected with losses from livestock and declining soil fertility which is a result of the effect of land productivity (Amaza and Olayemi, 2015). Hence, there is every need to increase food crop production due to increase in human population so as not to cause hunger and starvation among the teeming population.

This study was therefore conceived to determine the effect of land management practices on maize production among maize farmers Ogun state, Nigeria. Hence, the specific objectives are to describe the socioeconomic characteristic of maize farmers, examine the type of land management and conservation practices adopted by maize farmers and determine the effect of land management practices on Maize production in the study area.

METHODOLOGY

Study area

Figure 1:
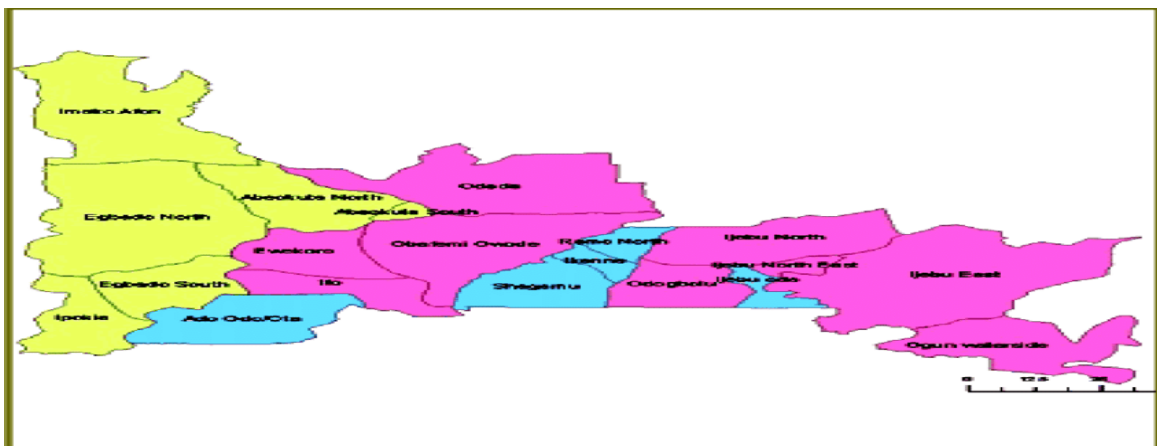
The study was carried out in Ogun State, South Western Nigeria. The state lies between longitudes $2^0 2^1$ and $3^0 55^1$ and latitudes $7^0 01^1$ and $7^0 18^1$. It has a tropical climate with rainforest vegetation on its southern part and a derived savannah on its northern end. It has an estimated land area of 16,409.26 square kilometers. The estimated human population is 3751140 (2006 population census) and it is characterized commercially by a dual economic focus, the bourgeoning industrial sector and a dominant agricultural sector. The vegetation is largely rainforest and savannah and this makes it possible to cultivate many crops ranging from tree crops to arable crops and food crops such as maize, cowpea, cassava, melons, cashew, cocoa, oil palm, garri and vegetables.

Sampling procedure and Data collection

The study populations were mainly rural farming households who engaged in maize crop production in the study area.
Multistage samplingtechnique was used to select 240 farming households from 20 communities in two Agricultural Development Programme (ADP) zones of Ogun State (Abeokuta and Ilaro). First stage involved the selection of two Zones which are Abeokuta and Ilaro randomly. Second stage involved simple random selection of three (3) and two (2) blocks from each of the two ADP zones respectively making 5 blocks respectively. Stage three involved random selection of four (4) cells from each of the 5 blocks making 20 cells. While the last stage involved random selection of twelve (12) farming households from each of the 20 cells making 240 farming households. Primary data were collected using structured interview guide. Data were analyzed using frequency count, percentage, mean and Stochastic Production Function (SPF) Regression

RESULTS AND DISCUSSION

Socioeconomic characteristics of respondents

The socioeconomic distributions of the respondents were presented in Table 1. Distribution of age of the food crop farmers in the study area as shown in Table 1 reveals that majority (94.17 percent) of food crop farmers were aged below 60 years with the mean age of 43 years. The result was in conformity with Adebayo (2014) who pointed out that individuals were more active under the age of 50 years. This implies that most of the respondents were in their economically active age and were expected to be energetic and productive. Also, many (72.5 percent) of the food crop farmers were married with mean household size of 4 persons. Also, based on religion distribution of the respondents, majority (60.0 percent) are Christains. Distribution of food crop farmers by educational status revealed that many (50.8

percent) had secondary school education as against 10.8 percent without formal education. The mean farming experience and farm size were estimated at 9 years and 4.1 hectares respectively. This is contrary to Dipeolu, Philip, Akinbode and Adedokun (2013) where majority of food crop farmers had no formal education while Arimi (2014) reported that majority of Nigeria's farmers are still subsistence in nature. Also, majority (72.5 percent) of food crop farmers had contact with extension agents once a year. This finding aligned with Fabusoro *et al.,* (2010) that shortage of extension personnel hindered the delivery of good agricultural extension services.

Distribution of the respondents based on the various land management practice adopted in the study area

Table 2 revealed the various land management practices adopted by maize farmers in the study area. It was revealed that 2.50% of the respondents does not engage in any form of land management practices, 3.34% of the respondents engaged in Terracing 1.67% of the respondents engaged in contour bonds, 1.67% of the respondents engaged in Ridge across slope, 5.83% of the respondents engaged in Crop rotation, 35.0% of the respondent engaged in Multiple cropping, 32.5% of the respondent engaged in Cover Cropping, 9.17% engaged in Mulching, none of the respondent were engaged in Agro-forestry, 2.50% of the respondents engaged in bush fallowing, 5.0% of the respondents engaged in compost, while 0.82% of the respondents engaged in Fertilizer Application. This implies that Majority of the respondents were engaged in various land management practices.

Land conversation practices adopted by the respondents

Land conservation practice adopted by maize farmers in the study area was revealed in Table 3 that 28.33% of the respondents engaged in crop rotation, 13.33% of the respondents engaged in Bush fallowing, 48.33% of the respondents engaged in Mixed cropping, 8.33% of the respondents engaged in Planting cover crop while 1.67% of the respondents engaged in Mulching. This implies that majority of the respondents were engaged in diverse land conservation practices in the study area.

Maximum Likelihood Estimates of the Stochastic Production Function of Maize farmers

Table 4 presents the maximum likelihood estimates (MLE) of the production function of maize farmers in Ogun state. The variance parameter for sigma-square for cassava farmers was estimated at 0.467. The sigma-square attests to the goodness of fit and correctness of the distributional form of the model while the gamma revealed the systematic influences that were unexplained by the production function and the dominant sources of

Table 1: Distribution of the respondents according to the socioeconomic characteristics in the study area

Socioeconomics characteristics	Frequency	Percentage	Mean
Sex			
Male	170	70.83	
Female	70	29.17	
Age			
Less than 30	52	21.67	
31-40	48	20.00	
41-50	88	36.67	43
51-60	38	15.83	
61 and above	14	5.83	
Marital status			
Married	174	72.50	
Single	52	21.67	
Divorced	10	4.17	
Widowed/widow	2	0.83	
Separated	2	0.83	
Religion			
Christianity	144	60.00	
Islam	88	36.67	
Traditional	8	3.33	
Level of education			
Non-formal	26	10.83	
Primary	40	16.67	
Secondary	122	50.83	
Tertiary	52	21.67	
Household size			
1-2	68	28.33	
3-6	142	9.17	4
7-10	28	11.67	
10 and above	2	0.83	
Farm size			
1-5 hectares	180	75.00	4.19
6-10 hectares	16	6.67	
11-15 hectares	26	10.83	
16 and above	18	7.50	
Farming experience			
1-5 years	66	27.50	
6-10 years	94	39.17	9.6
11years and above	80	33.33	
Contact with extension agent			
None	4	1.67	
Once	174	72.50	
More than once	62	25.3	
Total	**240**	**100**	

Source: Field Data, 2018

Table 2: Distribution of the respondents based on the various land management practice adopted in the study area

Land Management Practice	Frequency	Percentage
None	6	2.50
Terracing	8	3.34
Contour Bonds	4	1.67
Ridge Across Slope	4	1.67
Crop Rotation	14	5.83
Multiple Cropping	84	35.00
Cover Cropping	78	32.50
Mulching	22	9.17
Agro-Forestry	0	0.00
Bush Fallowing	6	2.50
Compost	12	5.00
Fertilizer Application	2	0.82
Total	240	100

Source: Field Data, 2018

Table 3: Distribution of respondents according to land conversation practices adopted in the study area

Land conservation methods	Frequency	Percentage
Crop Rotation	68	28.33
Bush Fallowing	32	13.33
Mixed Cropping	116	48.34
Planting Cover Crop	20	8.33
Mulching	4	1.67
Total	240	100

Source: Field Data, 2018

Table 4: Stochastic Frontier Production Function result of Maize farmers' production

Variables	Coefficient	Standard error	t-value
Constant	0.6231***	0.2115	2.9460
Farm size	0.4510***	0.1521	2.96515
Labour (Man days)	0.7211***	0.2007	3.5929
Fertilizer (Kg)	0.2981	0.3092	0.9641
Agrochemicals (Kg)	1.0134	0.7022	1.4431
Planting material/input (₦)	0.0207	0.0332	0.6234
Inefficiency Model			
Constant	2.1311**	1.0763	1.9800
Sex	0.5671	0.5231	1.0841
Age	0.0033	0.1128	0.0292
Education	-0.2091	0.3121	-0.6699
Farm Experience	-0.7711	0.9899	-0.7789
Household size	-0.2219	0.3441	-0.6448
Land Management Practice	-0.1952***	0.0522	-3.7394
Land Conservative Practice	-0.6493***	0.2316	-2.8035
Diagnostic Statistics			
Stigma-square (δ^2)	0.741	1.586	0.467
Gamma (γ)	0.641	0.311	2.061
Log Likelihood	-116.21		
Chi Square	32.21***		

Source: Field Data, 2018
*** implies significant at 1 percent, ** implies significant at 5 percent

random error. This implies that about 47 percent of the variance in output of maize farmers in Ogun state is due to the differences in their technical inefficiency.

The result showed that hired labour and farm size in hectares have positive significant influence on maize production at 1 percent significant level. Furthermore, the finding showed that other variables such as fertilizer, agrochemical and cost of planting materials/input didn't exert any significant influence on maize production in the study area.

The contribution of farmers' personal characteristics such as Age, Years of education, Farming experience, Household size and Sex, land management practice, land conservative practice to farm inefficiency were also examined. However, all the variables examined in the inefficiency model are not significant except land management practices and land conservative practice that have negative influence on farmers' inefficiency model

CONCLUSION AND RECOMMENDATION

The study concluded that majority of the respondents were still in their active stage, married and expected to be productive. Also, majority of the respondents in the study area engaged in diverse land conservation and management practices such as contour bonds, terracing, crop rotation, ridge across slope, bush fallowing, mixed cropping and mulching. The result of SPF revealed that hired labour and farm size in hectares exert a positive influence on maize production in the study area. While inefficiency model of the SPF revealed that various land management and conservation practices adopted by the respondents have a significant influence on food crop production in the study area.

The study recommends that researchers should be of farmers specific in their researches in creating awareness on how to improve the quality of farm management practices currently in practice. There is need for the government to add to the present subsidy style (credit facilities support) through subsidized planting materials, inorganic fertilizers and agro-chemicals as well as provision of soft loan to farmers who were unable to benefit directly from the credit subsidies to remain in agriculture. Government and private sector should organize a seminar on organic farming which will encourage indigenous land conservation practice in the study area

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