Global Journal of Science Frontier Research
Agriculture & Biology
Volume 12 Issue 1 Version 1.0 January 2012
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Determinant of Land Management Practices among Crop Farmers in South-Western Nigeria

By Raufu, M.O., Adetunji M.O.
Ladoke Akintola University of Technology, Ogbomoso Oyo State, Nigeria

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GJSFR-D Classification : FOR Code: 960904, 070101

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Determinant of Land Management Practices among Crop Farmers in South-Western Nigeria

Raufu, M.O.[α] , Adetunji M.O.[Ω]

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I. Introduction

Land is the major resource for the livelihood of the poor. In Nigeria, a typical villager recognizes land in its entirety. According to Fabiyi, (1990) land, to the farmer, is home and work place and shares it with the entire biotic complex. As important as land is to farmers' livelihood, Adekoya (1997) observed that subsistent farmers are with a lot of in integrating many of the land management practices. Dixon (1995) arranged these constraint under three headings; economic 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 (Brabier, 1999). Many poor African pastorialists and farming households 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. Couper (1995) noted that the need for appropriate soil management in tropical soils becomes imperative because of inability of the soil to sustain increased crop yields as cultivation continues on an annual basis. This was traced to the fact that the clay in most tropical soil, 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 cation exchange capacity, which means that nutrients are not held by the soil, but quickly leached below the crop roots. This is due to high temperatures, 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 in determining its impact on natural resources management and degradation. Households that are not poor by welfare criteria such as minimum levels of consumption may still face "investment poverty" that prevents them from making profitable investments in resource conservation and improvement. (Reardon and Vosti 1995) claimed that households that lack access to road and markets, or that own little land may deplete soil nutrients less rapidly since they are subsistence – oriented and thus export less soil nutrients in the farm of crop harvest and sales. On the other hand, households that are livestock poor may deplete soil nutrients more rapidly because they lack access to manure.

As a result of this, the study centered on land management since land is the major resource for the livelihoods of the poor. A large body of past research shows that the major determinants of land management include households' endowments of different types of capital, land tenure and the biophysical and socio-economic environment in which rural households live (Reardon and Vosti, 1995; Barrett, et al, 2002; Nkonya, et al, 2004).

Land use and management practices affect human health directly and indirectly. It affects fauna and flora, contributes to local, regional, and global climate changes and is the primary source of soil, water and land degradation (Sala et al., 2000; Pielke, 2005). Altering ecosystem services— i.e., the provisions people obtain from ecosystems (e.g., food, water), regulating

Author α Ω : Department of Agricultural Economics and Extension, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso Oyo State, Nigeria. E-mail : oyedapo1971@yahoo.com Tel. +23438261934

services (e.g., predator-prey relationships, flood and disease control), cultural services (e.g., spiritual and recreational benefits), and support services (e.g., pollination, nutrient cycling, productivity)—that maintain the conditions for life on Earth affect the ability of biological systems to support human needs (Vitousek et al., 1997). Alterations lead to large scale land degradation, changing the ecology of diseases that influence human health and making it more vulnerable to infections (Collins, 2001).

In addition, the identification of constraints to farmers' use of sustainable management practices would provide a direction of action for government in trying to boost farmers involvement in land management practices, reveal areas of inadequacy and where the farmers need improvement. There is likewise the need to focus on the sustainability of the environment through emphasizing the desirable ways by which farmers can utilize the land that would prevent consequential depletion of the soil fertility.

Finally, there is the need to develop a benchmark of wider dimension that would identify land-use indices and threshold in a typified smallholder farming system. This is even more important now that the Federal Government of Nigeria is exploring ways of sourcing revenue from non-oil sector. The consequence of enhanced production is also most likely to result in enhanced welfare for crop farming communities.

The achievements of all these would not only improve agricultural production but would further ensure the sustainability of the environment. The results of this study is likewise expected to provide policy makers with good understanding of the situation in the south-western part of the country such that they would be adequately equipped with the right policy intervention tools that will promote the welfare of crop farming households.

II. Objective of the Study

The main objective of the study is to identify the determinants of land management practices among crop farmers in South-western Nigeria. The specific objectives are to:

1. identify the socio-economic characteristics of the farmers,
2. examine the pattern of land use as regards crops diversification, and
3. highlight the determinants of land management practices in the study area.

III. Hypothesis

The working hypothesis stated in null form is ;

There is no significant relationship between access to credit and land management practices.

IV. Methodology

The study was conducted in Osun State of South-Western Nigeria that is made up of three agro-ecological zones, characteristics of some of the South-Western States of the federation. The State has six administrative zones and thirty local government areas. The predominant farming system in the area is shifting cultivation with mixed cropping and crop rotation. Crops cultivated include maize, yam, cassava, cocoyam, cocoa, kolanut, citrus and vegetables. Livestock like sheep, cattle, goat, pig rabbit and poultry are also reared for sales and consumption. A three-stage sampling procedure was adopted in proportionately selecting 71 respondents from Iwo (Savannah zone), 109 respondents from Osogbo (Derived savannah zone) and 180 respondents from Ife/Ijesha (Rainforest zone) zones of the State. Out of the 360 questionnaires administered, 301 were found to be very useful for the study. The primary data collected were coded and subjected to both descriptive and inferential statistics.

The descriptive statistics used are frequency and percentage distribution, mean and standard deviation to describe the socio-economic characteristics of the respondents while the probit models were employed as the inferential statistics since the dependent variables are dichotomous (e.g whether or not farmer use inorganic fertilizer, organic fertilizer, purchased seeds and agrochemicals) as shown below;

$$LM = f(NC, PC, HC, FC, AS, XN,) \quad (1)$$

Where;

LM = Land management practices

NC = Natural capital (including land size and investments on land)

PC = Physical capital (including fixed inputs such as farm buildings, equipments)

HC = Human Capital (including education and primary source of income of household head).

FC = Financial Capital (including access to financial capital or participation in rural credit and savings).

XN = Village and higher level factors influencing comparative advantage (agro-climatic potential and access to roads)

AS = Access to agricultural technical assistance (including contact with extension agents).

e^{I} = random factors

a) Land Use Pattern Analysis

Analysis of land use pattern was done by measuring the index of crop diversification. Crop Diversification Index (CDI) consists of Entropy and Herfindal Index. Entropy Index is given as;

$$CDIe = \sum_{i=1}^{n} P_i \log P_i^{-1} \quad (1)$$

Where CDI_e = Crop Diversification Index

P_i = Proportion of net income from the crop.

The Diversification Index is optimal when $0 < CDI_e/n < 1^-$

The Herfindal Index is given as;

$$CDI_h = \sum_{i=1}^{n} P_i^{\,2} \quad (2)$$

P_i is as described above.

b) Probit model

The probit model represents another type of widely used statistical model for studying data with binomial distributions. Probit models are generalized linear models with a probit link;

$$\eta = \varphi^{-1}(\mu) \quad (3)$$

Where η is a linear predictor produced by $x_1, x_2, x_3, \ldots\ldots\ldots\ldots\ldots, x_k$

φ^{-1} is the inverse of the standard normal cumulative distribution function (CDF) and μ is the expected value of the x_s.

The inverse of the normal CDF is in effect a standardized variable, or a Z score. As with the logit model, the probit model is used for studying a binary outcome variable. The probit model can be expressed in probability thus;

$$\Pr ob(y=1) = 1 - F\left[-\sum_{K=1}^{K}\beta_K\, b_K\right] = F\left[\sum_{K=1}^{K}\beta_K\, b_K\right]$$

$$= \phi\left[\sum_{K=1}^{K}\beta_K\, b_K\right] \quad \text{------- (4)}$$

Where the more general form of CDF, F, is replaced by the standard normal cumulative distribution function, φ. Unlike the logit model, which may take on two major forms-one expressing the model in logit (and a transformed version expressed in odds) and the other expressing the model in event probability-the probit model expressed in η is a linear regression of the Z score of the event probability. The equation for probability of nonevent is then;

$$\Pr ob(y=0) = 1 - \phi\left[\sum_{K-1}^{K}\beta_K b_K\right] \quad (5)$$

The farmer's decision on use of a particular input depends on the criterion function,

$$Y_i^* = \gamma Z_i + \mu_i \quad (6)$$

Where Y_i^* is an underlying index reflecting the difference between the use of an input and ts non-use, γ is a vector of parameters to be estimated, Z_i is a vector of exogenous variables which explain use of an input, and μ_i is the standard normally distributed error term. Given the farmer's assessment, when Y_i^* crosses the threshold value, 0, we observe the farmer using the input in question. In practice, $Y_i^*$is unobservable. Its observable counterpart is Y_i, which is defined by

$Y_i = 1$ if $Y_i^* > 0$ (Household i use the input in question), and

$Y_i = 0$ if otherwise.

In the case of normal distribution function, the model to estimate the probability of observing a farmer using a input can be stated as

$$P\left(Y_i = 1/X\right) = \Phi\left(X^1\beta\right) = \int_{-\alpha}^{X^1\beta} \frac{1}{\sqrt{2\pi}} \exp\left(-z^2/2\right) dz \quad (7)$$

Where,

P is the probability that the ith household use the input and 0 otherwise;

x is the K by 1 vector of the explanatory variables;

z is the standard normal variable, i.e., $Z \sim N(0,\sigma^2)$; and

β is the K by 1 vector of the coefficients estimated.

LIMDEP 8.0 software was used to derive estimates for the probit model used.

V. Results and Discussion

Table 1.0 reveals that about 69.8 percent of the farmers are between 16-45 years of age, showing that they are in active age brackets. The mean age is 46.81 and this has implication on the available family labor and productivity of the labor because age has a direct bearing on the availability of farm labor and the ease with which improved agricultural practices are adopted. The gender distribution of the farmers depicts more male (94.01%) than female owning farms. This result conforms with the cultural setting in the study area where male have more access to land than female.

Also the main occupation of most of the sampled farmers is farming and larger proportion (84.%) of them depends on crop production for daily existence. This result has effect on the level of cropping pattern and intensity in which the agricultural land is used. Majority (95.10%) of the respondents are married, 4.3 percent are single and just 0.3 percent each are widowed and divorced.

Most of the farmer's households (85.8%), male and female, have at least a primary education. Those households with tertiary education probably constitute the civil servants who engaged in part-time farming in the area. This is expected in line with a priori expectation, to have significant impact on productivities,

income earning opportunities and ability of farmers to effectively adopt better management practices.

Table 2.0 shows that 52.5 percent of the farmers had two-crop mixture on their farm with combination mean of diversification index being 0.714. For the four-crop combination and five-crop combination, the average H-index is 0.433 and 0.218 respectively. The result however, shows that as the number of crops in combination decreases, the H-index increases and would become one for sole cropping implying specialization. But on the average, the H-index for all the sampled farms is 0.578. The H-indices show that the sampled farmers undertook one form of cropping diversity or the other, but the majority of them practiced one to two crop combinations.

Table 3.0 implies that secondary and tertiary education of males is associated with higher likelihood of practicing crop rotation and greater likelihood of encouraging fallow respectively. Encouraging crop rotation may be less labor intensive means of addressing concerns about soil fertility, pest and weeds while education at the tertiary level is a signal of higher opportunity cost of labor in more educated households directly encouraging fallow of agricultural land. But female education at all levels has no significant impact on land management practices.

The livelihood strategy of the household measured by the primary source of income of the household head, has limited impact on most land management practices. Non-farm activity as a primary source of income increases the probability to fallow relative to household for whom crop production is the primary activity. Likewise non-farm activities enable and encourage less intensive crop production, by providing households with alternative sources of income and increasing the opportunity cost of family labor. There is no statistical significant difference in land management practices between households whose primary income source is livestock as against crop production.

Natural capital, particularly in terms of investment on land encourages fallowing and incorporation of crop residues. Fallowing, for example, is common on farms where agro forestry (non-crop) trees have been planted. Other land investment such as fishponds, fences and paddocks increase the probability to incorporate crop residues. Furthermore, as expected, larger farms are more likely to fallow since they have enough land for crop production while resting part of their land. They are likewise less likely to incorporate crop residue on a given plot.

Access to credit has statistically insignificant impacts on most land management practices, except a negative impact on crop rotation. The negative association of credit with crop rotation may be because credit is used to facilities non-farm activities, rather than efforts to increase soil fertility and crop production. Therefore the hypothesis that there is no significant relationship between access to credit and land management practices is accepted. This findings suggest that credit constraint are not major impediment to adoption of improved land management practices, and that access to credit may promote less intensive land management practices by facilitating more remunerative non-farm activities. This finding goes in contrary to observation of Sharma and Bucherneieder (2002) that limited credit is a constraint to improved land management practices.

The results of the agro-ecological zone shows that fallowing and crop rotation practices are more common in the rainforest zone of the State than the other zones perhaps because of the adoption of non-crop trees in their farming systems.

VI. Summary

The study revealed that about 40 percent of the farmers are between 36 to 45 years of age, majority (94.01%) are male and 84.1 percent of the farmers takes farming as main occupation. 95.10 percent of the farmers' are married and 85.8 percent of the farmers' households have at least primary education. Education of male at secondary and tertiary education level has significant impact on land management practices contrary to female education. Also the livelihood strategy of the household has limited impact on most land management practices. Investment on land encourages fallowing and incorporation of crop residues while assess to credit encourages non-farm rather than the expected farm activities.

VII. Recommendation

Government should encourage researches that would be farmers specific for awareness to be created on how to improve the quality of farm management practices currently in practice. More farmer groups should be formed for collection, distributions and utilization of agricultural loans. There is need for the government to add to the present subsidy style (credit support) of providing subsidized planting materials, inorganic fertilizers and agro-chemicals as well as provision of soft loan with a price support policy where farmers' outputs at peak period are bought at fairly reasonable prices above the current market prices. This will encourage farmers who are unable to benefit directly from the credit subsidies to remain in agriculture.

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Tables

Table 1.0 : Distribution of Respondents by their Socio-economic Characteristics

Characteristics	Frequency	Percentage
Age group (years)		
16-25	14	4.7
26-35	77	25.6
36-45	119	39.5
46-55	36	11.9
56-65	44	14.6
>66	11	3.7
Gender		
Male	283	94.01
Female	18	5.99
Occupation		
Crop production	253	84.1
Livestock production	7	2.3
Non-farm activities	41	13.6
Marital status		
Single	13	4.3
Married	286	95.1
Widowed	1	0.3
Separate	1	0.3
Household Educ. Level		
No schooling	M 79	6.6
	F 91	7.6
Primary level	M 222	18.6
	F 210	17.6
Secondary level	M 235	19.7
	F 166	13.9
Tertiary level	M 145	12.2
	F 39	3.5

Source; Field Survey, 2005/2006

Table 2.0 : Herfindal Index of Crop Diversification

Description	Frequency	Combination	S.D	Min. value	Max. value
Sole cropping	63	1	1	1	1
Two-crop combination	158	0.714	0.051	0.323	0.875
Three-crop combination	50	0.526	0.118	0.427	0.662
Four-crop combination	27	0.433	0.101	0.152	0.609
>Five-crop combination	3	0.218	0.073	0.198	0.414
Sample mean	60.2	0.578	0.269	0.420	0.712

Source; Field Survey, 2005/2006

Table 3.0 : Determinant of Land Management Practices

Variable	Fallow	Crop Rotation	Crop Residue
Human Capital			
Male Household Members			
Primary education	-1.40	-0.137	0.354
Secondary education	0.066	0.062*	0.168
Tertiary education	0.572***	0.175	0.430
Female Household Members			
Primary education	0.240	0.341	0.564
Secondary education	0.150	-0.044	0.334
Tertiary education	0.034	-0.461	-0.063
Primary Source of Income of the Household Head			
Livestock	-0.286	-0.154	0.711
Non-farm	0.301***	-0.158	-0.098
Natural Capital			
Investment on Land	1.114**	-1.096	0.086**
Farm size (ha)	0.485**	-0.017	-0.115*
Physical Capital			
Fixed Capital	0.036	-0.708	1.123
Access to Farm and Services			
Access to credit	-0.244	-0.104**	-0.591
Number of extension visits	0.058	-0.246	-0.575
Distance of farm to residence (km)	0.066	0.037	0.067
Village Level Factor			
Agroecological Zone			
Savannah	0.164	-0.173	-0.128
Derived Savannah	-0.121	0.038	0.040
Rainforest	0.305*	0.226**	0.106

Source; Field Survey, 2005/2006