Characteristics of Input Use by Crop Farmers in South-Western Nigeria.

M.O. Raufu, Ph.D.

Department of Agricultural Economics and Extension, Ladoke Akintola University of Technology,
PMB 4000, Ogbomoso, Oyo State, Nigeria.

E-mail: abusaudah@yahoo.com
Telephone: +23438261934

ABSTRACT

This study examined the determinants of input use among crop farmers in South-Western Nigeria. A total of 360 respondents were selected from the three agro-ecological zones of the State. Well-structured questionnaires with a few open-ended questions were administered out of which 301 were found to be very useful for the study. Analysis of data was done using descriptive statistics and probit models were employed to analyze the inferential statistics.

The result showed that 90 percent of the farmers are male and married while 85.5 percent of their household members are literate. About 40 percent of the farmers are in their active age. The male education at all levels is statistically significant to the use of inorganic fertilizer while livelihood strategy of the household head has no statistical significant on input use. The presence of investments on land and access of farmers to credit has negative association with the use of inputs. The bulky nature of some of the inputs discourages their use on distant plots while the rainforest zone has a statistical relationship with organic residue and use of agrochemicals.

(Keywords: agricultural inputs, production, management system, investment on land)

INTRODUCTION

Land as a factor of production and as a natural resource is a critical input in agricultural production. The criticality is imposed by its availability, accessibility, quantity, and quality. In Nigerian agriculture, the quality factor stands out as a major determinant of land productivity. This is due to the problems associated with sourcing artificial amendments that can improve the productivity of land especially by subsistent farmers that dominate the arable crop production landscape.

Rosegrant and Ringler (1997) submitted that although estimates of the effects of land degradation on food production are rare, it had been realized that the problem often leads to drastic reduction in agricultural production by necessitating the use of higher level of inputs to maintain yields, temporary or permanent abandonment of plots, and conversion of land to lower value uses. A global analysis by Lane (1982) revealed that during the 1970's, one hectare of arable land supported an average of 2.6 people; it was projected that by the year 2000, given the present population projection, one hectare of land will be supporting 4 people.

Also, Rosegrant and Ringler (1997) reported that while food production in 1993 had been derived from 748.6 million hectares, it has been projected that 795.5 million hectares will be needed in 2020 to meet up with world's food requirement. It was likewise stressed that the land constraint, among other constraints, will make rice production to only grow by 1.05 percent 1993 and 2020, 1.17 percent in wheat and 1.03 percent in maize.

Nigerian food problem shows both in quantity and quality. Tied to low agricultural production and productivity is the increasing relative and absolute poverty of the farming population in Nigeria. Although as observed by Swinton et al. (2003), the land management pursued by wealthier household may increase some forms of resource degradation (e.g., more soil erosion due to use of mechanical equipment, or more damage to water resources and biodiversity due to greater use of agro-chemicals), while reducing other forms of resources degradation (e.g., less soil nutrient depletion as a result of greater ability to purchase fertilizers or greater ownership of livestock and recycling manure). The need for increased food production call for knowing the socio-economic characteristics of the farmers, know the farm characteristics in term of physical inputs used as well as identifying the determinants of input use among crop farmers in the study area.

Apart from this, 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 a farmer is both home and work place and he/she shares it with the entire biotic complex. As a result, data collected on the relationship among the use of the different land management practices are good reference materials that would guide agricultural economists and extension workers wishing to plan a strategic agronomy-based extension service delivery for farmers.

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.

OBJECTIVE OF THE STUDY

The main objective of the study is to identify the determinants of input use among crop farmers in South-Western Nigeria. The specific objectives are to:

(i) highlight the socio-economic characteristic of the farmers;

(ii) describe the farm input characteristics; and

(iii) identify the determinants of input use in the study area.

HYPOTHESES

The working hypotheses stated in null forms are:

(i) there is no significant relationship between the livelihood strategy of the household and input use;

(ii) there is no significant relationship between investment on land and input use.

METHODOLOGY

The study was conducted in Osun State of South-Western Nigeria that is made up of three agro-ecological zones, characteristic 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 to analyze 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;

Input use; $I = f(HC, NC, PC, FC, AS, XN, e^{I})$ **(1)**

where;

I = Input use (including use of inorganic fertilizer, organic fertilizer, purchased seeds and agrochemicals).

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

PC = Physical capital (including fixed inputs such as farm buildings and 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

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;

$$\eta = \varphi^{-1}(\mu) \quad \textbf{(2)}$$

Where η is a linear predictor produced by $x_1, x_2, x_3, \ldots\ldots\ldots\ldots, x_k$
φ^{-1} = the inverse of the standard normal cumulative distribution function (CDF)
μ = 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:

$$\text{Prob}(y=1) = 1 - F\left[-\sum_{K=1}^{K}\beta_K\, b_K\right] = F\left[\sum_{K=1}^{K}\beta_K\, b_K\right] = \phi\left[\sum_{K=1}^{K}\beta_K\, b_K\right] \quad \textbf{(3)}$$

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;

$$\text{Prob}(y=0) = 1 - \phi\left[\sum_{K-1}^{K}\beta_K b_K\right] \quad \textbf{(4)}$$

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

$$Y_i^* = \gamma\, Z_i + \mu_i \quad \textbf{(5)}$$

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 an input can be stated as:

$$P\left(Y_i = 1/X\right) = \Phi\left(X^1\beta\right) = \int_{-\alpha}^{X^1\beta} \frac{1}{\sqrt{2\pi}} \exp\left(-z^2/2\right) dz \quad \textbf{(6)}$$

where,
P = the probability that the ith household use the input and 0 otherwise;
x = the K by 1 vector of the explanatory variables;
z = the standard normal variable, (i.e., Z ~ $N(0,\sigma^2)$; and
β= the K by 1 vector of the coefficients estimated.

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

RESULTS AND DISCUSSION

Table 1 reveals that about 69.8 percent of the farmers are between the age of 16-45 years, showing that they are in active age brackets. The mean age is 46.81 and this has implication on the available family labor and their productivity 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 males (94.01%) than females owning farms. This result conforms with the cultural setting in the study area where males have more access to land than females.

Table 1: 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

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. A majority (95.10%) of the respondents were 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 indicated that on the average, the farm size cultivated by each farmer is 3.068 hectares and much more family labor was used than hired labor. One of the probable reasons for hiring less proportionate units of labor could be the fact that majority (65.1%) of the farmers are within the active age bracket as revealed in table 4.1 and in addition large family size could provide the needed assistance for farm operations. On the average, costs of labor constitute 69.29 percent of the total cost with capital cost and cost of planting having 2.501 percent and 28.21 percent respectively. It then fallows that labor is the most limiting factor of production and that the farming activities in the area are mostly labor intensive.

Table 3 shows that male education at all level is strongly associated with higher probability of using inorganic fertilizer. From the primary education to the tertiary level, the coefficient estimates are all positively related to the use of inorganic fertilizer and are statistically significant at $\alpha = 0.05$, 0.10 and 0.01 respectively. This may be because more educated farmers are more aware of the benefits of using inorganic fertilizer, or because they are better able to afford to purchase fertilizer. The negative impact of post secondary education on organic inputs use is likely due to the higher labor opportunity cost of more educated women.

Other aspects of human capital (i.e., the livelihood strategy of the household) measured by the primary source of income of the household head, has statistically insignificant impact on input use. Therefore the null hypothesis 1that there is no significant relationship between the livelihood strategy of the household and input use is accepted.

Also, natural capital has statistical significant impact on input use. Investment on land has negative relationship with the use of inorganic fertilizer and purchased seeds, significant at $\alpha = 0.10$ and 0.05, respectively. This implies that the presence of land investment such as fish pond, fence, paddocks etc reduced the likelihood of using inorganic fertilizers, and purchased seeds probably because this investment promote livestock or aquaculture rather than crop production. Likewise the coefficient (-0.486) of larger farm size is negative and statistically significant at $\alpha = 0.01$.

Table 2: Description of Farm Input Characteristics.

Description	Sample Mean	Standard Deviation	Minimum Value	Maximum Value
Farm Size (ha)	3.068	2.966	0.1	23.5
Family Labor (Manday)	58.25	31.256	1.0	77.0
Hired Labor (Manday)	23.40	0.203	0.0	166.0
Hired Labor (Naira)*	9,380.00	4,471.28	0.0	30,005.00
Total Labor (Naira)	50,155.00	13,198.68	1,470.00	190,589.00
Capital (Naira)	1,810.41	3,203.64	106.00	36,175.00
Cost of Planting (Naira)	20,423.41	18,602.85	55.00	128,900.00
Total Cost (Naira)	72,388.82	23,791.60	225.00	132.034

**In the area of study, one manday is equivalent to =N=700.00*
Source; Field Survey, 2005/2006

Table 3: Determinant of Input Use.

Variable	Inorganic fertilizer	Organic fertilizer	Purchased seed	Agrochemicals
Human Capital				
Male Household Members				
Primary education	0.478**	-0.062	-0.092	0.146
Secondary education	0.321*	0.168	0.005	-0.167
Tertiary education	0.924***	0.211	0.009	0.047
Female Household Members				
Primary education	0.225	0.564	-0.137	-0.053
Secondary education	0.262	0.334	0.185	0.040
Tertiary education	0.280	-0.046**	0.065	0.343
Primary Source of Income of the Household Head				
Livestock	_	-0.124	0.277	0.115
Non-farm activities	-0.457	0.606	-0.214	0.403
Natural Capital				
Investment on Land	-0.647*	0.639	-0.162**	-1.467
Farm size (ha)	0.120	-1.520	-0.486***	0.518
Physical Capital				
Fixed Input	-0.045	0.067	0.007	0.041
Access to Farm and Services				
Access to credit	-0.036**	-0.591	0.286	-0.238
Number of extension visits	0.284	0.016	0.305	-0.002
Distance of farm to residence (km)	-0.583*	-0.699**	0.113	-0.343
Village Level Factor				
Agro-ecological Zone				
Savannah	0.159	-0.290	0.372*	0.004
Derived Savannah	-0.277	0.084	-0.417	-0.562
Rainforest	-0.045	0.747**	0.093	0.191*

Source; Field survey, 2005-2006

This shows that larger farms are less likely to use purchased seeds. This result is consistent with Boserup theory of intensification, the findings of Nkoya, et al. (2004) and Pender et al. (2004). As a result of this significant impact, the second hypothesis that there is no significant relationship between investment on land and input use is rejected.

Access to credit surprisingly has a negative association with use of inorganic fertilizer. This finding suggest that farmers use credit to engage in non-farm activities, which are likely to have higher returns than agricultural production and as a result it shows that access to credit is not a binding constraint to inorganic fertilizer use.

Also the table revealed that use of organic (-0.699) and inorganic (-0.583) fertilizer significant at α =0.05 and 0.10, respectively, is less likely on plots more distant from the residence, probably because of the costs of transporting such bulky inputs (especially organic inputs).

Among the agro-ecological zones rainforest zone has a positive and significant relationship with organic residue (0.747) and use of agro-chemicals (0.191) at α =0.05 and 0.10, respectively. This may be due to perennial crops like cocoa, etc., the leave fall of which added to the richness of the soil for better productivity. Likewise the tree crops often demands the use of pesticides and other forms of agro-chemicals against various kinds of pest and diseases affecting tree crops. In the savannah zone, the coefficient estimate of purchased seeds is positive and significant at α =0.10.

SUMMARY

The farmers' socio-economic characteristics revealed that about 40 percent of the farmers are between 36 to 45 years of age, a majority (94.01%) are male, and 84.1 percent of the farmers takes farming as main occupation. A total of 95.10% of the farmers' are married and 85.8 percent of the farmers' households have at least a primary education. The male education at all levels is statistically significant to the use of inorganic fertilizer while livelihood strategy of the household has no statistical significance on input use. Also, the presence of investments on land and access of farmers to credit, has negative association with the use of inputs. The bulky nature of some of the inputs, coupled with poor road network discouraged their use on distant plots while the rainforest zone has a statistical relationship with organic residue and use of agrochemicals.

RECOMMENDATION

There should be provision for land augmenting materials at affordable price to the farmers although more farmers' groups need to be formed to ensure that agricultural loans are used for the intended purposes. There is also the need for a combination of price support programs with the current credit support program provided by the government so that farmers' outputs at peak periods are bought at 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. Good road networks to near and distant farms should be topmost in the list of government priorities to ensure accessibility of these inputs and their use.

REFERENCES

1. Boserup, E. 1981. *Population and Technology Change*. University Chicago Press: Chicago, IL.

2. Fabiyi, Y.L. 1990. "Land Policy for Nigeria: Issues and Perspectives". Inaugural Lecture. Series 99 OAU: Ile Ife, Nigeria.

3. Lane, A. 1982. "The Global 2000 Report to the President". Lagos, Nigeria.

4. Nkoya, E., J. Pender, P. Jagger, D. Sserunkuuma, C. Kaizzi, and H. Ssah. 2004. "Strategies for Sustainable Land Management and Poverty Reduction in Uganda." Research Report No 133. International Food Policy Research Institute: Washington, D.C.

5. Pender, J., S. Ssewanyana, K. Edward, and E. Nkonya. 2004. "Linkages between Poverty and Land Management in Rural Uganda; Evidence from the Uganda National Household Survey, 1999/ 2000". Environment and Production Technology Division Discussion Paper No 122, International Food Policy Research Institute: Washington , D.C.

6. Swinton, S.M., G. Escobar, and T. Reardon. 2003. "Poverty and the Environment in Latin American; Concept, Evidence and Policy Implications". *World Development*. 20(10): 1-8.

ABOUT THE AUTHOR

Dr. Raufu Mufutau Oyedapo, is a Nigerian born in Oyo State Nigeria in 1971 and now married with children. He earned his first two degrees (B.Sc. and M.Sc. Agricultural Economics) from the University of Ibadan, Nigeria, and his doctoral degree in Agricultural Economics from Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State specializing in agricultural production and resource economics. Currently, he is a Lecturer I in the Department of Agricultural Economics and Extension (LAUTECH) Ogbomoso with research interests in agricultural land use and management.

SUGGESTED CITATION

Raufu, M.O. 2010. "Characteristics of Input Use by Crop Farmers in South-Western Nigeria". *Pacific Journal of Science and Technology*. 11(1):436-442.

Pacific Journal of Science and Technology