

DETERMINANTS OF FERTILIZER USE AMONG SMALLHOLDER FOOD CROP FARMERS IN ONDO STATE, NIGERIA

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Abstract

Fertilizer is an important technology in increasing food production. In this study, cross-sectional data from 110 smallholder food crop farmers were used to examine fertilizer use and the influencing factors among smallholder farmers in Ondo state, Nigeria. Descriptive statistics and Tobit regression model were used for the analysis. The results showed that 60.91% of the farmers are male and in their active age. Majority of the respondents (78.18%) are fertilizer users. The result of the Tobit model showed that years of education, distant to the nearest fertilizer market, membership of registered farmers' group, farm size, credit access and fertilizer price were significant factors influencing fertilizer use among the farmers. All the significant variables except distance to the nearest market and price of fertilizer influenced fertilizer use positively. The results suggested that in order to enhance fertilizer use, human capital such as education should be emphasized and formation of cooperatives that offer micro-finances and loans to farmers should be encouraged. Government should also ensure that the subsidized fertilizer reaches the farmers at the subsidized price.

Keywords: Fertilizer- use, smallholder, food crop farmers, Ondo state, Nigeria.

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Introduction

Agriculture is a fundamental instrument for sustainable development, poverty alleviation and enhanced food security in developing countries. It is a vital development tool for achieving the Millennium Development Goals (MDG), one of which is to halve the share of people suffering from extreme poverty and hunger by 2015 (World Bank, 2008). In Africa, agriculture is a potent option for spurring growth, overcoming poverty, and improving food security. Therefore, high agricultural productivity is imperative in stimulating growth in other sectors of the economy. In Nigeria, agriculture remains a significant sector in the nation's economy despite the extensive role of the oil sector in the economy. It serves as the economic mainstay of the majority of households in Nigeria (Amaza, 2000; Udoh, 2000). It contributes about 45% of the GDP, employs two-third of total labour force and provides livelihood for over 90% of the rural population. The sector is dominated by smallholder farmers accounting for over 90% of the total output while more than half of the farmers produce only food crops (IFAD, 2010). Farming population comprises predominantly of resource-poor peasants, cultivating an average of about two hectares of land usually on scattered holdings with rudimentary farming system, low capitalization and declining productivity resulting to high food insecurity and poverty. Consequently, increasing

agricultural productivity in the country is an urgent necessity and one of the fundamental ways of improving agricultural productivity is through introduction and use of improved agricultural technologies.

Fertilizer is one of the most important technologies in increasing food production in the world. Several policy approaches have been used to promote increased use of fertilizer in smallholder farming systems. In Nigeria, these have included the promotion of a state monopoly for fertilizer import and distribution, institution of price controls and subsidies at the fertilizer retail markets, provision of credit to farmers for the purchase of fertilizer, institution of import tariffs, decentralization of procurement and distribution, and deregulation of markets. Numerous fertilizer regulatory activities concurrently exist in Nigeria. The Standards Organization of Nigeria (SON), National Agency for Food and Drug Administration and Control (NAFDAC), Federal Fertilizer Department (FFD) of FMARD, States Ministries of Agriculture (SMAs) and agricultural research institutes under the national university system are key agencies mandated to participate in fertilizer regulation. Despite these numerous participants, fertilizer quality issues remain a challenge (Liverpool-Tasie *et al*, 2010).

Due to rapid population growth, Africa can no longer be viewed as a land-abundant region where food crop supply could be increased by expansion of land used in agriculture. Large areas in Africa are increasingly becoming marginal for agriculture and arable land has become scarce (Duflo *et al*, 2006). This makes the need for intensification of land use through adoption of productivity enhancing technologies such as fertilizer crucial for achieving food security. Despite the growing evidence that fertilizers can substantially increase yields in sub-Saharan Africa (SSA) as well as slow down environmental degradation, farmers in this region still lag far behind other developing countries in fertilizer use (Liverpool-Tasie *et al*, 2010). The fertilizer supply is limited and the cost is prohibitive for SSA farmers because fertilizer may cost as much as five times the global market price (Mosier *et al*, 2005).

In Nigeria, fertilizer subsidy occupies a central role in the policy tool kits of the government and this explains why the federal, state, and local governments have all been involved in the procurement, distribution and price determination of fertilizer at various times. The involvement of the federal government in the fertilizer distribution system dates back to 1976 when it adopted a national fertilizer policy to ensure national self-sufficiency through local production; supplemented through importation to ensure adequate and timely fertilizer supply to all Nigerian farmers; offer subsidy on the market price of fertilizer so as to make fertilizer affordable to smallholder farmers and ensure that the right quality fertilizer is accessible to smallholder farmers at the right time in the right place. The government's huge budgetary expenditure on fertilizer subsidy notwithstanding, non-subsidized prices remains high and rising in Nigeria. The nominal prices of fertilizer (type unspecified) for a 50 kg bag escalated from ₦50 in 1990 to ₦2000 in 2001 compared to the official subsidy retail price of ₦900 per 50 kg bag; suggesting that the federal and state government's subsidies are not fully transmitted to farmers (Liverpool-Tasie *et al*, 2010). According to Nagy and Edun (2002) only 30 percent of subsidized fertilizer reaches smallholder farmers at the subsidized price.

Furthermore, fertilizer use estimated at 13 kg/ha in 2009 by the Federal Ministry of Agriculture and Rural Development (FMARD), is far lower than the 200 kg/ha recommended by the FAO thereby resulting to declining soil fertility which is one of the major reasons for slow growth rate in food production in the country (Ogunmola, 2007). Consequently, low fertilizer use has been identified as a major challenge that must be overcome in order to increase Nigeria's agricultural productivity. It is in this light that this study seeks to examine fertilizer use and its determinants among food crop farmers.

Objectives of the study

The general objective of the study is to examine determinants of fertilizer use among smallholder food crop farmers in Ondo state, Nigeria. The specific objectives are to:

- Examine some socio-economic characteristics of food crop farmers in Ondo state, Nigeria.
- Examine fertilizer use among the food crop farmers in the study area
- Determine the factors influencing fertilizer use among food crop farmers in the study area.

Materials and Methods

Study Area, Sampling and Data Collection Procedure

This study was carried out in Ondo state, Southwest Nigeria. It was based on primary data collected through the use of structured questionnaire from a cross-section of smallholder food crop farmers. Data collected included demographic characteristics of the farmers; socio-economic and farm-specific variables. A multistage random sampling technique was employed to select representative food crop farmers for the study. The first stage involved the selection of two Local Government Area (LGAs) each from the two agricultural zones in the state while the second stage involved random selection of three communities from each LGA. In the final stage, ten farmers were randomly selected from each community. Therefore, a total of 120 farmers were sampled but as a result of inappropriate completion of ten questionnaires, a total of 110 farming households were used for the study.

Analytical technique

The analytical techniques employed in the analysis were descriptive statistics and the Tobit regression model. The descriptive statistics included frequency, means, percentages, tables and standard deviation. These were used to categorize the farmers according to their fertilizer use status and under different socio-economic and demographic characteristics.

Determinants of fertilizer use

Tobit regression model, a hybrid of the discrete and continuous models was used to estimate the effect of explanatory variables on the probability of fertilizer use. The choice of the model as against the probit or logit models is based on the fact that there are differentials in the level of use. The model can be expressed as:

$$\begin{aligned}
 FU_i^* &= \beta_0 + \beta_i X_i + \mu_i \\
 FU_i &= FU_i^* \text{ if } \beta_0 + \beta_i X_i + \mu_i > 0 \dots\dots\dots(1) \\
 &= 0 \text{ if } \beta_0 + \beta_i X_i + \mu_i \leq 0
 \end{aligned}$$

Where,

FU_i^* = the latent variable and the solution to utility maximization problem of intensity of fertilizer use subjected to a set of constraints per household and conditional on being above certain limit

FU_i = fertilizer use intensity for ith farmer

X_i = vector of factors affecting fertilizer use intensity

β_i = vector of unknown parameters

μ_i = error term

The independent variables specified as determinants of fertilizer use intensity are defined below:

X_1 = Gender of the respondent (D=1 if male ; 0, if otherwise)

X_2 = Age of respondent (years)

X_3 = Education (years)

X_4 = Household size

X_5 = Primary occupation of respondent (D= 1 if farming; 0, if otherwise)

X_6 = Participation in off- farm activities (D =1 if yes; 0 if otherwise)

X_7 = Credit access (D =1 if yes; 0 if otherwise)

X_8 = Land size (ha)

X_9 = Extension agent access

X_{10} = distance to nearest market(km)

X_{11} = membership of farmers' association

X_{12} = contact with extension agents

X_{13} = crop yield (tonnes/ha)

X_{14} = farming experience (years)

X_{15} = fertilizer price

Results and discussion

Socio-economic characteristics of respondents

The socio-economic characteristics of the respondents are as shown in Table 1. From the table, majority of the respondents (60.91%) are male while 39.09% are female. This might be due to the tedious nature of farming activities. About 75% of the farmers are between the age of 31 and 50. This shows that most of the respondents are in their active age. 6.37% are 30 years and below while 19.09% are above 50 years of age. Majority (50.91) of the respondents have a household size of between 5 and 9 people while 36.36% have a household size above 9. Most of the respondents (76.36%) have between 0 and 6 years of education while 23.64% have between 7 and 12 years of education. 27.27% of the farmers have farming experience of 10 years and below, 48.18% have between 11 and 20 years of farming experience while 24.55% have a farming experience of above 20 years. Most farmers (80%) have contact with extension agents while 20% do not.

Table 1: The Distribution of Respondents by Socio-economic Characteristics

Characteristics	Frequency	Percentage
Gender Female	43	39.09
Male	57	60.91
Age ≤ 30	7	6.37
31-40	32	29.09
41-50	50	45.45
>50	21	19.09
Household size 0-4	14	12.73
5-9	56	50.91
>9	40	36.36
Years of education 0-6	84	76.36
7-12	26	23.64
Years of experience ≤ 10	30	27.27
11-20	53	48.18
>20	27	24.55
Extension agent contact No	22	20.00
Yes	88	80.00

Field study, 2011

Fertilizer use status of the respondents

Table 2 reveals the fertilizer use status of the farmers in the study area. From the table, majority of the farmers (78.18%) used fertilizer on their farms while 21.82% do not use fertilizer in the study area.

Table 2: Fertilizer use status of the respondents

Fertilizer use status	Frequency	Percentage
Yes	86	78.18
No	24	21.82

Field study, 2011

Determinants of fertilizer use intensity

The factors influencing fertilizer use intensity among the farmers in the study area is as shown in Table 3. Years of education, distance to market, membership of farmers' group, farm size, access to credit and fertilizer price are significant factors in the use of fertilizer in the study area. Years of education of the farmer is significant at 10% and has a positive sign. This implies that farmers with higher level of education use more fertilizer than those with lower level of education. The coefficient is 0.0625 which means that a unit increase in years of education will increase fertilizer use by the 6.25%. This may be due to the fact that more educated farmers are enlightened on the benefits of using improved farm inputs such as fertilizer on crop production. The distance to nearest fertilizer market is significant at 5% with a negative sign. This implies that the longer the distance, the less the probability of fertilizer use. The result shows that one kilometre increase in the distance to the nearest fertilizer market reduces fertilizer use by 0.0159.

Furthermore, membership of farmers' group positively and significantly influenced probability of fertilizer use at 1%. This might be attributed to the fact that farmers' group can make bulk purchase as this will be easier and cheaper. The coefficient of the farm size was positive and significant at 5% implying that farmers with larger farms use more fertilizer than those with smaller farms. Access to credit significantly (5%) and positively influenced fertilizer use. This indicates that credit access increases the level of fertilizer use. The coefficient of fertilizer price is significant at 10% but negative. This indicates that farmers use more fertilizer when the price is low than when its price is high.

Table 3: The determinants of fertilizer use intensity among food crop farmers

Variables	Coefficients	p-value
Sex	0.2423	0.2814
Age	0.0038	0.3660
Primary occupation	0.0421	0.6321
Off- farm income	-0.0225	0.6910
Household size	0.0602	0.2833
farm size	0.1405	0.0214
Access to credit	0.2471	0.0255
Distance to market	-0.0159	0.0217
Membership of farmers' group	0.7948	0.0000
Years of education	0.0625	0.0819
Extension agent contact	0.0436	0.1473
Fertilizer price	-0.0629	0.0611
Yield	0.3451	0.1813
Constant	-0.1633	0.0000
Sigma	0.3799	

Field survey, 2011.

Conclusion and recommendation

This study is centred on fertilizer use and the influencing factors among food crop farmers. Empirical evidence from this study has revealed the fertilizer use status of the

farmers and the factors influencing fertilizer use among the farmers. The results shows that majority of the farmers use fertilizer on their farms. Years of education, distance to the nearest market, membership of farmers' group, farm size, access to credit and fertilizer price are factors that significantly influenced fertilizer use in the study area.

Based on the findings of this study, the following recommendations are made:

- The government and other policy makers should increase knowledge and skills of farmers through avenues such as field days, extension agent contact with farmers or any other means of capacity building.
- Rural credit should be emphasized in order to mobilize savings and maximize the availability of credit to the farmers.
- The government and other stakeholders should establish institutions and encourage formation of cooperatives that offer micro-finances and loans to farmers.
- Farmers should be sensitized on the need to be a member of farmers' group
- Government should ensure that the subsidized fertilizer reaches the farmers at the subsidized price.

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