PJ PALGO JOURNAL OF AGRICULTURE

Volume 2 Issue 1, January 2015 Page 24 – 31
http://www.palgojournals.org/PJA/Index.htm
Corresponding Authors Email: oafodu@gmail.com

COMPARATIVE ANALYSIS OF ORGANIC AND INORGANIC FERTILIZERS USED AMONG CROP FARMERS IN IKENNE LOCAL GOVERNMENT AREA OF OGUN STATE

***Afodu Osagie John,Bello Taofeek Ayodeji and Salau Saheed**

Babcock University Ilishan Remo Ogun State.

Accepted 29 August,2014

Arable lands are fixed and demand for food is increasing; land holdings are small because of land fragmentation due to an increasing population pressure. Unless land is intensively and more productively used, it's unlikely to provide enough food for consumption and sale. Land productivity can only improve if soil fertility were improved. To overcome the soil the soil fertility problem, farmers in Ikenne Local government area need fertilization for crop production. Rapid population growth has made Africa to be no longer viewed as a land-abundant region where food crop supply could be increased by expansion of land used in agriculture.

This study was conducted with the use purposive sampling techniques, ninety-one (91) crop farmers were selected and data was collected from them using structured questionnaire. Data were analysed using descriptive statistics and multiple regression analysis.

Majority of farmers, 75.8% of respondents had above primary education, 59.3% participated in cooperative societies, 64.8% had no contact with extension agents and 48.4% had at least 15 years of farming experience.

It was also revealed that the adoption of only organic fertilizer use increased with credit access and extension contact but declines with increase in farm size and cooperative membership. Also, adoption of the combination of organic and inorganic fertilizers increased farm size, extension access and credits access.

The results from this study show that farmers' adoption of fertilizer is influenced by farm size and extension services among other factors. Special attention need to be paid to these variables when formulating fertilizer use policy.

Keywords: Organic Fertilizer, Inorganic Fertilizer, Farmers and Land use

INTRODUCTION

BACKGROUND TO STUDY:

Agriculture continues to be a fundamental instrument for sustainable development, poverty reduction 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 by 2015 the share of people suffering from extreme poverty and hunger (United Nations Millennium Development Goals 2009.)

Nigerian agriculture has been dominated by the peasant farmers who produce the bulk of food requirements in the country. Despite their unique and pivotal role, the small holder farmers belong to the poorest segment of the populace and therefore, cannot invest much on their farms. The different circle of poverty among these farmers has led to the unimpressive performance of the agricultural sector. Efforts have been made to raise production and productivity of these farmers in order to achieve food security; such efforts have had negative implication or adverse effect on the environment. As the population density increases, farmers are expected to produce more food that will satisfy the increasing populace. As the population increases today, people are being pushed to increase food to feed the growing population will be to raise productivity and efficiency in the agricultural sector. More so that Nigeria's rapid population has outstripped the nation's capacity to grow foods.

Over the past decades, many cropping systems in Africa have been in a major transition from land abundant to land constrained. Pressure to produce more from less and lower quality land has increased soil degradation. Yields of many

major staple crops have fallen or stagnated. Due to constantly increasing pressure on available land as a result of high population densities, fallow periods have significantly reduced, and at presently rarely exceed six years (Onyebinama, 2006). As a general rule, fallow shorter than ten years will not allow the soil to recover adequately and the quality of the soil decreases with more frequent exploitation (Ewes, 1978). As a result of the diminishing fertility status of the soil due to shorter fallow periods, small holder farmers no longer produce a surplus sufficient food to feed the ever-increasing population. Application of fertilizer is inevitable for the replacement of soil nutrients that are mined through harvest annually. Adequate use of fertilizer has been found to increase agricultural output (Ogunlade *et al. 2009*).

Fertilizer is any material that supplies one or more of the essential nutrients to plants. Fertilizer can be classified into one of two categories: organic or inorganic.

Organic fertilizers are derived from living material. These materials include animal waste, crop residues, compost and numerous others by products of living organisms.

Inorganic fertilizers are derived from non-living source which include most of our man-made commercial fertilizers.

Fertilizer use is a staple of modern agriculture, and understanding the function it serves helps farmers grow their crops. By using fertilizers, farmers can reach the optimum output that their land can produce and feed more mouths at lower cost.

Soil productivity and fertility can be maintained by the use of fertilizers. The problem with the use of inorganic fertilizers on Nigeria soils is that, the fertilizers are not obtained at the right time in addition to the huge cost of procurement. Improper chemical fertilizer application has ruined tropical soils through its abuse (IFDC 2005). Poultry manure contains high percentage of nitrogen and phosphorus for the healthy growth of plants (Ewulo, 2005).

Soil fertility decline is considered a major limiting factor to achieving household food sufficiency in the majority of smallholder farming systems of sub-Saharan Africa (Okalebo et al., 2007). Crop yield decline in sub-Saharan Africa to less than 1 t/ha observed in food security crops such as maize and beans, is attributed to loss of soil fertility in smallholder systems (Sanchez et al., 1997). Declining productivity in these systems, usually characterized by low plant populations, higher incidences of pest and disease pathogens, weed infestations and stunted crop, is correlated to a number of soil related bio-physical limitations. Continental, district (Smaling et al., 1997) and farm (Shephered et al., 1996) scale studies show widespread deterioration in soil chemical, biological and physical properties in most smallholder cropping environments. These studies further reveal negative nutrient balances in major soil elements such as nitrogen (> 46 kg /ha) and phosphorus (> 3 kg/ha) in most countries in sub Saharan Africa, with average nitrogen mining in some parts of western Kenya estimated at up to 112 kg N/ha (Bekunda et al., 2007).

Despite numerous research that prove positive crop yield responses to mineral nitrogen and phosphorus fertilizer additions, lack of access due to prohibitive costs limits their use in smallholder cropping systems (Odendo et al., 2007). Decomposition and mineralization of organic resources by soil micro-organisms remains the principle pathway for N supply in the majority of East Africa smallholder farming systems (Bekunda et al., 2007), while P supply has to be sought from external sources such as mineral fertilizers (Mafongoya et al., 2003). However, recommended rates of N and P fertilizer rates are rarely met from sole use of organic materials due quality and their limited quantities available in smallholder farms as well as competing household uses for these resources (Mureithi et al., 2007). Supply of organic materials in smallholder farms is thus likely to be insufficient to adequately meet crop nutrient demands in the cropping systems. However, integration of modest amounts of inorganic fertilizers with organic materials such as compost manure or nutrient rich legume residues, offers a strategy to meet smallholder crop nutrient requirements, especially in nutrient intensive maize bean intercrop systems (Jama et al., 1997).

PROBLEM STATEMENT

Arable lands are fixed and demand for food is increasing; land holdings are small because of land fragmentation due to an increasing population pressure. Unless land is intensively and more productively used. It's unlikely to provide enough food for consumption and sale. Land productivity can only improve if soil fertility were improved. To overcome the soil fertility problem, the farmers in Ikenne Local Government area need fertilization for crop production. As noted by Duflo *et al* (2006), the rapid population growth has made Africa to be no longer viewed as a land-abundant region where food crop supply could be increased by expansion of land used in agriculture.

One of the reasons for persisting food insecurity in the region is the low level and inappropriate use of improved technologies, which acts as a principal barrier to increase farm productivity. Growth in agricultural production in the past was achieved through horizontal expansion. Today, there is a little scope for horizontal expansion because of high population density in the region.

The gap demand and supply is very wide because of the decrease in production which prevents producers to meet demand of the consumers; these demand and supply gap can be bridged by increasing land productivity through fertilization.

Continuous use of land leads to degradation; farmers that do not apply fertilizer on their plots of land rely on the land's natural fertility, with continuous cultivation. Use of fertilizer is a management method/strategy for reclamation, since

continuous use of land, without replenishing it will not only lead to decrease in crop productivity as a result of nutrient depletion, but also in land degradation.

The elimination or even the reduction of fertilizer use in developing countries would result not only in starvation and malnutrition of millions of millions but also in an increased degradation of the environment through deforestation, soil erosion and desertification, as has occurred worldwide I past centuries. In the vast majority of agricultural areas of developing countries, the certain benefits of fertilizer use to the environment to the environment overwhelmingly outweigh any of the possible but uncertain detrimental effects. Sound soil fertility management is the key to human survival. (Parish 1993; Conway and Pretty 1991).

Increased fertilizer use can help to solve Africa's environmental problems; lack of inorganic fertilizer has greater negative environmental consequences than increasing use of this fertilizer. Current agricultural practices mine soil nutrients, with average removal of more than 24kg/ha/year of Nitrogen (N), phosphorus (P), potassium (K). Organic sources are not sufficient to replace these nutrients. Inorganic fertilizer use, consistent with agronomic recommendations, will have few if any adverse environmental impacts, and many positive impacts. Increased inorganic fertilizer use will benefit the environment by reducing the pressure to convert forests and other fragile lands to agricultural uses and, by increasing biomass production, help increase the organic matter content of African soils. This organic material supplies and helps retain soil nutrients. For efficient nutrient utilization, inorganic fertilizer must be combined with organic matter, water harvesting, and controlling soil erosion in site-specific integrated soil fertility management strategies. These complementary activities help insure that maximum benefits are derived from each component practice.

RESEARCH QUESTION

What are the socio-economic characteristics of these farmers?
Has farm produced been maximized in Ikenne Local Government Area
What are the factors that influence the use of fertilizer in the Area?

OBJECTIVE OF THE STUDY

The main objective is to determine the factors that influence fertilizer use by crop farmers in Ikenne Local Government Area Ogun State.

The specific objectives are;
To describe the pattern and potency of fertilizer use among the respondent
To determine the factors responsible for maximum farm produce
To analyse the factors influencing the use of fertilizer in the area of study

JUSTIFICATION OF THE STUDY

Fertilizer use has been widely recognized for stability in food crop supply; Population is growing at an alarming rate though the area for expansion of cultivable land is limited. However, there is a significant room for yield improvement through intensification. Use of appropriate improved technologies by agricultural producers is an essential prerequisite for economic development in developed countries (Abebe Mijena, 2011). It is widely recognized that the use of modern inputs, particularly that of improved seeds and fertilizers, is closely linked to higher agricultural productivity and food security (Evanson and Gollin 2003; Crawford *et al.* 2003; Crawford, Jayne and Kelly 2006).
Increased biomass resulting from fertilizer use can increase soil organic matter; increase fertilizer use will increase crop residues, and a larger portion of them can be left on the soil to increase its organic matter, protect soils from erosion, and improve soil structure. Because of low yields, crop residues are now used for fuel, fodder and building material. These demands will certainly continue, but with higher yields some residues can remain on the soil.

MATERIALS AND METHODS

Area of study: The study was carried in Ikenne Local Government Area of Ogun State. This area was chosen because the Local Government Area is endowed with good climate typical of rainforest, which makes it favourable for the people to engage mainly in Agriculture.
The local Government area is bounded 4km to the east of odogbolu, 5km to the south by Ayepe 10km to North-east by Irolu, 4km t the North by Ilara, 2km to the East Ilishan and 7km to the west by Sagamu. (Onuah, Felix 2006).
Ikenne local government is entirely semi-urban and it comprises Iperu-remo, Ilisha-remo, Ogere-remo, Irolu-remo, and Ikenne-remo and the headquarters. The inhabitants are mainly of remo stock with trading and farming as their

predominant occupation. The Local Government Area, using 2006 national population commission census figure has 202,980 people as the population.

NATURE AND SOURCES OF DATA

Primary data were collected from farmers in the study area through the aid of structured and unstructured questionnaires administered to the farmers. The questionnaires were structured in such a way that will be able to extract information on the socio-economic and demographic characteristics of the farmers, and other inputs available and the use by the farmers

SAMPLING PROCEDURE

Simple random sampling technique was used to select ninety-one (91) respondents in the study area

ANALYTICAL TOOLS

Two types of analytical tools were used for data analysis and they are; the descriptive statistics and regression

Descriptive analysis:

The descriptive statistics involved the use of tables, average frequencies and percentage to describe the socio-economic demographic characteristics of the respondents by grouping them according to the similarities of their responses.

The Logit Regression Analysis

Regression analysis was used to examine the factors that influence the respondent's determinants of fertilizer use. For this motive, logit model was considered to suit the regression equation.
The model is stated as follows:
$Ln(P1/1-P1)=\beta o+\beta 1X1+....+\beta 9X9+e_i$(Gujarati, 2003)
P1 = Probability of using fertilizer
1-P1 = Probability of not using fertilizer
βo = the intercept
β1 = Regression coefficients that explains the relationship between determinant of fertilizer and farmer income
X1 = independent variables (i= 1, 2, 3 4,……6)
e_i = the error term
The independent variables specified as factors affecting the determinant of fertilizer, and are defined below:
X_1 = Educational status (below primary education = 0, primary education and above = 1)
X_2 = Farm size, (hectares);
X_3 = Household size;
X_4 = Access to extension services (yes=1, no=0)
X_5 = Access to credit facilities (yes=1, no=0)
X_6 = Cooperative membership (yes=1, no=0)
X_7 = Farming experience (Years)
X_8 = Farms affected by degradation (yes=1, no=0)
X_9 = Use of fertilizer for conservation (yes=1, no=0)
e_i = error term

RESULT AND DISCUSSION

SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

Table 4.1 Distribution of farmers by level of education

Level of Education	Frequency	Percent
Below primary education	22	24.2
Primary education and above	69	75.8
Total	91	100.0

Source: field survey, 2012

Table 4.1 shows that majority of the farmers (75.8 percent) had primary education. This indicates that the farmers could understand the importance of fertilizer application. Twenty-four percent of the respondent had no formal education.

Table 4.2: Distribution of farmers by size of cultivated land

Farm Size (Ha)	Frequency	Percent
0.1-1.0	34	37.4
1.1-2.0	50	54.9
2.1-3.0	7	7.7
Total	91	100.0

Source: Field survey, 2012

Table 4.2 shows that majority of the farmers cultivates between 1.1ha to 2.0ha. Fifty-six percent of the farmers have more than 1.5 hectares of farm land. This could be attributed to the cost of labour or management practices involved in the distribution of fertilizer.

Table 4.3 Distribution of respondents by years of experience

Years	Frequency	Percent
11-20	44	48.4
21-30	38	41.8
31-40	8	8.8
41-45	1	1.1
Total	91	100.0

Source: field survey, 2012

Table 4.3 shows that 48.4 percent of the respondents have 11-20 years of experience, this indicates that majority of the farmers are experienced enough to know the importance of fertilizer.

Table 4.4 Distribution of farmers by household size

Household size	Frequency	Percent
2	5	5.5
3	26	28.6
4	42	45.1
5	15	16.5
6	4	4.4
Total	91	100.0

Source: field survey, 2012

Table 4.4 shows that 45.1percent of the farmers have four children; this could be attributed to their level of education and income of farmers.

Table 4.5 Distribution by farmer's access to extension

Extension service	Frequency	Percent
No	59	64.8
Yes	32	35.2
Total	91	100.0

Source: field survey, 2012

Table 4.5 shows that 68.1 percent of the farmers have access to credit facilities 41.8 percent of them are from cooperative, 17.6 percent was from the bank and the remaining 14.3 percent of the farmers are through other sources.

Table 4.6 Distribution of farmers affected by degradation

Degradation	Frequency	Percent
No	3	3.3
Yes	88	96.7
Total	91	100.0

Source: field survey, 2012

Table 4.7 Distribution of farmers by those that use fertilizer for conservation

Degradation	Frequency	Percent
No	23	25.3
Yes	68	74.7
Total	91	100.0

Source: field survey, 2012

Table 4.7 shows that 74.7 of the farmers conserve their soil with fertilizer. This indicates that majority of this farmer knows importance usefulness of fertilizer on their crop and to the soil itself.

Table 4.8 Parameter estimates of logistic regression model for the determinant of organic and inorganic fertilizer use.

ORGANIC			**INORGANIC**	
Variables	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error
Constant	22.541	25.402	-1.689	2.647
Education	-0.297	0.598	0.085	0.609
Farm size	-0.955*	0.536	0.920*	0.547
Family size	-0.477*	0.275	0.541*	0.283
Extension	-1.011*	0.562	1.062*	0.568
Credit access	1.270*	0.720	1.254*	0.730
Farming experience	0.013	0.410	-0.017	0.414
Cooperative access	1.640**	0.716	1.839**	0.734
Degradation	-19.702	25.402	-1.039	1.528
Conservation	0.446	0.586	-0.709	0.599

Source: field survey, 2012

	ORGANIC	INORGANIC
Model chi-square	19.28*	17.27*
-2 Log likelihood	106.779*	108.343*
Nagelkerkr R square	25.5	23.1

*** Significant at 1%, ** Significant at 5%, Significant at 10%

DISCUSSION OF ORGANIC FERTILIZER USE ONLY:

The Chi-square statistics for organic fertilizer use indicate that the variables included in the model were significantly different from zero at 100%. This indicates a good fit and the correctness of specified and distributed assumption of the composite error term. Regression result shows that farm size, family size, extension access, credit access, cooperative membership is significant in to study. He estimated coefficients represent a change in odds

Regarding farmers' resources endowment, coefficients of farm size appears significant at 10% and has a negative sign, implying that per hectare fertilizer use decreases with farm size. This could be reflecting an increasing efficiency of

fertilizer productivity as farm size increases or due to bulkiness of organic fertilizer with regards to quantity needed. Household size is negative and significant. This could discourage adoption of only organic fertilizer because as farm size is increasing additional labour will be required. Extension is significant at 10%, this implies that organic fertilizer use will increase 1.011 if there is extension contract in the area because the importance of organic farming and pattern of application of input will be addressed b this agents. Credits access is positive and significant because of their awareness about government provision on fertilizer through extension agents. Cooperative membership is significant which implies the encourages of the adoption of this input (organic farming). This could be as a result of cooperative involvement in some marketing function e.g. distribution, ready market etc.

DISCUSSION OF INORGANIC FERTILIZER USE:

For the use of inorganic fertilizer the chi-square statistics indicated that the parameters included in the model were significantly different from zero at 10%.

Farm size appears significant at 10%, implying that per hectare fertilizer use increases with farm size. This could be as a result of different fertilizer use. As expected, household size has a positive and significant influence on the probability of adoption and use intensity of fertilizer in the study area. This implies that household size provided a proxy for farm labour, especially in the transportation and application of fertilizer. This result is consistent with previous findings (Minto *et al,* 2000; Bamire *et al,* 2002) who observed a positive influence of household size on the adoption of fertilizer in the derived savannah of Nigeria.

Extension is significant at 10%; this implies that there will be increase in the fertilizer use because the extension agent would encourage agent would for the use of fertilizer. Though Daramola and Aturamu (2000) who noted that contracts with extension agents as well as acquisition of formal education exposes the farmer to the availability of technical-know-how of innovations and increases their desirability for acquiring it. Credit access is significant; therefore adoption of inorganic fertilizer use will increase because access to credit would encourage expansion of farm size and acquisition of more input to increase production. With respect to cooperative membership the coefficient is positive and statically significant at 5% level. This result shows that cooperative motivates farmers to adopt this input use which could base on the involvement of cooperative in distribution of fertilizers and other marketing functions.

SUMMARY, RECOMMENDATION AND CONCLUSION

SUMMARY OF FINDINGS

During the course of this study, farmers were interviewed to examine the factors that determine their use of fertilizer.
Findings shows that majority of the farmers (75.8 percent) had primary education, which literarily means that most of the respondent would know the importance of fertilizer input on their farm.
Reasonable numbers of farmers also participate in the cooperative society which should be an added advantage to their use of fertilizer but since the cooperatives are not involved in distribution of this input, this could cause delay in the distribution and exploitation by middlemen.
Majority of the farmers claimed not to have come in contact with extension workers who were supposed to give them adequate information on fertilizer.
Majority of the farmers had access to credit facilities either through banks or cooperative membership.

RECOMMENDATION

With regards to findings of this study, the following recommendations are made;

Cooperative society should be involved in sales of fertilizer so as to facilitate distribution
Federal government should respond to allocation of fertilizer on time
Government should provide subsidized fertilizer. This is to reduce cost of production
Credit facilities should be made available to farmers in form of needed inputs and not in direct cash
Government should create agricultural centre and put extension agents there as coordinator
Government should build more outlets for fertilizer and it should also be close to the farmers
More efficient should be made to make organic fertilizer less bulk to encourage organic farming.

CONCLUSION

This study has analysed the determinants of fertilizer use by farmers in Ikenne Local Government Area of Ogun State. The result of these findings has shown that input like fertilizer can bring about food stability, breached demand and supply gap and improve the standard of living of farmers through increased yield.

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