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Factors Affecting Application of Inorganic Farming Practices by Small Farmers in Kogi State, Nigeria

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ABSTRACT The paper assessed the factors affecting application of inorganic farming practices in Kogi State, Nigeria, from 120 respondents using structured interview schedules. The objectives included to: characterize the respondents, determine sources of information, ascertain the effects of socio-economic variables on the income of the farmers, and identify constraints associated with inorganic farming practices. The result reviewed that young, experienced farmers with no formal education dominated inorganic farming practices. The majority (85%) learned of inorganic farming practices from sources other than extension services. Regression analysis indicated a significant positive relationship between age, years of experience and sources of credit on the farmers' level of income at a 5% probability level. The farmers indicated high cost of fertilizers and limited access to credit as their major constraints inorganic farming practices. The present research paper endeavors to study the increased extension efforts, effective marketing, and distribution system and easy accessibility to credit facilities.

INTRODUCTION

Agriculture has traditionally been characterized as the mainstay of the Nigerian economy with many assigned roles to perform in the course of the country's economic development. Garba et al. (2010) noted that in Nigeria, agriculture used to be an important and dominant sector of the economy, contributing up to 42% of the Gross Domestic Product (GDP). However, the performance of agricultural sector in the last few decades remained far from expectations in terms of efficient crop production. The extent, to which the expected roles have been adequately played, lies greatly in the agricultural productivity.

Factors militating against sufficient crop production can be social, political, scientific and technological including the use of fertilizer. Most African soils are fragile and low in fertility (International Centre for Soil Fertility and Agricultural Development (IFDC) 2005) and they are unable to support reasonable agricultural production (Singh 2003). Besides, insufficient utilization of nutrients from fertilizers, fertilizer rates and types and appropriate application methods also contribute to the persistent low yield and economic low returns out of farmers' fields. Salimonu (2007) potentially emphasized that increased cultivation on less productive lands is a major cause of declining yield among small-holder farmers. To reverse the declining yield trends, intensification through the use of inorganic fertilizers and other land augmenting technologies is very essential.

Fertilizer, generally refer to chemically synthesized plant nutrient compounds which are usually applied to the soil to supplement fertility. Inorganic or mineral fertilizers are mined out of mineral deposits with little processing such as lime, potash or phosphate rock or industrially manufactured through chemical processes such as Urea (Singh 2003). The demand and use of fertilizer has a close interaction on the supply factors. In Nigeria, there is a significant unsatisfied demand for fertilizer, only about one-third of the demand is being satisfied (Singh 2003). Inadequate supply of fertilizer has led farmers to rely heavily on organic waste as an alternative source of plant nutrients.

Farm lands in Nigeria, especially the ultisols which constitute the main agricultural lands in South-Eastern Nigeria, suffer the constraints of depleted essential plant nutrients as a result of erosion, leaching, low organic matter contents and high soil acidity (Okpara 2011). Inorganic fertilizer is one of the most economical and reliable productivity enhancing inputs available. However, most Nigeria farmers under-fertilize their farms, apparently due to unavailability of the commodity. Quoting an instance, a study conducted by Maiangwa et al. (2007) reported that farmers in the North West region of Nigeria

applied between 41.5kg and 67.2kg per hectare of inorganic fertilizer in contrast with the recommended inorganic fertilizer application rate of 120kg – 215kg per hectare depending on the crop. It is pertinent to note that Nigeria cannot hope to produce enough food to feed her teeming population without using yield increasing technologies, including inorganic fertilizer. Idachaba (1994) identified some central elements which constitute the pivot upon which increase in productivity per unit of land revolves viz: high yield seed varieties that are fertilizer responsive and resistant to pests; capacity to domestically produce adequate quantities of inorganic fertilizer or to import them; extension agents to transmit knowledge on correct fertilizer application and related agronomic practices; efficient fertilizer marketing and distribution system; and appropriate national farm input policy.

During the pre and post independence era, the Nigerian Government implemented scores of agricultural development programs ostensibly to capture the interest of farmers in agriculture. The relegation of agriculture in the nation's economy, and the present day attitude of farmers, calls for continued examination. Akubuilo (2004) and Ugwoke et al. (2005) noted that there is growing awareness of farmers' changing attitude towards such innovations. Sometimes, farmers' attitude towards such innovation may play a decisive role. Farmers' attitude are more likely to correspond with their behavior and in most cases, attitude influences a broad range of behaviors. These may be attributed through some of the following; lack of knowledge by farmers; poor education and information by farmers towards inorganic fertilizers, poor extension service and contact, among others. These and other factors distracting farmers' attitude towards using the yield increasing technologies, need to be addressed. These problems have forced farmers to cultivate without ameliorating the soil to produce quantitative and qualitative agricultural products which will meet the recent challenges of agricultural markets for reasonable income. It is against the backdrop that this paper sought to investigate the factors affecting application of inorganic farming practices among small farmers in Kogi state, Nigeria.

Objectives

(1) Describe the socio-economic characteristic of the farmers;
(2) Determine farmers' source of information;
(3) Ascertain the effect of some socioeconomic variables on the income of the farmers; and
(4) Identify the constraints associated with inorganic farming practices.

Literature Review

Past studies have documented some factors affecting application of inorganic farming practices among small-scale farmers. Aderi et al. (2013) observed that though, the nutrients supplied by mineral fertilizers are usually specific and released rather fast, minerals fertilizer do not have significant residual effect after the year of application. However, it has been reported to increase soil acidity and nutrient imbalance. This implies that long term usage of inorganic fertilizer is detrimental to the soil. Unagwu et al. (2013) argue that due to the poor nutrient capacity of the soil and the usual difficulties with unfavorable climate and weather in the recent years, the application of inorganic fertilizers are usually lost to leaching. Otunaiya et al. (2012) opine that inorganic fertilizer seems to be the only practical way to provide enough plant nutrients to restore African's nutrient-depleted soils and feed Africa human population.

Akpan et al. (2012) identified education, extension services, rainfall pattern and soil textures as important determinants of fertilizer demand decision in Kenya. Olayide et al. (2009) in Nigeria, established that the intensity of fertilizer use increases with the family labour and physical access to fertilizer. Also in Nigeria, Amanze et al. (2010) proved that output of crop, level of education, farm size and price of fertilizers were important factors influencing farmers' use of fertilizer in arable crop production. In spite of the early adoption of fertilizer technology by small-scale farmers (arable crops), crop output have not shown encouraging growth rate as observed by (Kogi State Fadama Development Project (KSFDP) 2013). Therefore, following the current situation of low growth rate of crop outputs, rapid population growth and unintended objective from the highly publicized fertilizer subsidy program in Kogi State, Nigeria, there is the need to uncover factors which could hinder optimum use of inorganic fertilizer among small-scale farmers in the State.

METHODOLOGY

The study was carried out in Kogi state, Nigeria. The state lies between latitude 71'49^0 North and longitude 61'45^0 East, with a geological feature depicting young sedimentary rocks and alluvium along the riverbeds, which promotes agricultural activities and has an average maximum temperature of 33.2^{0}C and average minimum of 22.8^{0}C. Ethnically, Igala, Yoruba, Egbira, Nupe and Bassa form the main ethnic groups. Kogi state occupies 29,833 square kilometers and has a population of 3,314,043, out of which 1,672,903 are male and 1,641,140 are female (National Population Commission (NPC) 2007). The state has two distinct weathers. The dry season, which lasts from November to February and rainy season that lasts from March to October. Annual rainfall ranges from 1016mm to 1524mm Kogi State Fadama Development Project, (KSFDP) 2013). Farmers in the state constitute the population for the study. Multistage sampling technique was used to select the respondents for the study.

Stage 1: This involves selection of four Local Government Areas (LGA) Lokoja, Ibaji, Kogi and Idah, out of the 16 LGAs in the state, based on the agrarian nature of the areas.

Stage 2: From each of the 4 LGAs, 3 town communities were randomly selected based on the high concentration of agricultural activities, thus giving a total of 12 communities.

Stage 3: 10 respondents with six years of farming experience and above were randomly selected from each of the 12 communities, thus yielding a sample size of 120. The preferences for farmers with long years of experience was made so as to get the most useful knowledge, information and experience on the factors affecting application of inorganic farming practices.

Data for the study were collected through structured interview schedule that was validated by experts in agricultural extension. The structured interview schedule contained several sections, each comprising multiple statements with different units of measurement. To determine the sources of information by the farmers on production activities, a list of possible available information channels was complied and the respondents were asked to indicate the channels in which they sourced information most. To obtain a quantitative measure of the respondents on the factors affecting application of inorganic farming practices, a list of possible factors was compiled and made available, and respondents were asked to rate the factors using four-point Likert type scale with values of strongly agree = 4; agree = 3; disagree = 2; and strongly disagree = 1. This was used to determine each respondent's level of agreement or disagreement with the statements. A cut off point of 2.5 was used to select statements which were perceived favourably by the respondents. For all the statements, a mean score of 2.5 and above depicts a favourable factor while a mean score below 2.5 indicates unfavourable factors militating against effective application of inorganic farming practices. Multiple regression analysis was employed to ascertain the effect of some selected socio-economic variables on the income of the farmers on application of inorganic farming practices.

Objectives 1, 2, and 3 were realized using frequency, percentages, means, mean score and prioritizing the result of four-point Likert type scale. Objective 4 was achieved using multiple regression analysis. The multiple regression model was explicitly specified as

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, \ldots\ldots\ldots\ldots\ldots) e_i$

Where

Y = annual income of farmers (₦)

X_1 = age of farmers (years)

X_2 = educational level (years)

X_3 = household size (number of persons living together)

X_4 = size of farm holding (hectare)

X_5 = years of farming experience (years)

X_6 = Source of credit (dummy = sourced = 1, otherwise = 0)

X_7 = Membership of farmers' organization (dummy = member = 1,

otherwise = 0

e_i = stochastic error term.

RESULTS AND DISCUSSION

The results, as displayed in Table 1 provided an interesting insight into the respondents' socio-economic backgrounds. Majority (60%) were male while 40% were female. Most 63.33% of the respondents were within the age range of 40 – 49 years; 50 – 59 years fell within age bracket of 20%; 10% within 30 – 39 years; while those within 60 years and above accounted for only 6.67%, with a mean age of approximately 47 years. A major asset of the farmers is their age. This is in consonance with Akpan et al. (2012) in their study of factors influencing fertilizer use intensity among small holder crop farmers in Abak Agricultural Zone of Akwa-Ibom State, Nigeria. The relatively youthful age is an added advantage and hence, it is necessary to harness and

exploit these assets in youths in time and in the right way.

Table 1 also exhibits that most (85%) of the respondents were married, a trend which implies that majority of them have family responsibilities that need financial commitments. Educationally, majority (60%) of the respondents had no formal education indicating that most of them had low level of awareness about agricultural activities as a result of their low level of education. The result satisfies *apriori* expectation because increase in education would tend to enhance agricultural innovation and adoption. The results corroborate the findings of Olwande et al. (2009) in Kenya. This also gave credence to Nenna (2012) who found that 64% of his respondents on factors influencing women participation in fisheries activities in Anambra-West Local Government Area of Anambra State, Nigeria had no formal education.

The results further revealed that majority (56.67%) of the respondents had a household size of 6-10 people, 23.33% had 11-15 people, while 1-5 people had 11.67%, and the remaining 8.33% had 16-20 people. This implies that the farmers had a fairly large household, which could probably serve as an insurance against shortfalls in supply of farm labour. Household size has a great role to play in family labour provision in agricultural sector. The results agree with the findings reported by Amanze et al. (2010) in Owerri Agricultural Zone of Imo State, Nigeria and Akpan and Aya (2009) in Wetland Region of Cross River State, Nigeria. A good proportion of the respondents (43.33%) had 2-3 hectares of farm holding and 40% had less than one hectare, with an average farm holding of 2.23 hectares, hence could be regarded as small-scale farmers. With regard to farming experience, 41.67% had 11-15 years farming experience, with an average farming experience of 15.4 years. This implies that the respondents have had considerable experience in farming, which could serve as an advantage in day to day running of farming activities. A greater proportion (53.33%) of the respondents belonged to 3-4 associations, with an average farmers' organization of approximately 3. Unnayan (2010) noted that promotion of farmers' organizations and reinforcing capacities of the producers will enhance access to improved services. This has implication for extension organizations to encourage farmers to form groups to enable them gain better access to resources for increased agricultural production and productivity.

Table 1: Socio-economic characteristics of the respondents

Variable	*Frequency*	*Percentage*	*Mean*
Sex			
Male	72	60.00	
Female	48	40.00	
Age			
30 – 39	12	10.00	
40 – 49	76	63.33	
50 – 59	24	20.00	
60 and above	8	6.67	46.53
Marital Status			
Married	102	85.00	
Single	10	8.33	
Widowed	8	6.67	
Educational Level			
No formal education	72	60.00	
Primary education	36	30.00	
Secondary education	10	8.33	
Tertiary education	2	1.67	
Household Size			
1 – 5	14	11.67	
6 – 10	68	56.67	
11 – 15	28	23.33	
16 – 20	10	8.33	9.42
Size of Farm Holding (Hactares)			
Less than 1	48	40.00	
2 – 3	52	43.33	
4 – 5	20	16.67	2.23
Years of Farming Experience			
6 – 10	16	13.33	
11 – 15	50	41.67	
16 – 20	34	28.33	
21 – 25	20	16.67	15.42
Membership of Farmers' Organization			
1 – 2	50	41.67	
3 – 4	64	53.33	
5 – 6	6	5.00	2.8
Source of Credit			
Banks	10	8.33	
Money lenders	25	20.83	
Isisu	29	16.67	
Friends/relatives	3	2.50	
Personal savings	62	51.67	
Source of Inorganic Fertilizer			
Open market	68	68.33	
Agricultural development Programme (ADP)	12	10.00	
Cooperative society	26	21.67	
Annual Income (N)			
50,000 – 75,000	38	31.67	
76,000 – 100,000	52	43.33	
101,000 – 125,000	20	16.67	
126,000 – 150,000	10	8.33	88,258.38

The data in Table 1 also indicated that the respondents (51.67%) sourced their credit through personal savings, indicating that most of the respondent's access fund from personal savings to service their various farming activities. The data further revealed that the respondents (68.33%) purchased their inorganic fertilizer from open market at unofficial high prices which may be attributed to the interference of middlemen and government officials in the distribution system. Most (43.33%), realized annual income of between N76,000.00 to N100,000.00 per annum, with mean annual income of N88,258.33k.

Source of Information

The results in Table 2 show that only 15% of the respondents learned of application of inorganic farming practices through extension agents while majority 85% learned of them from other sources, indicating a gap in extension service delivery system which could be addressed through intensified efforts of extension agents. However, Nenna (2011) observed that extension services bear great potential for improving the productivity of natural resources, promoting the right attitude among natural resource managers. The service is recognized as an essential mechanism for information delivery and advice as input, into modern resource management. It could also be deduced from Table 2 that fellow farmers (26.67%) played a very important role in the dissemination of useful and practical information to the audience on the application of inorganic farming practices to improve production and productivity.

Effect of Socio-economic Variables on Application of Inorganic Farming Practices by Small Farmers

Multiple regression analysis was used to predict the effect of selected socioeconomic variables (independent variables) on the income (dependent variable) of the respondents involved in application of inorganic farming practices. The selected predictors were; age of the farmer (X_1), educational level (X_2), household (X_3), size of farm holding (X_4), years of experience (X_5) source of credit (X_6), and membership of farmers' organization (X_7). The data were fitted and tried in four functional forms of linear, exponential, semi-log and double-log. Output of double-log was chosen, since, it gave the best result in terms of signs, magnitudes, and significant parameter estimates.

Table 2: Distribution of respondents according to information sources

Information source	*Frequency*	*Percentage*
Radio	5	4.17
Television	3	2.50
Extension agents	18	15.00
Fellow farmers	32	26.67
Farmers' organization	20	17.50
Fertilizer marketers	16	13.33
Text messages	25	20.83

Of the seven socio-economic variables considered as independent variables, three (X_2, X_5 and X_6) were found to influence the farmer's income in the study area (see Table 3). The estimated co-efficient for X_2 were positively correlated with the income of the farmers and statistically significant at a 5% probability level. This implies that any increase in this variable will increase the income of the farmers in the area. The implication of this is that farmers with higher educational qualifications earned higher farm income. This is in line with *prior expectations* that educational level should have positive effect on farm income. This is in line with the observation of Otunaiya et al. (2012) that education is one of the major socio-economic factors that are likely to influence output and the productivity of farmers as well as quantity of inorganic fertilizer use and the rate of use. Years of experience had positive and significant influence on farm income. This implies that farmers, who have been farming for long a time, would have accumulated knowledge to adopt modern farming techniques, and now have become more efficient in production and earn higher income. The significant and positive influence of access to credit on farm income among the farmers in the area is an indication that farmers who accessed credit and utilized it well had their farm income improved. This finding corroborates with Nenna et al. (2012) who in their separate studies confirmed the realization of higher income by farmers who accessed and properly utilized credit facilities. The estimated co-efficient of X_1 (age) was negatively correlated with the income of the farmers. The negative relationship implies that an increase in this variable will decrease the income of the farmers. However, Nenna (2012) observed that irrespective of age, most people assume more roles for higher economic return to meet their household obligations.

The output of the regression analysis showed an R^2 of 0.85. This implies that about 85% of the variation in the income of the respondents was

Table 3: Multiple regression results for the effect of selected socio-economic variables on the application of inorganic farming practices

Variable	*Regression coefficient*	*t-Value*	*Significant*
Constant	11.578	0.715	0.423a
X_1 (Age)	-1.642	-0.268	0.527
X_2 (Educational level)	3.795	0.307	0.000*
X_3 (Household size)	0.732	0.425	0.237
X_4 (Size of farm holding)	0.695	0.534	0.351
X_5 (Years of experience)	0.461	0.307	0.002*
X_6 (Source of credit)	0.391	0.567	0.001*
X_7 (Member of farmers' organization)	0.578	0.239	0.137

R^2 = .85. F-value = 12.356, * = significant at a 5% level of significance

accounted for by joint actions of the seven independent variables. The high value of R^2 observed is an indication that the explanatory variables were sufficient to explain the variations in farming activities, while the remaining 15% was as a result of non-inclusion of some explanatory variables, errors in estimation, as well as other factors outside the study. This implies that the indicators considered were relevant socioeconomic variables that influenced farming activities in the area. The overall result was found to be statistically significant, as F-static value of 12.356 was significant at a 5% level of significance. Also the Durbin-Watson value of 1.728 which lies within the bench mark of 2.0, indicated an absence of autocorrelation among the factors considered.

Prioritized Constraints to Application of Inorganic Farming Practices

Farmers were asked to prioritize their most important barriers to the application of inorganic farming practices. The priority barriers as perceived by farmers were summarized as presented in Table 4 and can be categorized into (1)

Table 4: Prioritization of constraints to application of inorganic farming practices

	Statements	*Weighted mean*	*Interpretation*	*Priority*
Production	High cost of fertilizer	4.00	Strongly agree	1
	Increases cost of production	3.82	Agree	2
	Capacity to apply the recommended quantities	3.77	Agree	3
	Difficulties with unfavourable climate and weather	2.83	Agree	4
	Increases pest and diseases of crops	2.74	Agree	5
	Increases weed manifestation	2.70	Agree	6
	Affects quality of produce	2.67	Agree	7
	Having no knowledge by farmers	1.15	Disagree	8
	Inappropriate methods of application	1.13	Disagree	9
Marketing and	Unavailability of fertilizer	3.86	Agree	1
Distribution	Lack of efficient marketing and distribution system	2.95	Agree	2
	Inadequate supply of fertilizer	2.83	Agree	3
Institution	Limited access to credit	4.00	Strongly	1
	Unavailability of fertilizer	3.86	Agree	1
	Unavailability of fertilizer	3.86	Agree	1
			Agree	1
	Lack of extension agents	3.83	Agree	2
	Poor education and information	3.75	Agree	3
	Lack of support by government	2.85	Agree	4
	Poor water harvesting techniques	2.71	Agree	5
	Lack of appropriate national farm input policy	2.58	Agree	6
Attitude	Middlemen buy at low prices	3.77	Agree	1
	Middlemen sell at high prices	3.63	Agree	2
	Consumers are reluctant to pay	3.10	Agree	3
	Not willing to cultivate	0.88	Strongly disagree	4

production, (2) marketing and distribution (3) institutional, and (4) attitudinal. The result show that high cost of fertilizer (x=4.00) was ranked as the highest priority in the list of barriers with respect to crop production activities. The second priority was that it increases cost of production (X = 3.82). This implies that farmers are taking farm records to some extent and are aware of the importance of fertilizer as one of the yield increasing technologies and also aware that most Nigerian soils are fragile and low in fertility. Considering the marketing and distribution barriers, unavailability of fertilizer (X = 3.86) was the most important barriers from farmers' point of view. As seen in Table 4, with respect to institutional barriers, limited access to credit and finance (X = 4.00) was the most important barriers cited by the farmers. Also of all the variables considered lack of credit and high cost of fertilizer were at the top of the list as indicated by the farmers. The result satisfies *apriori* expectation because; lack of credit and high cost of fertilizer would tend to affect agricultural production negatively. The results corroborate the findings of Kelly (2006) in Ngeria et al. (2006) in Ethiopia and Akpan et al. (2012) in Nigeria. Data in Table 4 indicate that the major constraining factor with regard to attitudinal was that middlemen buy produce at low prices, and sell at high prices. This attitude inhibits the moral of the farmers to increase their production and maximize the necessary profits.

This could be attributed to the fact that the farmers battle with sun in its nakedness and rains in its intensity while the middlemen, without any labour are enjoying the gains of their sweat.

CONCLUSION

The results have informed that relatively young married, experienced, dynamic, with no formal education dominated inorganic farming practices in the study area. There was a dearth of extension services, which could be addressed through intensified efforts of extension agents. Some of the socio-economic variables tested in multiple regression analysis were significant at a 5% probability level and found to be positively correlated with the income of the farmers. The farmers encountered many problems which militated against their full application of inorganic farming practices.

RECOMMENDATIONS

The paper recommended that extension should step up to its responsibilities in ensuring effective and practical information dissemination and delivery to end users. Nigerian government should establish effective marketing and distribution system to connect inorganic farmers and check the activities of middlemen, to enable the farmers, still remain in agricultural production. Finally, there is the cardinal necessity of improved access to education, support and policy on agricultural inputs, and accessibility to credit facilities from financial institutions.

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