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RESEARCH ARTICLE

Farmers' Perception on the Use of Inorganic Fertilizer in Yam Production on Eroded Soils of South Eastern Nigeria

Chukwu AO[1], JC Nwaiwu[1] and IE Nwosu[2]

[1]Department of Agricultural Economics, Extension and Rural development, Imo State University, Owerri, Nigeria; [2]Department of Rural Sociology and Extension, Michael Okpara University of Agriculture, Umudike, Abia State Nigeria

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***Corresponding Address:**
AO Chukwu
andychuks2009@yahoo.com

ABSTRACT

The study focused Farmers' perception on the use of inorganic fertilizer in Yam production on eroded soils of Southeastern Nigeria. It specifically determined the influence of socio-economic characteristics of yam producers on inorganic fertilizer use, determined factors affecting farmers' use of inorganic fertilizer, ascertained farmer perception on inorganic fertilizer use, and extent of closeness of the problems or attributes and the use of inorganic fertilizer. Three States (Abia, Anambra and Imo) were purposively selected among others in the study area. Sixty farmers (Yam producers) were randomly selected from the selected states. A set of structured questionnaire was used to sort for primary data. Analysis was carried out using percentages, chi-square, regression model and contingency coefficient (c). Results showed that crop yield, availability of fertilizer, easy of procurement, skill of application, soil condition, income level of farmers were among factors that influence inorganic fertilizer use. Socio-economic factors of the farmers determined up to 81% variations in the quantity of fertilizer used. Annual income and experience were significant at 1% level, while age and farm size were significant at 5% level. High cost, inadequate extension services, skill of application, difficulty of obtaining fertilizers were some of the major problems of fertilizer use in the study area. Determining the degree of association between the two attributes, the value of coefficient was 0.487 indicating that degree of association between them was upto 49% showing that stated constraints contributed significantly to the use of inorganic fertilizer. The null hypotheses postulated were all rejected. The study recommends increase extension services to famers to enable them appreciate the need to use inorganic fertilizer for this improves their perception about the product.

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INTRODUCTION

Farmers in Southeastern Nigeria traditionally relied on extended fallow periods of 10-15 years following a two-three year production cycle to maintain crop yields and soil fertility. High rate of erosion and population increase have made it difficult to maintain soil quality and increase production using these extensive techniques. Declining fallows lead to various forms of land degradation. The soil fertility of cultivated land is no longer able to regenerate naturally; farmers are pushed onto Marginal environmentally fragile lands; and vegetative cover, which protects soil against erosion, progressively disappears.

It is estimated that 72% of African arable land and 31% of pasture lands have already been degraded as a result of erosion (Oldeman Hakkeling and Sombroek, 1991). Fragile soils with poor buffering capacity have been particularly susceptible to this type of degradation when cultivated continuously. This has caused a 7% loss of agricultural productivity on irrigated lands, 14% loss on rain fed crop land, and 45% loss on rangeland (Crossom and Anderson, 1994). Declining soil fertility is considered by some to be the most fundamental impediment to agricultural growth and a major reason for decreasing trends in tuber crop production in Sub-Saharan Africa (SSA) generally (Sanchez *et al.,* 1995).

The World Bank has estimated that an agriculture production growth rate of 4% per annum is required to stimulate a satisfactory level of general economic development in Africa (World Bank, 1989). To achieve this rate, labor productivity must increase by 1.5%

annually and land productivity by 3% (World bank, 1993). Moderate use of inorganic fertilizer is one of the most important ingredients to achieving increase land productivity. Inorganic fertilizers are chemical combinations of the nutrients that plants must have to grow, and available in a form they can use (Louis, 1997). Inorganic fertilizer seems to be the only practical way to provide enough plant nutrients to restore Africa's nutrient-depleted soils and feed African human population (Ahemba, 2009). Fertilizer use in Nigeria decreased from over 500,000 nutrient tons in 1993/94 to approximately 100,000 nutrient tons in 1999/ 2000, because fertilizer market is not functioning properly, transaction cost is high, fertilizer is not readily available and quality is poor (IFDC, 1996).

In developing countries of Asia, Nigeria and Latin America, Chemical fertilizers has played a key role in helping farmers overcome land constraints and increase aggregate production (Bumb, 1995). To feed her growing population, Nigeria must increase food production by 4% per year for the next 10 years. To accomplish this challenge, the use of inorganic fertilizer must increase from an average of 10-50kg/ha; since organic sources of soil nutrients will not be sufficient (Okoloko, 2006). Fifty percent of the increase in India's grain production has been credited to fertilizer (Hopper, 1993 quoted in Bumb, 1995). A third of the increase in cereal production world-wide is due to the use of fertilizer and related factors (Bumb, 1995). A review of nine West African cotton producing countries showed that the use of fertilizer increased yields from 310 to 970 kg per hectare during the 1960-1985 periods (Pieri, 1989). Despite wide-spread recognition of the importance of inorganic fertilizer use, use rates remain alarmingly low. Uganda farmers use an average of one kilogram of nutrients per hectare of arable land, compared to 35 in Kenya, 22 in Malawi and 13 in Tanzania (Wallace and Knausen berger, 1997). This low rate of fertilizer use is particularly worrisome given that Uganda has one of the highest rates of soil nutrient depletion among countries in Sub-Saharan Africa (Stoorvogel and Smaling, 1990). Also, average per hectare use of fertilizer in South-eastern Nigeria remains low despite compelling evidence that chemical fertilizers have a critical role to play in increasing agricultural productivity. Could it be that farmers do not see the need to use it or have negative perception towards its use? In efforts to address this issue, the study:

i) determined the socio-economic characteristics of yam producers that influence their use of inorganic fertilizer;

ii) determined factors affecting farmer use of inorganic fertilizer;

iii) ascertained farmer perception on inorganic fertilizer use; and

iv) ascertainedthe extent of closeness of the problems or attributes and the use of inorganic fertilizer.

Hypothesis

The following null hypotheses were postulated:

1) Farmers' socio-economic characteristics do not influence their use of inorganic fertilizer.
2) There is no significant relationship between the attributes on farmers' perception and the level of use of inorganic fertilizer.

There is no significant relationship between the attributes/constraints and the use of inorganic fertilizer.

MATERIALS AND METHODS

Southeast agro-ecological zone was the study area. This zone lies between latitudes $4^0 20'$ and $7^0 51'$N and longitudes $50^0 25'$ and $80^0 51'$E covering a land area of about 109, 524 59sqkm (Monanu, 1975). It has a population of about 18.92 million or 21.48% of the total population of Nigeria (NPC, 2006). It is one of the most thickly populated agricultural zones in Nigeria (Iloka and Anuuebunwa, 1995). About 60-70% of the inhabitants are engaged in agriculture, mainly crop farming except the Riverine areas such as the Ijaws are primarily fisherman (Unamma *et al.*, 1985).

A purposive sampling technique was adopted to select three states (Abia, Anambra, Imo) in the zone. These are yam producing States with its large expanse of land proned to soil erosion. Twenty yam producers were selected from each state given a sample size of sixty. Primary data was collected through the use of structured questionnaire administered to the respondents. Data were analyzed using percentages, regression model, Chi-square and contingency coefficient. Factors affecting farmer use of inorganic fertilizer use and extent of closeness of the problem or attributes and inorganic fertilizer use were analyzed using percentages, Chi-square and contingency coefficient. Regression model was used to determine the use of inorganic fertilizer as influenced by the socio-economic characteristics of Yam producers. This is implicitly stated as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8\ e)$

Where

Y = Perception of Inorganic fertilizer use.
X_1 = Age (years)
X_2 = Educational level
X_3 = Cooperative Membership (Dummy Variables: member = 1, Otherwise = 0).
X_4 = Farming experience (years)
X_5 = Family size (Number of Persons)
X_6 = Extension contact (frequency of visit).
X_7 = Annual Income (Naira)
X_8 = Farm Size (Hectare)
e = error term

RESULTS AND DISCUSSION

Result in Table 1 contains estimated multiple regression model connecting some socio-economic characteristics of the farmers with the use of fertilizer. The model was tried in four functional forms. The linear form of the model was chosen as lead equation following statistical and econometric reason. It provided the best fit because it has the highest value of coefficient of multiple determinations (R^2). It also has the highest number of significant regressors. The coefficient of multiple determination of 0.8117 shows that up to 18% of variations in the regression and or uses of fertilizer were explained by the set of explanatory variables of the model. The age, cooperative membership, farming experience and extension contacts were all negatively related to use of inorganic fertilizer. Family size, annual income and

Table 1: Estimated Multiple Regression Model Relating some socio-economic Factors to Quantity of Fertilizer used

Variables	Linear	Exponential	Semi log	Double log
Constant	-2.02484 (-1.98)x	-1.896348 (-3.42)xxx	-40.50622 (-4.23)xxx	-18.16497 (-3.95)xx
Age (X_1)	-0.0289477 (-2.34)xx	-0.0064571 (-1.04)	-1.567375 (-2.51)xx	-0/382574 (-1.39)
Education (X_2)	0.0156799 (0.63)	0.0322139 (2.35)xx	-0.02223878 (-0.14)	0.144372 (1.90)x
Cooperative Membership (X_3)	-0.4594219	-0.1504135	-0.431772	-0.1164093
Farming experience (X_4)	-0.0146964 (-3.34)xxx	-0.0055174 (-0.98)	-0.226875 (-0.84)	-0.12040 (-0.98)
Family size (X_5)	0.0200597 (0.24)	0.0374553 (0.93)	-0.37738 (-0.83)	0.0279822 (0.14)
Extension contact (X_6)	-0.2114135 (-1.35)	-0.1639672 (-2.23)	-0.179523 (-1.10)	-0.160564 (-2.24)xx
Annual income (X_7)	0.000203 (7.60)xxx	0.000893 (6.05)xxx	4.998818 (6.08)xxx	2.02898 (5.13)xxx
Farm size (X_8)	0.9170704 (2.92)xx	0.3208853 (1.69)	0.8335016 (3.19)xx	0.376401 (2.96)xx
R^2	0.8117	0.8002	0.7051	0.8086
R^2	0.7822	0.7631	0.7629	0.773
F-ratio	27.48	21.53	24.73	22.71

Source: Field Survey, 2012.

Table 2: Distribution of Respondents on factors affecting use of Inorganic Fertilizer

Items	MF	MiF	NF.	Total	Index	Remark
Income of the farmer	50	8	2	60	2.8	Accept
Availability of the product	42	12	6	60	2.6	Accept
Price of the product	29	23	8	60	2.35	Accept
Yield expected from the use of the product	32	21	7	60	2.42	Accept
Soil condition of the farm or nature of the soil	37	16	7	60	2.5	Accept
Labour availability	26	24	10	60	2.26	Accept
Soil of the farm	17	13	30	60	1.78	Accept
Culture on the use of product	27	32	1	60	2.43	Accept
Conservative nature of the farmer	34	20	6	60	2.46	Accept
Lack of extension advice on its usage	48	11	1	60	2.78	Accept
Total	342	180	78	600		Accept

Source: Field Survey, 2012; KEY: Major Factor (MF), Minor Factor (MiF), Not a Factor (NF).

Table 3: Distribution of respondents on Perception about use of Inorganic Fertilizer

Item	AG	UND	DAG	TOTAL	Index (2)	Remark
Given Higher yield	49	3	8	60	2.68	Accept
Expensive to purchase	37	8	15	60	2.36	Accept
Easy to apply	19	7	34	60	1.75	Accept
Not readily available	29	16	15	60	2.23	Accept
Risky because of its chemical content	43	12	5	60	2.63	Accept
Required much labour to apply	41	11	8	60	2.55	Accept
Renders crops unuse next planting season	8	21	31	60	1.62	Accept
Easily washed away by rain water	12	21	27	60	1.75	Accept
Bind soil structure effectively	38	17	5	60	2.55	Accept
Support the growth of soil organism	36	19	5	60	2.52	Accept
Use on a large scale	9	17	34	60	1.58	Accept
Require skill to apply	57	1	2	60	2.92	Accept
More effective than organic manure	31	17	12	60	2.32	Accept
Increase soil acidity	20	30	10	60	2.16	Accept
Difficult to apply	34	8	18	60	2.26	Accept
Total	470	224	266	960	2.21	Accept

Source: Field Survey, 2012; KEYS: Agree (AG), Undecided (UND), Disagreed (DAG)

Table 4: Distribution of Respondents on Constraints associated with the use of Inorganic Fertilizer

Item	Maj. P	Min. P	Not. P	Undecided	Total	Index	Remarks
Difficulty in obtaining	45	5	8	2	60	3.55	Accept
High cost of inorganic fertilizer	31	22	6	1	60	3.33	Accept
Requires skills in application	38	10	7	5	60	3.35	Accept
It increases soil acidity	12	13	22	13	60	2.40	NA
High labour intensive	39	12	5	4	60	3.43	Accept
Inadequate extension services	42	9	6	3	60	3.5	Accept
It is poisonous in nature	30	7	12	11	60	2.93	Accept
Lack of knowledge about appropriate ratio to use	40	10	2	-	60	3.73	Accept
Total	295	93	97	55	540	3.16	Accept

Source: Field Survey, 2012; KEY: Major Problem (MaJ. P), Minor Problem (Min. P), Not a Problem (Not. P) farm size were positively related to quality of fertilizer used. Increases in them increased fertilizer usage. Annual income and experience were significant at 1% level while age and farm size were significant at 5% level and cooperative membership was significant at 10% level. They contributed immensely to the use of fertilizer. The F-ratio was significant showing overall usefulness of the model. Since the Chi-square (χ^2) calculated was greater than the Chi-square critical, we reject the null hypothesis and accept the alternative. That means that there was a significant relationship between the listed factors and the use of fertilizer. The coefficient of correlation between the two attributes was 0.44, indicating that the degree of association between the variables was 44%.

In the survey, the factors that influence or determine the use and non-use of inorganic fertilizer were ascertained. Among the factors are income levels of the farmer, availability of the fertilizer, price, yield expectation, nature of the soil or fertility level of farm etc. Farmers feeling/perception about these factors were sought using Chi-Square statistic and contingency coefficient, conclusion was drawn. The factors were rated major factor, minor factor and not a factor in a three point scale (Table 2). The aggregate of farmers' responses showed that up to 57% favoured that attributes as major, 30% as minor factor and only 13% as no factor. The Chi-Square (χ^2) calculated was 140.697 while the χ^2 – tabulated was 28.869 at 5% level of probability. This means that the factors actually determined the use of the fertilizer. Also the degree of association between the two attributes was determined using contingency coefficient (c) which showed a value of 0.436 or 44%. This value shows a moderate level of association between them.

Result in table 3 showed views of the farmers about the use of inorganic fertilizer in the study area. They formed several opinions such as high yield, expensive to purchase, relatively easy to use, not available, destruction of crops, requires skill, can destroy soil etc., much of these feelings of the people were rated into agree, undecided and disagree. The farmers agreed to a great extent (48.95%) that the set of attributes determined the extent inorganic fertilizer was used among them. They however disagree (27.71%) that the attributes determined their level of fertilizer usage. These were however confirmed using Chi-Square (χ^2) statistic and contingency coefficient (c). The critical χ^2 was 43.773 at 5% while the calculated was χ^2 was 409.49. Since the χ^2- calculated was greater that the χ^2- critical, we reject the null hypothesis and accept the alternative. This means that there was a significant relationship between the attributes and level of use of fertilizer. The contingency coefficient (c) was 0.546. This means that there was high degree of association between the alternative. The famers' feelings about the use actually determined the level of use of the fertilizer

A set of constraints to use of the inorganic fertilizer were considered. These problems or attributes were rated in a four point likert scale of major problem, minor problem, not a problem and undecided. The Chi-square statistic and contingency coefficient were applied to ascertain the extent of closeness of the attributes and the use of fertilizer. The Chi-square critical or tabulated at 5% level was given as 36.415 while the Chi-Square calculated was 167.98. Since the χ^{2-} calculated was greater than the χ^2- critical, we reject the null hypothesis and accept the alternative. This shows that there was a significant relationship between the two attributes. The degree of association between the two attributes was equally determined using contingency coefficient (c). The value of coefficient was 0.487 indicating that degree of association between them was up to 49%. The stated constraints therefore contributed significantly to the use of fertilizer. The application of four point likert scale shows that all the factors were rated major problem of the fertilizer used.

Conclusion

Fertilizer usage among the farmers were a function of fertilizer availability, expected yield of crops, acquisition of fertilizer application skill, easy of procurement, soil condition annual income and price of their products. Socio-economic factors of the farmers contributed immensely to the changes in the quantity of fertilizer the farmer use. Finally, farmers' feelings or perception about the use of inorganic fertilizer actually determined the level of its use.

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