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LEVEL OF USE OF ORGANIC MANURE BY FARMERS IN ISOKO NORTH LOCAL GOVERNMENT AREA OF DELTA STATE, NIGERIA

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ABSTRACT: *The study assessed the level of use of organic manure in Isoko North Local Government area of Delta State, Nigeria. A multi-stage sampling procedure was used to compose a sample size of 427 respondents for the study. Data generated were analyzed using both descriptive and inferential statistics. The results of the study showed that majority of the farmers were not using organic manure. The reasons adduced for this amongst others were unavailability of organic manure, preference for fertilizer and bulkiness of organic manure. From the logit regression result, three variables, namely, educational level (t=3.645), farm size (t=3.978) and farming experience (t=2.998) were significantly in their relationship with organic manure use. From the findings of the study, it was recommended among others that farmers in the study area should be enlightened on the benefits of using organic manure in their farms.*

KEYWORDS: Organic Manure, Farmers, Logit Regression, Adoption, Delta State.

INTRODUCTION

In many parts of sub-Saharan Africa, there is serious soil nutrient depletion (Heisey and Mwangi 1996; De Jager et al. 1998). Sanchez et al. (1997) reported annual losses of 4.4 million tons of nitrogen (N), 0.5 million tons of phosphorous (P) and 3 million tons of potassium (K) in 37 countries in sub-Saharan Africa.

The rapid decline in soil nutrients appears to be linked to poor soil fertility management fuelled by continuous cropping under ever-increasing population pressure (Waithaka et al, 2007). However, it has been argued (Omamo et al. 2002; Heisey and Mwangi 1996) that increasing population pressure need not lead to soil nutrient depletion; this is perceived in Asia with much higher population densities, where average grain yields are three times those of Africa and growing, while those in Africa have stagnated (Waithaka et al, 2007). Good use of soil additives can go a long way in improving the fertility of the soil.

Manures are usually such additives incorporated into soils in order to improve their fertility. In the past few decades, chemical fertilizers (inorganic manures) have widely been used the world. For instance, in Nigeria every year the government continues to make provision for fertilizer disbursement to farmers. However, it is now known that in fields under intensive monoculture which obtain only heavy applications of inorganic fertilizers, there is a gradual decline in farm output (Morteza et al, 2011). Applications of nitrogenous fertilizers like Ammonium tetra-oxo-sulphate VI and Ammonium tri-oxo nitrate V usually result in the releases of green house gases like nitrogen II oxide (N_2O) and ammonia (NH_3). Apart from providing nitrogen, ammonia can also cause soil acidity when it undergoes soil reaction.. Excessive nitrogen fertilizer applications can lead to pest problems by increasing the birth rate, longevity and overall fitness of certain pests (Jhan 2004, Jhan *et al*. 2005). Over a longer period of time, applications of

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organic materials such as livestock manure and crop residues have proven to bring about a gradual improvement in soil productivity and crop performance (Morteza et al, 2011). A study carried out on five crops in Japan showed that applications of organic matter promote root growth and development and nutrient uptake, resulting in improved yields (FFTC, 1998). Many organic materials serve as both fertilizers and soil conditioners as they feed both soils and plants. This is one of the most important differences between a chemical fertilizer use and use of organic manure in soil care and fertilizing. Chemical fertilizers usually contain mineral that plant roots can absorb quickly. Nevertheless, these salts do not provide a food source for soil microorganisms and earthworms, and will even repel earthworms because they acidify the soil. Over time, soils treated only with synthetic chemical fertilizers lose organic matter and the all-important living organisms that help to build a quality soil. As soil structure declines and water-holding capacity diminishes, more and more of the chemical fertilizer applied will leach through the soil. In turn, it will take ever-increasing amounts of chemicals to stimulate plant growth. However, use organic fertilizers helps to avoid throwing your soil into this kind of crisis condition. The manufacturing process of most chemical fertilizers depends on non-renewable resources, such as coal and natural gas. Others are made by treating rock minerals with acids to make them more soluble. Fortunately, there are more and more truly organic fertilizers coming on the market. These products are made from natural plant and animal materials or from mined rock minerals. However, organic fertilizer mixture can be equally as convenient and effective as synthetic fertilizers. Another benefit from the increased use of organic materials is that it can help to ameliorate pollution problems caused by agro-industrial wastes. Despite these merits of organic manure, the number of farmers using organic manure in their farms in Isoko north in particular and Nigeria in general is yet to be ascertained. However, the soil must not be seen as a dumping ground for organic wastes. Excessive use of nitrogen fertilizer in soils, whether in the form of organic matter or chemical fertilizer, may results in the formation of nitrates, which are detrimental to human health (Preap *et al.* 2002). Improper use of organic fertilizers can cause nitrates to filtrate into groundwater, and also in crops if they are taken up by the plant roots.

Nevertheless, from the above arguments, it is crystal clear that organic manures are crucial for the proper growth and development of crop plants. In spite of this, studies on the level of use of organic manures have not been carried out. Studies on the effects of the use of organic manures on crops have been well documented in literature (Ohyama, Katono, and Hasegawa, 1998; Sahrawat, 2006 and Tiamiyu, Ahmed, and Muhammad, 2012) ; however, research works that focused on the adoption level of organic manures in Nigeria are almost non-existent. Therefore a study of this nature becomes crucial. There is also dearth of information on the nature of organic manures used by farmers in Isoko North in particular.

There are different types of organic manure: farmyard manure, green manure and compost manure, depending on the sources and mode of preparation. Compost is organic matter that has been decomposed, either in stack or in heaps, and recycled as a fertilizer and soil amendment. Compost can be rich in nutrients. Compost increases water retention capacity of soil, improves soil structure, increases nutrient uptake, improves nutrient holding capacity and promotes plant health. Green Manures which are usually buried plant parts boost organic matter contents in the soil. The root systems of some varieties of green manure grow deep in the soil. Common cover crop used as green manure functions for weed suppression and prevention of soil erosion. Farm yard manure which is commonly sourced from animal faeces has been used as a fertilizer for farming as it improves the soil structure and texture. It has high nutrients and water retention capacity. Farm yard manure also encourages soil microbial activity which promotes the soil's

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trace mineral supply, improve plant nutrients. The types of organic manure used in this area need be ascertained. The choice of independent variables is guided by the hypothesis that organic manure use is influenced by a combination of farm and farmer characteristics. Farm characteristics measure levels of resource management and access to markets. These are size of the farm, area of the farm under crops, number of casuals engaged on the farm, size of household dependent on the farm and distance to the market. Households with large farms are expected to practice land management practices such crop rotation and fallowing (Crowley et al. 1996). Farm size is expected to be positively related to intensity of organic manure use. Availability of casual labour will allow farmers to open more land or improve management practices such as land preparation, weeding and application of fertilizers or organic manure (Crowley et al. 1996). Thus availability of casual labour is expected to be positively related to organic manure use. It is also expected that short distances to the market will reduce the relative costs and availability of inputs and improve access to output markets hence generate better incomes.

Thus distance to the market is expected to be negatively related to fertilizer use and positively related to organic manure use, since farmers located far away from supply sources are likely to incur higher transportation and search costs. This is so because organic manure markets do not exist as such and thus distance to markets has a bearing only on fertilizer costs. However, since organic manure and fertilizer also have complementary effects, we would expect that increasing distance would raise fertilizer costs, which would tend to make farmers turn to organic manure. Households with many members dependent on the farm are expected to use less fertilizer, but rely more on organic manure. This is based on the assumption that such households will be more concerned with meeting food security needs before pursuing income related objectives (Omamo et al. 2002). Farmer characteristics used in testing the stated hypothesis relate to levels of resource endowment and experience and include education level of the household head, gender of the farmer, size of the household, ownership of means of transport and income of the household. Older farmers are expected to command more resources and hence have wider investment options including use of organic manures. However, it will be expected that older household heads will have relatively large farms while younger household heads will own smaller holdings. Older household heads will be expected to be less educated and so may not be able to relate well to complex fertilizer management, but will be more comfortable with using organic manures. Thus education level of the household head may be taken as a proxy for being exposed to (or able to access) technical information on organic manure use, and thus may be positively associated with organic manure use (Omamo et al. 2002; Omamo and Mose 2001). Male headed households are associated with being in command of productive resources. Even where women play key roles in farming decisions, they may not lack access to inputs, cash incomes, credit and technical information. It is expected that female-headed households will be negatively associated with organic manure use, because women may not command the resources that would allow them access to organic manure. Households that have some means of transport are expected to be able to access input and output markets and should relate positively with organic manure use (Jayne et al. 2003). Households with higher incomes (often from off-farm income) have been shown to obtain larger harvests because they are able to access farm inputs (Crowley et al. 1996). Therefore, having said all these, it is also proper to determine the factors that are likely to influence the use of organic manure in Isoko North Local Government area. In the wake of this, the following research questions thus arise: What are the socio-economic characteristics of farmers in Isoko North local government area? How many farmers make use of organic manure in their farming activities? What types of organic manures are used in the area? What are the likely factors that

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could influence farmers' use of organic manure in the area? Hence the following objectives were addressed in this study:

1. Describe the socio-economic characteristics of farmers in the area
2. Determine the proportion of farmers that make use of organic manures
3. Determine the types of organic manure used in the study area
4. Ascertain the likely factors (if any) affecting the use of organic manure in the study area.

The following hypothesis, stated in the null form, was tested:

There is no significant relationship between the socio-economic characteristics of the respondents and their use of organic manure.

RESEARCH METHODOLOGY

The study was conducted in Isoko North Local Government Area, Delta State, Nigeria. Isoko North Local Government has an estimated land area of 463 km^2 and a population of 183, 657 (NPC, 2006). It is bounded to the South West by Isoko South Local Government Area, to the West by Ughelli North Local Government Area, to the North by Ndokwa West Local Government Area and to the East by Ndokwa East Local Government Area, all in Delta State. The climate of the area is the equatorial hot, wet type; precipitation is high, over 2000mm per annum and temperature hovering between 27^0c – 35^0c. Relative humidity in the area is high. There are two seasons in the area, namely, the dry season (November- March) and rainy season (April-October). Some parts of the area are swampy. Major crops grown include cassava, pineapple, yam, plantain/banana, potatoes and cocoyam. Some livestock is also raised, and fishing activity and aquaculture are also prevalent.

Sampling Procedure and Sample Size

A multi-stage sampling procedure was used to compose the sample for the study. Five of the 13 clans in Isoko North local Government Area (LGAs) of Delta state were randomly selected. Structured questionnaire was used to collect data from 446 farmers across these five communities. However, 427 questionnaires were found useful for data analysis.

The first stage involved the selection of five (5) clans out of the thirteen (13) clans in the local government area. Next, 5 percent of the farming households were selected from each of the clans and used for the study. The expected sample size was 446 but only 427 questionnaires were actually retrieved and used for the study. The procedure for the sample size selection is depicted in Table 1.

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Table1: Procedure of sample size selection

LGA	Clan selected	Registered Farmers	Selected Farmers	Expected sample Size	Actual Sample Size
Isoko North	Ofagbe	1604	80	80	74
	Ovrode	1590	80	80	76
	Oyede	1922	96	96	92
	owhe	2345	117	117	114
	Okpe	1456	73	73	71

Expected Sample Size = 446
Actual Sample Size = 427

Data generated were analyzed by using both descriptive and inferential statistics. Descriptive statistics used included frequency counts, means and percentages, likert and rating scales, while the Inferential Statistics that was used to test for the stated hypothesis was the logit regression analysis.

To determine the factors influencing adoption of organic manure the logit model was used. The rationale was to determine those factors that influence use of organic manure. In categorizing the arable farmers into adopters and non-adopters of organic manure a threshold concept was used (Daramola, 1987). This was used to divide arable farmers into two categories: (adopters and non—adopters of organic manure). The common models used in this threshold concept include Probit, Logit and Tobit (Nassimbeni, 2001). Logit model is preferred and adopted for this study because of the ease of computation of the dichotomy value involved. The basic logit model is presented as:

$$p\ (Y = 1) = \frac{e^{\beta x}}{1+e^{\beta x}} \quad \text{..... (1)}$$

$$p(Y = 0) = 1 - \frac{e^{\beta x}}{1+e^{\beta x}} = \frac{1}{1+e^{\beta x}} \quad \text{..... (2)}$$

The logistic regression or logit equation can be specified as:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + et \quad \text{..... (3)}$$

Where: Yi = the dependent variable defined as use of organic manure by farmers Y = 1 and 0 otherwise; b_0 = constant and intercept of the equation; X_1 = gendert,X_2 = age; X_3 = marital status; X_4 = educational level; X_5 = farming experience; X_6 = farm size; X_7 =household size and et = stochastic error term.

X_1 - X_7 = Explanatory variables (socio-economic characteristics of respondents).

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RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

The socio-economic characteristics of the farmers are as shown in Table 1. About 49% of the farmers were male and about fifty one percent were female. Majority (57,38%) of the respondents are within the age bracket of 20 to 59 years. This implies that the farmers are still in their economic active ages. This finding is supported by Nwaiwu et al who posited that farmers in Imo state are at their middle ages and within the working class limit most of the farmers (69 79%) are married which implies that many farmers in the study area have family responsibilities. About 87 percent of the respondents had one form of formal education or the other. Given this level of literacy it is expected that information can be disseminated with ease among these cassava farmers. Basically, the levels of education of farmers have significant impact on productivities, income earning opportunities and ability of farming households to effectively adopt better management practices. According to Nwaiwu et al (2012), this high level of education makes them capable of understanding and adopting available innovations that encourages increases in farm production. The greater proportion of the respondents are much experienced in their farming business. This shows that most farmers have been arable farmers for long. The long years of experience may enable farmers to evolve the farming practices that are most suitable to their ever-changing environment. The mean household size is 8 persons. Household size is used as a proxy for labour because individual in the household is a potential source of labour. Their availability reduces labour constraints faced during the peak of the farming season (Teklewold *et al*., 2006). Farm size in the study area was very small, most of the farmers having farm sizes of between 0 – 5 hectares as shown in Table4,1. Fragmentation due to land tenure systems, nearness to farms and resource endowment of farmers may be responsible. According to Alamu *et al* (2002) farmers with more resources including land are more likely to take advantage of a new technology. Farm size in the study area was rather small, majority of the farmers having farm sizes of between 0 – 5 hectares as shown in Table 1. Fragmentation due to land tenure systems, nearness to farms and resource endowment of farmers may be responsible. The finding agrees with those of Ogungbile and Olukosi, (1991), Nwaiwu, 2007 and Onemolease (2005) who observed that the average farm sizes of farmers were generally very small.

Table 1: Socioeconomic characteristics of respondents

Variable	Frequency(427)	Percentage(100)
Gender		
Male	210	49.18
Female	217	50.82
Age (years)		
Below 20	20	4.68
20 – 29	22	5.15
30 – 39	45	10.54
40 -49	87	20.37
50 – 59	91	21.31
60 and Above	162	37.94
Marital Status		
Never Married	67	15.69
Married	298	69.79
Divorced	23	5.39

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Separated	16	4.57
Widowed	23	5.39
Educational Level		
No formal	54	12.65
Primary	155	36.30
Secondary	187	43.79
Tertiary	31	7.26
Farming Experience (year)		
Less than 5	62	14.52
6 – 10	112	26.23
11 – 15	120	28.10
16 and Above	133	31.15
Farm Size (Hectare)		
0.5 and below	199	46.60
0.5 – 1.0	186	43.56
1.1 – 1.5	28	6.56
1.51 – 2.0	8	1.87
Above 2.0	6	1.41
Household Size (Number)		
5 and below	180	42.15
6 – 10	214	50.12
Above 10	33	7.73

Source: Survey data, 2014

Types of Organic Manure used by Farmers in the Area

Table 2 shows the types and level of use of the different types of manure in the study area. The findings indicated that the three different types of manure are used in the area. However, as can seen in Table 2, the level of use of the different organic manures is generally very low as 371. 353 and 416 farmers never make use of compost, farmyard manure and green manure respectively. Twenty four farmers, 43 farmers and 11 farmers respectively, always make use of compost, FYM and green manure while 32 and 31 farmers seldom make use of compost and FYM respectively on their farms; it is disappointing to note that no farmer ever uses green manure in the area in spite of its availability. Most of the farmers are even ignorant about the existence of green manure.

Table 2: Proportion of Farmers Using Different Types of Organic Matter

Types of Organic Manure	Frequency*		
	Always use	Seldom used	Never used
Compost	24	32	371
Farmyard Manure	43	31	353
Green Manure	11	0	416
Total	78	63	1140

*number greater than 427 due to multiple responses

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Factors Influencing the use of Organic Manure by Arable Farmers

Aside from the socio-economic variables, as to why some did not apply organic manure at all or why they have not been applying it on a continuous basis on their farms, there were multiple responses as can be observed in Table 3. The most serious complaint by farmers in the study area is that organic manure is not readily available in the area. Most of them would have like to use organic manure if it was available. The second most serious problem is that majority of the farmers still prefer inorganic fertilizers to organic manure.

Table 3: Factors affecting use of organic manure

Factor	Mean (X)	Standard deviation (S)	Rank of mean
Unavailability of manure	4.89	0.48	1st
Preference for fertilizer	4.86	0.38	2nd
Bulkiness of Organic M.	4.66	0.67	3rd
Cost of the manure	3.58	0.54	4th
Lack of awareness	3.55	0.89	5th
Land already fertile	3.49	0.55	6th
Don't know			

Likert Scale coded:1=not very serious,2=not serious,3=undecided, 4=serious,5=very serious

Relationship between Adoption of Organic Manure and Socioeconomic Characteristics of Arable farmers

To determine the socioeconomic factors influencing the use of organic manure among farmers in Isoko North of Delta State, Nigeria, tests were first conducted to check for multicolinearity among the independent variables. Tests revealed that there was no multicolinearity. Consequently, all the independent variables were entered and the equation fitting the logit regression model was estimated. The following variables, namely, gender (X_1), age (X_2), marital status (X_3), Educational level (X_4), farming experience (x_5), farm size (x_6) and household size

The coefficient for gender (X_2), age (X_3) and household size (X_5) were not significant 1% and 5% levels of significance, indicating that these variables were not important in influencing farmers' use of organic manure in the study area. The coefficient of level of education was positive and significant, suggesting that farmers with higher level of education use organic manure more than farmers with low education. The reason could be adduced to the fact that higher education enables the farmer to know the benefits of the use of improved inputs such as organic manure in crop production. This suggests that higher educational level influenced higher use of organic manure which is in line with previous study (Njoku, 1991) which reported that education correlates positively with adoption of improved practice. This is expected since most of the respondents in the study were educated. This result is also corroborated by the findings of Asomonye (1991). The coefficient of farm size was positive and significant, indicating that farmers with larger farm size use more organic manure than farmers with smaller farm size. The coefficient of farming experience was positive and significant, indicating that farmers much more experienced in farming use more organic manure in their farms.

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Table 4: Logit Regression Results

Independent variables	Logit regression coefficient	t-values
Gender	0.0799	1.662
Age	-0.0822	-1.234
Marital status	-0.0664	-1.318
Educational level	0.0824	3.645*
Farming experience	0.0911	3.978*
Farm size	0.0877	2.998*
Household size	-0.0714	-1.776
Constant	-20.677	-5.966*
Chi-square	69.448	
Sample	427	

*significant at $p < 0.05$

CONCLUSION AND RECOMMENDATIONS

The results from the study depicted that the use of organic manure among the farmers in Isoko North of Delta state is not popular. Farmyard manure is the most commonly used manure in the study area, followed by compost. Since education and farm size play a significant role in farmers adoption of the use of organic manure it is therefore strongly recommended that farmers in the area should be enlightened on the importance of using organic manure(for example through workshops and seminars); also farmers should be encouraged to operate large holdings This will go a long way in promoting sustainable agricultural production.

REFERENCES

Alamu, J.F., and Rahman, S.A. (2002): Agricultural Supply Response Evidence from four cereal crops in Nigeria. *The Nasarawa Journal of Humanities, 1(1): 198 – 203.*

Asomonye, D.E. Access and use of Selected Farm Inputs; Fertilizer, Improved Cassava cuttings and Poultry Breed by Farmers in Imo State.1991; B. Agric Tech Project, Federal University of Technology Owerri.

Commission (NPC) (2006). National Population and Housing Census, 2006, N.P.C Abuja.

Crowley EL, Soule MJ, Carter SE (1996) Off-farm income and farming in western Kenya. Report to USAID/ Kenya, Nairobi

Daramola, A. G. 1987. Quantitative Analysis of the Adoption of Improved Food Production Technology in Oyo State, Nigeria. Unpublished Ph. D. Thesis, Department of Agricultural Economics, University of Ibadan. xi 215pp.

De Jager, A., Kariuki, I., Matiri, F.M., Odendo, M. and Wanyama, J. M. (1998) Linking economic performance and nutrient balances in different farming systems in Kenya: a synthesis towards an integrated analysis of economic and ecological sustainability. Agric Ecosyst Environ 71:81–92

FFTC publication database. (1998). Food and Fertilizer technology centre Taiwan Microbial and Organic Fertilizers in Asia.

Heisey P.W., Mwangi, W. (1996) Fertilizer use and maize production in Sub-Saharan Africa. CIMMYT Economics Working Paper 96-01. CIMMYT, Mexico, DP 222

Print ISSN: ISSN 2058-9093 Online ISSN: ISSN 2058-910

Jayne TS, Govereh J, Wanzala M, Demeke M (2003) Fertilizer market development: a comparative analysis of Ethiopia, Kenya, and Zambia. Food Policy 28:293–316

Jhan, G.C. (2004). Effect of soil nutrients on the growth, survival and fecundity of insect pests of rice: an overview and a theory of pest outbreaks with consideration of research approaches. Multitrophic interactions in Soil and Integrated Control. *International Organization for Biological Control (IOBC) wprs Bulletin,* 27 (1): 115-122.

Jhan, G.C., Almazan, L.P., and Pacia, J. (2005). Effect of nitrogen fertilizer on the intrinsic rate of increase of the rusty plum aphid, *Hysteroneura setariae* (Thomas) (Homoptera: Aphididae) on rice (*Oryza sativa* L.). *Environmental Entomology*, 34 (4): 938-943. doi:10.1603/0046-225X-34.4.938, http://dx.doi.org/10.1603/0046-225X-34.4.938

Morteza, S., Alireza, N. and Shankar. L. L. (2011). Effect of Organic Fertilizer on Growth and Yield Components in Rice (*Oryza sativa* L.). Journal of Agricultural Science Vol. 3, No. 3: 217-221.

Nassimbeni, G (2001). Technology, Innovation Capacity and the exports attitude of small manufacturing firms. A logit/Tobit Model. Research Policy 30:245-262 National Population

Njoku, J.E. (1991): Factors influencing the adoption of improved oil palm technologies by small holders in Imo State of Nigeria. Appropriate Agricultural Technologies for Resource poor farmers. In Olukosi, J.O., Ogungbile, A.O. and Kalu B.A. (eds) National Farming System network. Pp 51-55.

Nwaiwu I.U (2007). " Compaative Analysis of the Use of External and Internal Farm Inputs for Sutainable Cassava Production in Imo State. An Unpublished M.SC Thesis submitted to the Postgraduate school, Federal University of Technology, Owerri, Nigeria

Nwaiwu I.U; Ohajiaya D.O; Orebiyi J.S; Obasi P.C; Lemchi J.I; Ibekwe U.C; Onyeagocha S.U.O; Ukoha I.I; Osuji M.N and Kadiri F.A. (2012).Socio-Economic Determinants of The Productivity of Garden Egg (*Solanum Melongena*) Farmers in Imo State, Southeast Nigeria. *Int'l Journal of Agric. and Rural Dev.* 15 (2):1147 – 1152.

Ogungbile A.O and J.O Olukosi (1991). "An Overview of the Problems of the Resource for farmers in Nigeria Agriculture" In Olukosi et al (eds) Appropriate Agricultural Technologies for Resource poor Farmers. Natural farm systems Network 1991 Pp21-34.

Ohyama, N., Katono, M. & Hasegawa, T. (1998). Effects of long term application of organic materials to the paddy field originated form Aso volcanic ash on the soil fertility and rice growth. I. Effects on the rice growth and nutrient uptake for the initial three years. *Proceeding of Faculty of Agriculture, Kyushu Tokai University*, 17:9-24. (In Japanese with English summary).

Omamo SW, Mose LO (2001) Fertilizer trade under market liberalization: preliminary evidence from Kenya. Food Policy 26:1–10

Omamo, S. W., Williams, J. C., Obare, G. A. and Ndiwa, N. N. (2002). Soil fertility management on small farms in Africa: evidence from Nakuru district, Kenya. Food Policy 27:159–170.

Onemolease E.A. (2005); Impact of the Agricultural Development Programme (ADP) Activities of Alleviation of Rural poverty in Edo State, Nigeria. A. Ph.D Thesis, Department of Agricultural Economics and Extension Services, University of Benin, Benin City, Nigeria. Pp 94 – 100.

Preap, V., Zalucki, M.P., and Jhan,G.C. (2002). Effect of nitrogen fertilizer and host plant variety on fecundity and early instar survival of *Nilaparvata lugens* (Stål): immediate response. *Proceedings of the 4th International Workshop on Inter-Country Forecasting System and Management for Planthopper in East Asia. 13-15 November 2002. Guilin*

Print ISSN: ISSN 2058-9093 Online ISSN: ISSN 2058-910

China. Published by Rural Development Administration (RDA) and the Food and Agriculture Organization (FAO), 163-180, 226.

Sahrawat, K. L. (2006). Organic matter and mineralizable nitrogen relationships in wetland rice soils. *Communications in Soil Science and Plant Analysis*, 37:787-796.

Sanchez, P. A., Shepherd, K. D., Soule, M. J., Place, F. M., Buresh, R. J., Izac, A-MN, Mokwunye, A. U., Kwesiga, F. R., Ndiritu, C. G. and Woomer, P. L. (1997). Soil Fertility Replenishment in Africa: An Investment in Natural Resource Capital. In: Buresh RJ, Sanchez PA, Calhoun F (eds) Replenishing Soil Fertility in Africa. Soil Science Society of America, Madison, Wisconsin.

Teklewold, H., Dadi, L., Yami, A. and Dana, N., (2006), Determinants of adoption of poultry technology: a double hurdle approach, *Livestock Research for Rural Development*, 18(3), (http://www.cipav.org.co/lrrd/lrrd18/3/tekl18040.htm) Economics of Improved and Local Varieties of Cassava.

Tiamiyu, R. A, Ahmed, H. G. and Muhammad, A. S. (2012). Effect of Sources of Organic Manure on Growth and Yields of Okra (*Abelmoschus esculentus L*.) in Sokoto, Nigeria. Nigerian Journal of Basic and Applied Science (September, 2012), 20(3): 213-216

Ugwuja V.C., Adesope O.M., Odeyemi T.J., Matthews-Njoku E.C., Olatunji S.O., Ifeanyi-Obi C.C. and Nwakwasi R. (2011). Socioeconomic Characteristics of Farmers as Correlates of Fertilizer Demand in Ekiti State, Southwest Nigeria: Implications for Agricultural Extension. Greener Journal of Agricultural Sciences 1 (1): 048-054.

Waithaka, M. M., Thornton,P. K., Shepherd, K. D. and Ndiwa, N. N. (2007). Factors affecting the use of fertilizers and manure by smallholders: the case of Vihiga, western Kenya. Nutr Cycl Agroecosyst , 78 (2): 11–224

Print ISSN: ISSN 2058-9093 Online ISSN: ISSN 2058-910