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Socio-economic Determinants of Small-scale Rice Farmers' Output in Abuja, Nigeria

[1]Ajah Julius and [2]Ajah Francis Chukwumah
[1]Department of Agricultural Economics/Extension, Faculty of Agriculture, University of Abuja, Nigeria
[2]Coordination of Technical Research, Agricultural Research Council of Nigeria, Mabushi, Abuja, Nigeria

Corresponding Author: Ajah Julius, Department of Agricultural Economics/Extension, Faculty of Agriculture, University of Abuja, Nigeria Tel: +2348053188880

ABSTRACT

The study examined the effects of some socio-economic factors on small-scale rice farmers' output in Abuja, Nigeria. The population for the study included all small-scale rice farmers. A simple random technique was adopted for sample selection while semi-structured questionnaires were used for data collection. A total of 88 rice farmers drawn from all the agricultural zones (eastern, central, western and northern zones) were used for the study. Descriptive and multiple regression statistics were used to analyze the data. The results of a semi-log function (lead equation) indicated that fertilizer application, cost of chemicals (other than organic fertilizers) and farm size were the significant factors influencing rice output at 5% alpha level while the quantity of seed planted was significant at 10%. The R^2 indicated that the socio-economic factors accounted for 37.60% variation in rice output. The average farm size was 1.84 ha with mean rice output per farmer and per hectare as 1349.50 and 730.367 kg, respectively. The fertilizer application rate was 107.32 kg ha^{-1} while the seed rate was 62.66 kg ha^{-1}. The socio-economic characteristics showed that majority (90.91%) of the farmers were married with mean household size, age, education, years of farming experience as 8, 44, 7 and 14 years, respectively. Majority of the farmers indicated that their main reasons for cultivating rice were to get income and for household consumption. Although not all the variables were significant but based on the value of R^2 (0.376), the paper concluded that the farmers' socio-economic variables contributed significantly to the output of rice in the study area.

Key words: Quantity of rice seed planted, farm size, output of rice, fertilizer application rate

INTRODUCTION

There are so many crops that are cultivated all over the world for the benefit of mankind. Rice is one of them and it has contributed immensely to global food security. It is an annual grass of the genus Oryza with a natural order graminae (FAO, 2013). In terms of comparative advantage, rice can be grown in flooded and non-flooded soils because it has both lowland and upland varieties that can adapt to different agro-climatic and soil conditions. This favourable adaptive feature of rice is also contained in a report by Philip *et al.* (2006) which indicated that cereal like maize and rice are well distributed in high rainfall and low rainfall regions of the world. It is the leading cereal crop in South East Asia where it originated (FAO, 2013) and among the food crops, it is widely cultivated. At the global level, Akinbile (2010) stated that it ranks third after wheat and maize in terms of production. In Nigeria, it is the sixth major crop cultivated after sorghum, millet, cowpea,

cassava and yam (Akinbile, 2010). Nutritionally, research showed that rice produces 27% of the dietary energy supply and 20% of the dietary protein intake (Edoka *et al*., 2009). It is used in the preparation of several local dishes that are eaten in every home, especially during festivals and ceremonies (Ekeleme *et al*., 2008). According to Onwueme and Sinha (1991), more than half of human race needs rice as a source of calories. The importance of rice in our society has been widely acknowledged, hence every effort to improve its quality and quality is globally promoted.

Nigeria is one of the countries in the world that has the potentials to produce rice in a larger quantity. This is a fact because Nigeria has an estimated 4.6 million hectare of land (Danbaba *et al*., 2013) that is suitable for rice production and, interestingly too, a study by Ajah and Nmadu (2012) on farmers access to farm inputs indicated that land was one of the most accessible farm inputs. But despite all these potentials, only about 1.8 million hectare, representing 39% is under rice production (Danbaba *et al*., 2013). Although, Okonji *et al*. (2012) stated that Nigeria is the largest rice producer in the West African sub-region but ironically, Nigeria is one of the major importers of rice in the Sub-Sahara Africa because a large proportion of its foreign exchange is spent on the importation of rice. For instance, Sabair (2008) reported that Nigeria spends about hundred billion naira (N100 billion = $ 454 million) on rice importation annually. Rice demand in Nigeria is about 5 million metric tones while according to Nwalieji and Onwubuya (2013), only 2.2 million metric tones are produced locally. The implication of this is that more than half of the rice demanded in Nigeria is imported. The importation is largely due to the increase in population because an average Nigerian according to WARDA (2001), consumes 24.8 kg of rice per year and Nigeria has over 140 million people (NPC, 2006). Apart from importation, the market price of rice and other cereal crops like maize and millet are on the increase too (NAERLS and NPFS, 2011). In addition to the high import bill, a lot of money has been spent to improve rice production in Nigeria. For instance, in 2000, 66.67 US dollars was spent on an irrigation scheme aimed at improving rice production (Nwalieji and Onwubaya, 2013). This is discouraging because Nwajiuba and Ejiogu (2008) observed that staple foods like rice, maize and wheat account for a greater share of the food demand in the developing countries compared to developed countries. This ugly scenario calls for a comprehensive research to identify factors influencing rice production in Nigeria hence, the need for the study.

Similar studies have been conducted by Basoru and Fasakin (2012), Ayoola *et al*. (2011) and Jamala *et al*. (2011). The study is important because one of the challenges facing Nigeria as a nation is how to improve the productivity of the cereal crops, especially rice that has been marked as a major staple food crop. Again, Ajewole and Aiyeloya (2004) noted that socio-economic characteristics enable planners and policy makes to appreciate and develop a more user-friendly policies and strategies that will enhance productivity.

METHODOLOGY

This study was conducted in Abuja, Nigeria located between latitudes 8°25` and 9°25` N and longitudes 6°45` and 7°45` E. The territory covers an area of 8,000 square kilometers, lying in the centre of the country and is bordered on all sides by four States namely: Niger, Nasarawa, Kogi and Kadunna (Dawan, 2000). The vegetation of Abuja, which is squarely found in the savannah environment, is generally classified as rain green vegetation (Adakayi, 2000). It lies in the transitional zone between the savannah in the Northern and the forest vegetation zone in the Southern part of Nigeria which is endowed with tremendous potentials for supporting agricultural production (Adakayi, 2000). The population for the study comprised all the small scale-rice farmers

in Abuja. To access the rice farmers, a random technique was adopted for sample selection while semi-structured questionnaires were used for data collection. Abuja has 4 agricultural zones-namely, central, eastern, northern and western zones with 12 agricultural blocks and 93 cells. In each of the agricultural zones, some Agricultural Extension Agents who were familiar with the geographic and socio-economic characteristics of the people were recruited, trained and mobilized as enumerators. A total of 30 questionnaires were randomly distributed in each of the 4 agricultural zones in Abuja but only 88 properly filled and returned questionnaires were used for the study. Data analysis was done using descriptive statistics and multiple regression models. Four functional forms-linear, double-log, semi-log and exponential were fitted to the data. The analysis was done with SPSS 15.0 package and it was tested at 5% alpha level. The implicit form of the model is mathematically represented as:

$$Y = F (AGE, YFE, MCS, HHS, LDR, SLC, CMP, COC, FRT, LBO, LOE)$$

where, Y is the output of rice (kg). AGE is the Age of the farmers (years). YFE is the Years of Farming Experience (years). MCS is the Membership of Cooperative Society (dummy: Yes = 1, No = 0). HHS is the Household size (No. of persons per household), LDR is the land rent in naira (N). Those who cultivated their land were asked to state the amount they would have spent if under rent. FSC is the Farm Size cultivated (hectare). CRS is the quantity of rice seed planted in naira (kg). COC is the Cost Of Chemicals (herbicide, insecticide, pesticide) in naira (N). FRT is the quantity of organic fertilizer applied (kg). LBO is the Labour (N man^{-1} day^{-1}) and EDU is the Literacy level of the farmers. This represents the cumulative number of years the rice farmer spent in acquiring formal education which is also a reflection of the certificate obtained-no formal education (0 years), primary school education (6 years), secondary/commercial/Teachers Training College (TTC) (12 years), Ordinary National Diploma/Higher School Certificate (OND/HSC) (14 years), Nigerian College of Education (NCE) (15 years), B. Sc/ HND (16 years), M.Sc degree (18 years).

RESULTS AND DISCUSSION

Result of the socio-economic factors influencing rice output: Table 1 shows the results of the socio-economic factors influencing the small-scale rice farmers' output. Four functional forms-linear, semi-log, exponential, double-log were tested. The lead equation was semi-log because it had the highest R^2 compared to other models and some of the coefficients were significant with their signs in line with the apriori expectations. The F-ratio (4.171) was significant at 1% implying goodness of fit of the model. The R^2 (0.376) indicated that 37.60% of the variation in the dependent variable (rice output) was due to the independent variables studied. The magnitude of R^2 (0.376) is in line with the apriori expectation because there are so many factors that influence rice production and these factors have been highlighted by many scholars. Examples of such factors are pest and diseases, poor soil fertility and use of low yielding varieties (Kamara *et al*., 2011), rainfall, sunshine, wind, relative humidity and temperature (Alabi and Ibiyami, 2000), drought in the Northern (Ekeleme *et al*., 2008), use of simple and cheap farm tools, poor market channels and poor input delivery services (Nwalieji and Onwubuja, 2013).

Among the independent variables tested, the results showed that the coefficient of the farm size was positive and significant at 1%. This shows that (all things being equal) the output of rice will increase if the rice farmers increases farm size. This agrees with the findings of Basoru and Fasakin (2012) but contrary to the one obtained by Nmadu and Ibiejemite (2007) which showed that area

Table 1: Regression results of the socio-economic factors influencing rice output

Variables	Coefficient	SE	t-stat	p-value
Constant	6.723	0.439	15.319	0.000
Age of the farmer (AGE)	-0.005	0.012	-0.430	0.668
Years of farming experience (YFE)	0.007	0.012	0.612	0.542
Household size (HHS)	-0.016	0.027	-0.593	0.552
Literacy level (EDU)	-0.011	0.016	-0.668	0.506
Cooperative membership (MCS)	0.069	0.204	0.340	0.735
Land rent (LDR)	1.182	2.359	0.501	0.618
Quantity of rice seed planted (CRS)	0.002	0.001	2.000	0.089*
Cost of chemicals (COC)	-3.016	0.722	- 4.259	0.000***
Farm size cultivated (FSC)	0.190	0.077	2.468	0.015**
Quantity of fertilizer applied (FRT)	0.002	0.001	2.000	0.0089*
Labour (LBO)	-3.348	3.118	-1.074	0.286
R^2	0.376			
Adjusted R^2	0.286			
F-ratio	4.171***			
SE of y	0.732			

***Significant at 1%, **Significant at 5% , *Significant at 10% , Source: Survey data analysis, 2013

of land cultivated did not significantly increase farm output. The coefficient of the cost of chemicals other than organic fertilizer was also significant at 1% and inversely related to rice output. The sign of the coefficient was in line with the apriori expectation because the more money is spent on buying chemicals, the less money that may be available to buy other farm inputs and invariably output would be affected. The coefficient of the quantity of fertilizer applied was significant at 5% and positively related to output of rice. The positive sign indicated that output of rice (all things being equal) increases with increase in fertilizer application. This result agreed with those of Onyenweaku and Effiong (2005), Onyenweaku and Nwaru (2005) and Okoye *et al.* (2008) who observed that fertilizer shifts the production frontier upwards leading to higher productivity. The coefficient of the quantity of rice seed planted was significant at 10% level and positively related to rice output. This shows that, all things being equal, the quantity of rice produced increases as the quantity of rice seed planted increases.

The coefficients of the age of the rice farmers, years of farming experience, household size, literacy level of the farmers, membership of cooperative society, the amount paid to acquire land (land rent) and hired labour were not significant. This does not mean that the above variables didnot have any effect on rice output but the level of their significance fell below the level of confidence limits tested.

The results on Table 2 revealed that, on the average, each of the rice farmers cultivated 1.84 ha of land with mean output per farmer and per hectare as 1349.50 and 730.37 kg, respectively. Although, the output per hectare is low, it agrees with the report by Okeleye *et al.* (2012) which showed that the grain yield in most developing countries is as low as 0.5 t ha^{-1}. It also agrees with the report by Ekeleme *et al.* (2008).which indicated that the average rice yield in Nigeria is low and ranges between 1 and 2.5 t ha^{-1}. The output per hectare is low compared with the one recorded by NAERLS and NPFS (2011) which revealed that the output per hectare for 2010 and 2011 were 1.78 and 1.77 t ha^{-1}, respectively. Similarly, when compared to some other countries of the world, FAO (2013) stated that Nigeria recorded less yields per hectare compared to countries like Thailand, Malaysia, China and Indonesia. The seed rate is 62.66 kg ha^{-1} and it

Table 2: Estimate of some of the variables studied

Variables	Estimated value
Mean rice output per farmer (kg)	1349.50
Rice output (kg ha^{-1})	730.37
Mean land rent	₦21, 880.68
Mean cost of hired labour per farmer	₦45,276.14
Mean rice seed planted per farmer (kg)	115.80
Seed rate (kg ha^{-1})	62.66
Fertilizer application (kg ha^{-1})	107.32
Average farm size (ha)	1.84
Fertilizer application per farmer (kg)	198.30

Source: Survey data analysis, 2013

Table 3: Farmers' reasons for planting rice

Reasons	Frequency	Percentage
Sale and get money	(72) 46	52.27
Family consumption	(51) 32	36.36
Secure my land	(9) 5	5.68
Hobby	(4) 3	3.42
No other job	(3) 2	2.27
Total	(139) 88	100

Values in parentheses are multiple frequencies, Source: Field data analysis, 2013

Table 4: Distribution of the rice farmers according to source of land cultivated

Source land	Frequency	Percentage
Inherited the land	44	50.00
Cultivated family land	32	36.36
Rented the land (leased)	11	12.50
Cultivated communal land	1	1.14
Allocation from government	0	0.00
Total	88	100

Source: Field data analysis, 2013

is within the recommended lowland (50-60 kg ha^{-1}) and upland (40-50 kg ha^{-1}) seed rates (Ekeleme *et al*., 2008). The fertilizer application rate was 107.32 kg ha^{-1} which is approximately two bags per hectare. This is low although fertilizer application rate is a function of the soil nutrient needs.

Table 3 shows the farmers' reasons for cultivating rice. Greater proportion (52.27%) of the farmers indicated that they cultivated rice in order to sale the output and get income. In other words it was cultivated as a cash crop and this agrees with the findings of Basoru and Fasakin (2012) which indicated that farmers cultivated rice because it is a lucrative business that is capable of yielding income. The second set of people (36.36%) said that they cultivated rice mainly for household consumption. Only 2.27% indicated that they cultivated rice to secure their land while 3.42% said it was a hobby. Although the proportion of the farmers that indicated that they cultivated rice either to secure their land or as a hobby was small, it points to the fact that many of them did not take rice farming as an occupation or business and, therefore, may not have taken appropriate measures to improve the yield.

Table 4 shows the sources of land cultivated by the farmers. According Ekong (2003), land tenure system refers to the rights to hold, use and possess the natural resources found in the land

Table 5: Socio-economic characteristics of the rice farmers

Characteristics	Frequency	Percentage
Age group (Mean = 44 years)		
≤20	1	1.14
21-30	4	4.55
31-50	30	34.09
41-50	36	40.90
>50	17	19.32
Sub-total	88	100
Literacy level (Mean = 6.5 years)		
No formal education	34	38.64
Primary school	21	23.86
Secondary school	14	15.91
Post secondary school	19	21.59
Sub-total	88	100
Household size (Mean = 8 persons)		
1-2	0	0.00
3-4	18	20.45
5-6	46	52.28
>6	24	37.37
Sub-total	88	100
Years of farming experience (Mean = 14 years)		
1-10	36	40.91
11-20	41	46.59
>20	11	12.50
Sub-total	88	100
Membership of farmers' cooperative societies		
Yes	25	28.41
No	63	71.59
Sub-total	88	100
Marital status		
Married	80	90.91
Widow	3	3.41
Single	3	3.41
Separated/divorced	2	2.27
Sub-total	88	100

Source: Field data analysis, 2013

profile from the atmosphere to some few meters below the soil surface. The distribution revealed that majority (50.00%) of the farmers cultivated land inherited from their parents. This is a reflection of the land tenure system that is very common in the study area. The least land used was that belonging to government as none of the farmers interviewed indicated that he/she cultivated land allocated by government.

Table 5 shows the socio-economic characteristics of the small scale rice farmers. The results revealed that majority (86.25%) of the rice farmers were married with an average household size of 8 persons. The mean age of the farmers was 44 years and on average, they had farming experience of 14 years. This is a clear indication that they were middle-aged farmers that could handle any of the cultural operations in rice production. Age is very important in the study because it is one of the demographic characteristics that can be used to classify rural population into

targetable groups for development interventions. Again, Gul Unal (2008) stated that old age might pose problem in agriculture because most of the work is physically demanding. Greater percentage (68.12%) of the rice farmers had, at most, primary school education. The low literacy rate is equally revealed in the mean (6.5 years) which in Nigeria, reflects primary school education that lasts for 6 years. Understanding the literacy level of farmers is vital in this study because information from NGP (2006) revealed that education improves the individual's quality of life and offers him/her access to employment, income and political power. Majority (71.59%) of the rice farmers were not members of cooperative societies. This should be addressed because it enables farmers to solve their agricultural problems among other things (Kehinde *et al*., 2009).

CONCLUSION

Globally, there are some crops that are very popular and have contributed immensely to the sustenance of humanity. Rice is one of them and it is cultivated for different purposes. The importance of rice to humanity deserves that every effort should be made to identify all factors limiting its production hence, the aim of the study is to determine factors influencing small-scale rice farmers' output in Abuja Nigeria. Data on some socio-economic characteristics were collected from the rice farmers and analyzed using multiple regressive analysis and descriptive statistics. Results indicated that the quantity of seed planted, fertilizer application, cost of chemical (other than fertilizer) and farm size significantly influenced the output of rice. The results have a lot of policy implications in rice production. First, the value of R^2 (0.376) indicated that in addition to agro-climatic and biotic factors like rainfall, temperature, humidity, pests and diseases, socio-economic factors also influence the output of rice. Hence, policy maker and planners should be conscious of farmers' socio-economic variables in the planning and implementation of projects aimed at improving rice production. Again, the result also showed that some of the socio-economic variables influencing rice output were more important than others hence any effort to improve rice production should take cognizance of that. For example, the variables that were significant in the study were the major determinants of rice output while the non-significant variables were the minor determinants. In view of the findings, the paper recommended that the socio-economic characteristics that influenced the output of rice should be properly addressed in the formulation of policies and programmes that are aimed at improving the output of rice in the study area.

REFERENCES

Adakayi, P.E., 2000. Climate. In: Geography of Abuja Federal Capital Territory, Dawan, P.D. (Ed.). Famous/Asanlu Publishers, Minna, Niger State, Nigeria, pp: 9-23.

Ajah, J. and J.N. Nmadu, 2012. Socio-economic factors influencing the output of small-scale maize farmers in Abuja, Nigeria. Kasetsart J. (Soc. Sci.), 33: 333-341.

Ajewole, O.I. and A.A. Aiyeloya, 2004. Socio-economic analysis of benefits of Ibadan forest reserves. J. Trop. Forest Resources, 20: 95-105.

Akinbile, C.O., 2010. Behavioural pattern of upland rice agronomic parameters to variable water supply in Nigeria. J. Plant Breed. Crop Sci., 2: 73-80.

Alabi, R.T. and A.G. Ibiyami, 2000. Rainfall in Nigeria and Food Crop Production. In: Agronomy in Nigeria, Akoroda, M.O. (Ed.). University of Ibadan, Ibadan, Nigeria, pp: 63-66.

Ayoola, J.B., C. Dangbegnon, C.K. Daudu, A. Mando and T.M. Kudi *et al*., 2011. Socio-economic factors influencing rice production among male and female farmers in Northern guinea savanna Nigeria: Lessons for promoting gender equity in action research. Agric. Biol. J. North Am., 2: 1010-1014.

Basoru, O.J. and J.O. Fasakin, 2012. Factors influencing rice production in Igbemo-Ekiti Region of Nigeria. J. Agric. Food Environ. Sci., 5: 1-9.

Danbaba, N., J.C. Anounye, A.S. Gana and M.E. Abo, 2013. Grain physiochemical and milling qualities of rice (*Oryza sativa* L.) cultivated in Southeast, Nigeria. J. Applied Agric. Res., 5: 61-71.

Dawan, P.D., 2000. Brief History of the Creation of Federal Capital Territory (FCT). In: Geography of Abuja Federal Capital Territory, Dawan, P.D. (Ed.). Famous/Asanlu Publishers, Minna, Niger State, Nigeria, pp: 1-8.

Edoka, M.H., S.O. Adejoh and M.K. Ibrahim, 2009. The role of women in rice production in Idah local government area of Kogi State, Nigeria. Proceedings of the 43rd Annual Conference on Agricultural Society of Nigeria, October 19-23, 2009, Abuja, pp: 648.

Ekeleme, F., A.Y. Kamara, L.O. Omoigui, A. Tegbaru, J. Mshelia and J.E. Onyibe, 2008. Guide to Rice Production in Borno State, Nigeria. IITA, Ibadan, Nigeria, ISBN: 9781313242, Pages: 20.

Ekong, E.E., 2003. An Introduction to Rural Sociology. 2nd Edn., Dove Educational Publishers, Uyo, Nigeria.

FAO, 2013. FAO Rice Market Monitor (RMM). Volume, 16, Trade and Market Division, Food and Agriculture Organization of the United Nations, Rome, Italy, pp: 1-36.

Gul Unal, F., 2008. Small is beautiful: Evidence of an inverse relationship between farmsize and yield in Turkey. Levy Economics Institute Working Paper No. 551. http://www.levyinstitute.org/pubs/wp_551.pdf.

Jamala, G.Y., H.E. Shehu and A.T. Garba, 2011. Evaluation of factors influencing farmers adoption of irrigated rice production in Fadama soil of North Eastern Nigeria. J. Develop. Agric. Econ., 3: 75-79.

Kamara, A.Y., F. Ekeleme, L.O. Omogui and D. Chikoye, 2011. Influence of nitrogenous fertilizer on yield and yield components of rainfed lowland NERICA rice in the Northern guinea savanna of Nigeria. Afr. J. Agric. Res., 6: 3092-3097.

Kehinde, A.L., A. Ayandiji, O.A. Awoniji and M.T. Akiwumi, 2009. Effects of farmers' cooperative on agricultural production in Ejigbo local government area of Osun State: Implications for agricultural policy. Nigerian J. Rural Sociol., 9: 89-94.

NAERLS and NPFS, 2011. Agricultural performance survey of 2011 wet season in Nigeria. National Agricultural Extension and Liaison Services, Ahmadu Bello University and National Programme for Food Security, pp: 1-174.

NGP, 2006. Nigeria national gender policy, federal republic of Nigeria: Situation analysis/framework. The Federal Ministry of Women Affairs and Social Development, Abuja, Federal Republic of Nigeria, pp: 1-24.

NPC, 2006. Population and housing census enumerators manual. Federal Republic of Nigeria, National Population Commission, Nigeria, pp: 1-16.

Nmadu, J.N. and J.O. Ibiejemite, 2007. Economic analysis of fertilizer use on yam production in Kabba, Bunu L.G.A Kogi State. Proceedings of the 9th Annual Conference of the National Association of Agricultural Economics, November 5-8, 2007, Abubakar Tafawa Balewa University, Bauchi, pp: 11-20.

Nwajiuba, C.U. and A.O. Ejiogu, 2008. Short-run analysis of food and fuel prices in Nigeria 1990-2006: Implications for food security. Proceedings of the 10th Annual Water Distribution Systems Analysis Conference, August 17-20, 2008, Kruger National Park, South Africa, pp: 476-491.

Nwalieji, U. and E.A. Onwubuya, 2013. Adaptation practices to climate change among rice farmers in Anambra State of Nigeria. J. Agric. Extension, 16: 42-49.

Okeleye, K.A., A.A. Oyekanmi, O.I. Ariyo and T.O. Tayo, 2012. Performance of rice variaties under upland and lowland rainfed ecologies of southwestern Nigeria. ASSET Ser. A, 2: 127-140.

Okonji, C.J., K.A. Okeleye, S.O. Oikeh, S.G. Aderibigbe, F.E. Nwilene, O. Ajayi and A.A. Oyekanmi, 2012. Rice yield and yield components as influenced by phosphorus and nitrogen application rates in the moist savanna of West Africa. J. Agric. Sci. Technol., 2: 1214-1223.

Okoye, B.C., C.E. Onyenweaku, O.O. Ukoha, O.C. Asumugha and O.C. Aniedu, 2008. Determinants of Labour productivity on small-holder cocoyam farms in Anambra State, Nigeria. Acad. J. Sci. Res. Essay, 3: 559-561.

Onwueme, I.C. and T.D. Sinha, 1991. Field Crop Production in Tropical Africa. Technical Centre for Agricultural and Rural Co-operation (CTA) Ede, The Netherlands, ISBN-13: 9789290810865, Pages: 480.

Onyenweaku, C.E. and E.O. Effiong, 2005. Technical efficiency in pig production in Akwa Ibom State, Nigeria. Nig. Int. J. Agric. Rural Dev., 6: 51-57.

Onyenweaku, C.E. and J.C. Nwaru, 2005. Application of stochastic frontier production function to the measurement of tropical efficiency in food production in Imo State, Nigeria. Nigerian Agric. J., 36: 1-12.

Philip, O.A., A.O. Kehinde and O.O. Ganiyu, 2006. Principles of Crop Production. Ideas and Innovations Publication, USA., pp: 165-175.

Sabair, G., 2008. Nigerian spends one hundred billion yearly to import rice. Nigerian Tribune Newspaper, November 25, 2008.

WARDA, 2001. West Africa rice development association. Strategic Plan 2003-2010.