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RESOURCE UTILIZATION BEHAVIOUR OF CASSAVA PRODUCERS IN EPE AREA OF LAGOS STATE: STOCHASTIC FRONTIER PRODUCTION FUNCTION APPROACH

Ogunbameru A. and Okeowo T. A.

*Invited paper presented at the 4th International Conference of the African Association
of Agricultural Economists, September 22-25, 2013, Hammamet, Tunisia*

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**50-RESOURCE UTILIZATION BEHAVIOUR OF CASSAVA PRODUCERS IN EPE AREA OF LAGOS STATE:
STOCHASTIC FRONTIER PRODUCTION FUNCTION APPROACH**

Ogunbameru, A. and Okeowo, T. A.

biodunokeowo@gmail.com

+23480272829

ABSTRACT

The Stochastic frontier production function was used to assess the technical efficiency of cassava production in Epe Area of Lagos State, Nigeria. Results show that cassava farmers in the study area experienced increasing positive return-to-scale (2.2675). The study also reveals that a significant relationship exists between farm size, labour, planting materials, cost of other input and cassava output in the study area. Cassava farmers with large farms are found to have higher net farm income per hectare than small holder farms in the study area. The study points to the fact that cassava farmers in the study area were not efficient in allocating their resources considering their scope of operation.

Key Words: Productivity, Technical Efficiency, Technical Inefficiency, Farm Size, Cassava, Stochastic Frontier.

Introduction

Nigerian cassava production is by far the largest in the world, a third more than production in Brazil and almost double the production of Indonesia and Thailand, Cassava transformation is the most advanced in Africa (IFAD, 2004). The Food and Agriculture Organization of the United Nations (FAO) in Rome (FAO, 2004) estimated 2002 cassava production in Nigeria to be approximately 34 million metric tonnes. According to National Fadama Development Project (2009), Kogi State is the second largest producer of cassava in Nigeria with a production figure of 2.854 million metric tonnes. Farmers produce cassava as a source of family food and income. IITA (2004) corroborated this ranking by noting that Benue and Kogi state in the North Central Zone are the largest producers of cassava in Nigeria. IFAD (2004) showed that on a per capita basis, North Central is the highest producing state at 0.72 tonnes per person in 2002, followed by South East (0.56), South-South (0.47), South-West (0.34), North-West (0.10) and North-East (0.01). National per capita production of cassava is 0.32 tonne per person.

Agriculture employs about two-thirds of Nigeria's total labour force, contributed 42.2% of Gross Domestic Products (GDP) in 2007 and provides 88% of non-oil earnings (World Bank,2005). The agricultural GDP is contributed by crops (85%), livestock (19%), fisheries (4%) and forestry (1%). More than 90% of the agricultural output is accounted for by small-scale farmers with less than two (2) hectares under cropping (World Bank, 2005; Manyong, 2005). Cassava belongs to the family Euphorbiaceae. Two varieties of the cassava are of economic value: the bitter, or poisonous (*Manihot esculenta*), and the sweet, or nonpoisonous (*Manihot dulcis*). Its roots are eaten as food, fed to stock, or used in the manufacture of starch and glucose. The leaves are used as vegetable and source of vitamins, mineral and proteins. In Sub Saharan Africa the per capita per kg/year consumption of Cassava is 103, which is far higher than that of maize (40), banana/plantain (28), sorghum (23), milk (27), meat (11), yam (28) and millet (17) in the same region (IITA, 2004). Nigeria's

Presidential Initiative on Cassava Production is one of the strategies of the past Federal Government's National Economic Empowerment and Development Strategy (NEEDS) whose objective was to generate N3 billion from agricultural exports (National Planning Commission, 2005). IITA (2004) noted that poverty reduction can be attained in Sub-Sahara Africa by improving the technical and economic efficiencies of food production in crops such as cassava. IFAD (2004) showed that the growing demand for cassava which will spur rural industrial development and contribute to the economic development of producing, processing and trading communities and well-being of numerous disadvantaged people in the world, has prompted the development of the Global Cassava Development Strategy. The Strategy suggested that industry analysis in cassava producing countries should be undertaken to indicate current status, strengths, weaknesses and issues for attention and action needed to resolve pressing constraints and take advantage of markets and business opportunities as well as to encompass findings of committed national experts.

Cassava can be a powerful poverty fighter in Nigeria. The cash income from cassava proves more egalitarian than the other major staples because of cassava's low cash input cost (Nweke, 2004). Compared with other major staples, cassava performs well across a wide ecological spectrum. It therefore benefits farmers across broader of ecological zones. Cassava is likewise less expensive to produce. It tolerates poor soil, adverse weather and pests and diseases more than other major staples (Nweke, 2004). The crop puts ready money and food in the very vulnerable segments of society. Cassava stores its harvestable portion underground until needed; it is therefore a classic food security crop.

Food has been persistently used as a weapon during wars, national and international politics. Whosoever therefore controls the key to the store house controls the conscience of a hungry man or nation. In view of this, cassava not only serves as food crop, it is a major source of income and employment for rural households in Nigeria. As a food crop, cassava has some inherent characteristics which make it attractive especially to the small holder farmers in Nigeria. Firstly, it is rich in carbohydrates, especially starch, and consequently has multiplicity of end users. Secondly, it is available all the year round; making it preferable to other more seasonal crops such as grains, peas, beans and other crops for food security, and lastly it is tolerant of low soil fertility and more resistant to drought. Cassava tubers are mostly processed into cassava flour (lafun), gari and fufu (lafun is dried powdered form of cassava, gari is fried granulated form of cassava while fufu is fermented pounded form of cassava) in Nigeria. It can also be cooked or eaten, pounded and consumed in its raw form, most especially the sweet variety. By implication, cassava has become a regular item in household diets in Nigeria. Presently, the crop had achieved an 'export status' because of the increasing demand for cassava as industrial raw material abroad. To meet the export demand and domestic demand, Nigeria needs about 150 metric tonnes of cassava which prompted the Federal government of Nigeria to come out with a policy for cassava production with a view of setting policies that will stimulate domestic production.

Hence, in view of this development, the role of increased efficiency and productivity of cassava farms is no longer debatable but a great necessity in order to reverse the low technical, economic and allocative efficiency of small holder farms in Nigeria, since cassava has the potential for bridging the food gap, as it has been discovered from research that famine rarely occurs where cassava is widely grown. This study is aimed at opening a new dimension to farmers and policy makers on how to increase cassava production by determining

the extent to which it is possible to raise efficiency of cassava farms with the existing resource base and available technology in order to address the production problem in Nigeria.

The current policy direction of the Federal government of Nigeria has encouraged cassava development leading to a new orientation in the research-extension-farmers linkage. Asogwa et al. (2005) observed that the input expansion policy of government in the cassava industry through the provision of improved cassava varieties and improved processing technology led to efficient use of resources in cassava production in Nigeria. Given the various cassava programmes and policies implemented over the years to raise farmers' efficiency and productivity in cassava production, it then becomes imperative to empirically analyze the relationship of technical efficiency and socio-economic variables of cassava farmers. This will further guide policy makers in making policy for the improvement of the welfare of cassava farmers, and ultimately for the expansion of their cassava production.

A large portion of the economic development literature is devoted, with arguments going both for and against the notion that smaller farms are more productive (Masterson and Rao 1999). One critique leveled in the literature on the productivity-farm size relationship is that the measure used, land productivity, is inappropriate. Because it only compares total output to the size of the farm, ignoring other factors of production and inputs, land productivity is said to be, at best, an incomplete measure of economic efficiency. Small farms have both higher land productivity and equal or better technical efficiency. This is true even when controlling for many of the factors the literature suggests as possible explanations for the inverse relationship.

The problems of agriculture in Nigeria center essentially on the efficiency with which farmers use resources on their farms. It also borders on how the various factors that explain farm efficiency could be examined, so as to bring about some level of improvement. Nigerian agriculture is dominated by the small scale farmers who produce the bulk of food requirements in the country. Despite their unique and pivotal position, the small holder farmers belong to the poorest segment of the population and therefore, cannot invest much on their farms. The vicious circle of poverty among these farmers has led to the unimpressive performance of the agricultural sector (Ajibefun, 2002). According to Ajibefun and Daramola (2003), resources must be used much more efficiently, with more attention paid to eliminating waste; this will lead to an increase in productivity and incomes.

Based on the above, examining the productivity of resource use in these cassava-based communities in Lagos State will help highlight those variables that could be better managed to improve the productivity of cassava farms. Results from this study will be of immense benefit to farmers and stakeholders in the agricultural industry both within and outside of the immediate communities. The increase in output could result from the development and adoption of new technologies and improvement in the technical efficiency of enterprise operations. Technical efficiency also reflects the ability of a farm to obtain maximum output from a given set of input and available technology (Madan et al., 2000). It has been shown that efforts designed to improve efficiency as a means of increasing agricultural output are more cost-effective than introducing new technology particularly if farmers are not making efficient use of the existing technology (Belbase and Grabowski 1985). If however farmers are reasonably efficient, then increases in productivity would require new inputs and technology to shift the enterprise frontier upward.

The challenge of this study is to estimate the current level of productivity, technical efficiency and farm size in Epe Area of Lagos State. The outcome of the study would serve as a guide to public policy design and

implementation in enhancing the efforts of the cassava farmers. The general objective of the study is to determine the productivity and technical efficiency of cassava production in the study area with reference to farm size.

Specifically, the objectives are to:

- Determine the socio-economic characteristics of cassava farmers in the study area.
- Determine the productivity level of the cassava farmers in the study area.
- Determine the level of technical inefficiency of cassava production in study area.
- Determine the farm size utilized by cassava farmers in study area.

Methodology

The study was carried out in selected towns in Epe, Itokin, Ejinrin, Eredo and Agbowo in Epe Local Government Area of Lagos State. The state is bounded in the north and east by Ogun State, in the west by Republic of Benin and in the south by the Atlantic Ocean. For administrative convenience, the State is divided into five divisions, namely: Lagos, Ikeja Badagry, Ikorodu and Epe. Epe is a town and Local Government Area (LGA) in Lagos State, Nigeria located on the north side of the Lekki Lagoon. The Ijebu people of the Epe Local Government areas share a collective heritage with their kith and kin in the present day Ogun State and agriculture is their domain of occupation.

Primary data was collected using a standard structure questionnaire. The secondary sources of data are from government papers, online materials, magazines, publications and relevant bulletins. Stratified random sampling was used to select 80 cassava farmers from the study area, Epe Area of Lagos State. Data gathered for the study was analyzed using descriptive statistics and stochastic frontier production models. Stochastic Frontier Analysis as a method of economic modeling has its starting point in the stochastic production frontier models simultaneously introduced by Aigner, Lovell and Schmidt (1977) and Meeusen and Van den Broeck (1977). The production frontier model without random component can be written as:

$$Y_i = f(X_i; \beta) \cdot TE_i$$

Where,

- Y_i is the observed scalar output of the producer i , $i=1,..,I$,
- x_i is a vector of N inputs used by the producer i ,
- $f(x_i, \beta)$ is the production frontier, and
- β is a vector of technology parameters to be estimated.
- TE_i denotes the technical efficiency defined as the ratio of observed output to maximum feasible output. $TE_i = 1$ shows that the i -th firm obtains the maximum feasible output, while $TE_i < 1$ provides a measure of the shortfall of the observed output from maximum feasible output.

A stochastic component that describes random shocks affecting the production process is added. These shocks are not directly attributable to the producer or the underlying technology. These shocks may come from weather

changes, economic adversities, or plain luck. We denote these effects with $\exp(V_i)$. Each producer is facing a different shock, but we assume the shocks are random and they are described by a common distribution.

The stochastic production frontier will become:

$$Y_i = f(X_i; \beta) \cdot TE_i \cdot \exp(V_i)$$

We assume that TE_i is also a stochastic variable, with a specific distribution function, common to all producers. We can also write it as an exponential

$$TE_i = \{U_i\}$$

where $U_i \geq 0$, since we required $TE_i \leq 1$

Now, if we also assume that $f(x, \beta)$ takes the log-linear Cobb-Douglas form, the model can be written as:

$$\ln Y_i = \beta + \sum \beta_n \ln X_{ni} + V_i - U_i$$

where v_i is the “noise” component, which we will almost always consider as a two-sided normally distributed variable, and U_i is the non-negative technical inefficiency component. Together they constitute a compound error term, with a specific distribution to be determined, hence the name of “composed error model” as is often referred.

Specifically, the frontier production function utilized for this study is;

$$\ln Y = \beta_0 + \beta_1 \ln X_{1ij} + \beta_2 \ln X_{2ij} + \beta_3 \ln X_{3ij} + \beta_4 \ln X_{4ij} + \beta_5 \ln X_{5ij} + e$$

Where,

Y = Value of total output of the cassava farmers (Tonnes).

X_1 = Land area for cultivation (Hectare).

X_2 = Labour (man-days).

X_3 = Quantity of seed (cassava stem cuttings) planted (count).

X_4 = Variety of cassava planted (Improved = 1, Local = 0).

X_5 = Cost of other input

B_{1-5} = Vector of unknown parameters.

$e_i = V_i - U_i$ (Composite error term)

While the Technical Efficiency model is represented as follows;

$$TE = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + e$$

Where,

TE = Technical efficiency of the cassava farmers.

Z_1 = Years of experience

Z_2 = Year of formal education

Z_3 = Number of meeting extension

Z_4 = Seminars attended (Attend = 1, Not attend = 0)

Z_5 = Credit status (Access = 1; No Access = 0).

$e_i = V_i - U_i$ (Composite error term)

Results and Discussion

Socio-Economic Characteristics Of Respondents

The result from table 1 shows that the age of the majority of the respondents range from 30 – 50 which is about 91.3%. The result shows that most respondents were male (73.8%). This indicates that men are more into cassava production in the study area than women. About 96% of the respondents are married. Educational attainment of farmers does not only raise agricultural productivity but also enhances farmers' ability to understand and evaluate information on new techniques and processes. This is in support of the findings by Noor (2001). The percentage of respondents that are not educated is 1.3%, this shows that a significant percentage of the respondents went to school at least secondary school level. The effect of these can be seen in the level of exposure which strongly affects their level of efficiency. According to Omolola (1988), the size of the household largely depends on the status of farmers and particularly on the number of wives the farmer has. One of the most important factors affecting production level and productivity among farmers is the composition and size of farming family, the result shows that most of the respondents had household size between 1 – 10, with a mean family size of seven (7). About 46% has experiences between 6 – 10 years.

Table1:Percentage Distribution of Respondents According to Socio-Economic Characteristics

Variables	Categories	Frequency	Percentage
Age (Years)	Below 30	3	3.8
	30 – 40	39	48.8
	40 – 50	34	42.5
	Above 50	4	5.0
Sex	Male	59	73.8
	Female	21	26.3
Marital Status	Single	3	3.8
	Married	77	96.3
Educational Background	Never been to school	1	1.3

	Adult education	8	10.0
	Primary school	15	18.8
	Secondary school	44	55.0
	Tertiary education and above	12	15.0
Household size	1 – 5	31	38.8
	6 – 10	31	38.8
	11 – 15	18	22.5
Experience (Years)	1 – 5	12	15.1
	6 – 10	37	46.4
	11 – 15	18	22.5
	16 – 25	13	16.4

Source: Field Survey, 2011.

Productivity Analysis: The production function estimates indicates the relative importance of factors or inputs used in cassava production in the study area. The estimates show that farm size, labour, planting materials, variety planted and cost of other inputs are important factors of production with coefficient of 0.2375, 0.0492, 0.0375, 1.8750 and 0.0683 respectively. However, estimates of the parameters of the stochastic frontier production model revealed that all the estimated coefficients of the variables of the production function were positive. The positive coefficients of farm size, labour, planting materials, variety planted and cost of others input implies that as each of these variables are increased, cassava output also increased. For instance, a 10% increase in man-days of labour used in production would increase the total output by about 0.5%. The result of the analysis shows that by increasing all these variables, an increasing in output will be recorded in cassava production.

Table 2: Maximum Likelihood Estimates (MLE) for the parameters of the Stochastic Frontier Production Model for cassava production.

Explanatory variable	Parameter	Coefficient	Standard-error	T-ratio
Constant	β_0	3.2500*	0.2967	0.9167
Farm size	β_1	0.2375	0.1550	0.1275
Labour	β_2	0.0492	0.0483	0.0842
Planting Materials	β_3	0.0375*	0.0158	0.1958
Variety Planted	β_4	1.8750*	0.1917	0.8167
Cost of other inputs	β_5	0.0683**	0.0133	0.4208
Sigma-squared (Variance)	σ^2	1.4917	0.2621	0.6308
Gamma	Γ	0.0013	0.0001	0.0012**
Log likelihood function		-18.8113		

** = significant at 5%,

Source: Field Survey, 2011

The return to scale (RTS) analysis which serves as a measure of total resource productivity is given in Table 3. The RTS parameter (2.2675) is obtained from the summation of the coefficients of the estimated inputs, which indicates that cassava production in the study area was in stage I of the production surface. Stage I is the stage of increasing positive return-to-scale, where production was believed to increase at an increasing rate. Stage I is an irrational stage in production function where efficiency is not maximized. The variable input is being used with increasing output per unit, (since the average physical product is at its maximum at that point). The output per unit of the variable input is improving throughout stage I. Thus, farmers can make more profit using more input in this stage; this implies that farmers are not efficient in their operation. While the average farm size in the study area is 2.6 hectare.

Table 3: Return to Scale of the parameters

Variables	Coefficient
Farm size	0.2375
Labour	0.0492
Planting Materials	0.0375
Variety Planted	1.8750
Cost of other inputs	0.0683
RTS	2.2675

Technical Efficiency Analysis: The technical efficiency analysis revealed that technical inefficiency effects exist in cassava production in the study area as confirmed by the gamma value of 0.0153. The gamma (γ) ratio indicates the relative magnitude of the variance (σ^2) associated with technical inefficiency effects. Hence, 0.0153 implies that about 1.5 percent variations in the output of cassava farmers were due to differences in their technical efficiencies.

Table 4: Maximum Likelihood Estimates (MLE) for the parameters of the Stochastic Frontier Production Model for Technical Inefficiency.

Explanatory variable	Parameter	Coefficient	Standard-error	T-ratio
Constant	δ_0	3.6719	0.0444	1.2906
Farming Experience	δ_1	0.1688	0.1509	0.0175**
Education	δ_2	0.3203	0.1969	0.0255**
Contact with Ext. Agent	δ_3	-0.0525	0.0581	-0.0141**
Seminars attended	δ_4	0.8984	0.9984	0.0141**
Credit Status	δ_5	-2.2969	2.5938	-0.0138**
Sigma-squared (Variance)	σ^2	32.5000	20.0000	0.0255**
Gamma	Γ	0.0153	0.0003	0.8047

*** = significant at 1%, ** = significant at 5%, * = significant at 10%

Source: Field Survey, 2011.

Inefficiency Determinants: The estimated coefficients of the inefficiency function provide some explanation of the relative technical efficiency levels among individual farmers. Among the listed inefficiency variables are contact with extension agent and credit status. These are statistically significant causes of inefficiency in cassava production in the area. The result shows the higher the years of experience of the farmers, the higher the number of workers employed on the farms (table 2), the lower the likelihood of being inefficient i.e. experienced farmers are more efficient than their inexperienced counterparts. This is so because these variables carry positive values of their coefficients. The coefficients of contact with extension agent and credit status are negative. This implies that most of the cassava farmers in the area should be advised to increase their participation in extension and cooperative activities and make use of available technology if they are to remain efficient.

Farm size utilization by cassava farmers: The average farm size utilized by cassava farmer in the study area is 2.6 hectare. Inputs, costs, and output per hectare seemed to increase as farm size increased, while output per unit of input increased. It was found that there is an inverse relationship between total output divided by net cropped area and farm size, and that using gross cropped area reduces the strength of this relationship. The search for an inverse relationship for physical yield of individual crops yielded weak evidence, but a strong inverse relationship between cropping intensity and farm size was found. Inverse relationships were found between labour intensity and farm size, between family labour and farm size, between capital input intensity and farm size, between inputs and farm size. And an inverse relationship between percentage of land irrigated and farm size was discovered.

The observed inverse relationship between farm size and productivity was due to differences in factor endowments (soil, labor, management ability, etc.), while differential factor prices, property rights, and tenure play a part in this phenomenon; the inverse relationship reflects “the desperate struggle of poor and marginal peasants to scratch a bare subsistence” (Dyer, 1991). Many explanations have been proffered for the inverse relationship, some by those advocating for land reform and others by those who question its wisdom. Carter (1984) sets out many of the possible explanations for the observed inverse relationship. These are possible characteristics of small farms themselves: they may have better quality soil within villages, size may be a proxy for mode of production, there may be diminishing returns to scale, and they may be more technically efficient. It was concluded that the inverse relationship is a result of differential factor use intensity (Carter 1984; Newell, Pandya, and Symons 1997). Small cassava farmers have a higher resource use per unit of land and they have more productivity advantage over large farms. In the absence of technical extension, credit services and access to requisite technologies, small farmers might lose this advantage (Cornia 1985).

Conclusion and Recommendations

The study has been able to identify the major determinants of cassava productivity and technical efficiency in study area. The variables used to determined productivity included labour, planting materials, variety planted and farm size; it was observed that increase these variables are contributed to the output of cassava production in the study area. The variables used to determine technical efficiency included farming

experience, education, contact with extension agents, seminars attended and credit status. Technical efficiency analysis revealed that technical inefficiency effects exist in cassava production in the study area.

The study affirmed that cassava farming is an enterprise that brings increasing returns to its investors, but farmers are not efficient in their operation because they are producing in stage I of production surface. For cassava production in the study area to brace up to the challenges posed by negative indices in the farms (with regards to some inputs) and fill in its efficiency gap, the following recommendations need to be considered for implementation.

Efforts to maintain the appropriate nutrients in the soil by practice shifting cultivation and erosion controlled to avoid washing away of the nutrients. Also the rural people should be encouraged to appreciate education. Education was revealed to significantly affect the productivity of cassava farms. When farmers are educated, they can better appreciate improved technologies and even use them appropriately, thereby enhancing better resource use. Efforts at mobilizing farmers into viable cooperative groups should also be pursued vigorously. This will help mobilize rural savings that can be readily available to the farmers. Farmers, if capacitated financially can easily afford necessary inputs to improve their production. Also efforts to encourage the farmers to increased their participation in extension activities and make use of available technology if they are to remain efficient. In conclusion, a significant relationship are exists between farm size, labour, planting materials cost of other input and cassava output.

To achieve the desired impact of research findings on cassava productivity in Nigeria, government must encourage private investments in agricultural research and development and act with greater transparency and timeliness in the budgeting approval, and fund release processes of agricultural research. Whatever agricultural extension model is adopted, the government's direct promotion and practice of extension delivery in Nigeria must be divested. Larger participation by the private sector will reduce the budgetary burden and improve delivery efficiency. Finally, the government must make greater investments in transportation infrastructure, especially rural-urban roads and markets. Improvement in road quality will attract private investment in cassava production, improve access to purchased inputs, credits and output markets, and enhance marketing efficiency.

References

- Aigner, D., C.A.K. Lopvell, and P. Schmidt. 1977.** "Foundation and Estimation of Stochastic Frontier Production Function Models." *Journal of Econometrics*, 6: 23-37.
- Ajibefun, I.A. (2002).** Analysis of policy issues in technical efficiency of small scale farmers using the stochastic frontier production function: With application to Nigerian Farmers. Paper Prepared for Presentation at the International Farm Management Association Congress, Wageningen, Netherland, July 2002, pp: 8.
- Ajibefun, I.A. and Daramola, A.G. (2003).** Determinants of Technical and Allocative Efficiency of Micro-Enterprises: Firm-level Evidence from Nigeria, African Development Bank, pp: 353-395.
- Battese G.E. and Coelli T.J. (1992).** Frontier Production Function, Technical efficiency and Panel Data.with application to Paddy farmers in India, *Journal of Productivity Analysis*. 3. pp: 153-169
- Belbase K. and Grabowski R. (1985).** Technical efficiency in Nepalese Agriculture. *Journal of Development Area*, 19: pp: 515 – 525.

- FAO. (2004).** Online Statistical Database. Rome, Italy: Food and Agriculture Organization of the United Nations, Web Site www.fao.org.
- Farrell, M. J. (1957).** The measurement of productive efficiency. *Journal of the Royal Statistical Society – Series A (General)* 120 (3): pp 253–290.
- IFAD (2004).** The Global Cassava Development Strategy: A cassava industrial revolution in Nigeria The potential for a new industrial crop. Philips, T.P; Taylor, D.S; Sani, L. and Akoroda M. O.(eds). International Fund for Agricultural Development Food and Agriculture Organization of the United Nations: Rome.
- IITA. (2004).** Nigerian's Cassava Industry: Statistical Handbook.
- Madan M. Dey, Ferdinand J. Parguas Gasper B. Bimbao, Prescilla B. Regaspi (2000).** Technical efficiency of tilapia grows out pound operations in Philippines, *Aquaculture Economics and Management*. Vol.4 N 1 & 2.
- National Planning Commission (2005).** National Economic Empowerment and Development Strategy (NEEDS). National Planning Commission: Abuja.
- Noor A.L (2001).** Education and Basic Needs, Staff working Paper on Agricultural Credit and production NISER Monograph series 4, pp 67
- Nweke, F. (2004).** New Challenges in the Cassava Transformation in Nigeria and Ghana. Environment and Production Technology Division (EPTD) Discussion Paper No. 118, International Food Policy Research Institute, Washington,D.C. USA, June, 2004, pp: 118.
- Omolola A.A (1988).** Agricultural Extension and Production Efficiency. NISER Monograph series 4, pp 63.