American Journal of Food Science and Nutrition
2017; 4(5): 52-58
http://www.aascit.org/journal/ajfsn
ISSN: 2375-3935

AASCIT American Association for Science and Technology

Keywords
Economic,
Efficiency,
Food,
Security,
Farm,
Households

Received: April 13, 2017
Accepted: May 11, 2017
Published: August 29, 2017

Economic Efficiency and Food Security Status of Rural Farm Households in Abia State of Nigeria

Iheke O. R., C. O. Onyendi

Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Nigeria

Email address

ralphiheke@gmail.com (Iheke O. R.), iheke.onwuchekwa@mouau.edu.ng (C. O. Onyendi)

Citation

Iheke O. R., C. O. Onyendi. Economic Efficiency and Food Security Status of Rural Farm Households in Abia State of Nigeria. *American Journal of Food Science and Nutrition*. Vol. 4, No. 5, 2017, pp. 52-58.

Abstract

Global food insecurty remains a serious problem and more than 900 million people are still hungry in 2010 [7]. With high level of poverty, malnutrition, low agricultural productivity, and followed by considerable and continuous increase in food prices over the past few years, the issue of increasing agricultural productivity has become the main concern to governments. How efficient a farmer is determines his level of productivity and income, and subsequently how food secure he is. This study therefore, examined the economic efficiency and food security status of farm households in Abia State of Nigeria. Multi stage random sampling technique was employed in selecting the respondents and data was collected using structured questionnaire. The economic efficiency of the respondents was analysed using stochastic frontier Cobb-Douglas profit function and the food security status was analysed using food security line. The result of data analysis revealed that education, age of the farmer, primary occupation, farming experience, farm size, credit, membership of association and extension contact were the significant factors influencing the economic efficiency of the farm households. Ninety percent of the respondents were found to be more than 70% economically efficient. The most efficient farmers are found to operate at 99 percent while the least efficient farmers were found to operate at 13.4 percent efficiency level. The average level of economic efficiency was 85.5 percent. Also, the food security needs were not adequately met as 31.25% were food secure while 68.75% were food insecure. Adequate enlightenment and education of the farm households is therefore recommended for the farm households so as to improve their efficiency, as this will lead to increased productivity and food availability. This calls for the strengthening of the agricultural extension system provide the informal training that helps to unlock the natural talents and inherent enterprising qualities of the farm household for increased productivity.

1. Introduction

Poverty and malnutrition continue to be major problems in Sub-Saharan Africa. Agricultural production increased to 12.3 percent of gross domestic product in 2009. Yet, 72.9 percent of the population live on less than US$2 per day, 27.5 percent consume inadequate calories, and 23.6 percent of children under five are underweight [6, 16]. Despite of the significant progresses made in the agriculture in the past decade, poverty and malnutrition continue to be major problems in Sub-Saharan Africa [20]. In Nigeria, despite its vast agricultural resources and oil wealth, poverty is widespread in the country and has increased since the late 1990s [16].

The challenge that is currently confronting Nigeria's agriculture is related to the problem of low production resulting from inefficient use of resources [32]. Nigeria is one of the populous countries with an estimated population of 191.8 million people [48]. Approximately 68% of this population are women and children with over 70% residing and securing their livelihood in the rural areas [22]. Raising the productivity of rural households is crucial in reducing rural poverty and hunger [16].

The Nigerian agricultural sector is of notable relevance in the country's economic development and growth. It contributes immensely to the GDP (gross domestic product) and employs about 68% of the working population [27]. Agriculture as one of the critical sectors of the economy contributed about 33% of the total GDP of $183 billion in 2008 and 41.8% to real GDP in 2009 [26].

Despite these notable roles, food insecurity ranks top most among the developmental challenges facing Nigeria [4]. The level of food insecurity and poverty has continued to rise steadily in Nigeria. About 70 percent of Nigerians live on less than US$1.25 per day. Poverty is especially severe in rural areas where up 80 percent of the population live below the poverty line and social services and infrastructure are limited [8, 265, 21]. It rose from about 18% in 1986 to about 41% in 2004 [46]. Also, [19, 12] noted that growth in population and rapid urbanization has fuelled an increased demand for agricultural goods that regional production is increasingly failing to meet. Iheke, 2006 noted that although food production increased at an impressive rate in developing countries during the 1980's, it failed to keep pace with population growth in two third of the developing African countries. The situation has not only contributed to food insecurity among households but has led to adoption of inappropriate land use practices which have resulted to soil degradation and loss of fertility [12].

Admittedly, food security is strategic in that it is a measure of stability of the Nigerian Agriculture, the achievement of food self-sufficiency and self-reliance objectives of Nigerian government [37]. The reality is that Nigeria has not yet been able to attain self-sufficiency in food production annually. Many regard the Nigerian food problem as a paradoxical situation because, Nigeria appear to have the human and physical resources necessary to provide ample food and fibre for its domestic population and the export market [40].

Africa's low agricultural productivity has many causes, including scarce and scant knowledge of improved practices, low use of improved seed, low fertilizer use, inadequate irrigation, conflict, absence of strong institutions, ineffective policies, lack of incentives, and prevalence of diseases [18]. With scarcity of land, water, energy, and other natural resources, meeting the demands for food and fiber will require increases in productivity. The constraints to the rapid growth of food production seem to be mainly that of low crop yields and resource productivity [47]. According to [3], most of the essential farm inputs are rather not readily available or their cost is beyond the reach of most farmers. He equally observed other problems to include; lack of access to credit facilities, funding of research and inadequate storage facilities. The premise is that the level of technology prevailing in a given society reflects its capacity to optimize the use of natural and human resource in production 31]. This low state of technology has been the problem of agriculture and technical progress. The constraints to the rapid growth of food production seem to be mainly that of low crop yields and resource productivity [47]. Therefore, inefficiency in the use of resources constitutes the major constraints to increased agricultural production in Nigeria [35].

According to [14], efficiency has become a very significant factor in increasing productivity. They stated that assessing the relative performance of the processes used in transforming given inputs into output is key to increasing agricultural productivity and enhancing food security and income.

Activities in the food crop sub-sector have continued to dominate the category of farms variously referred to as smallholder farms based on size of the farm, size of holdings, scale of production [39]; low resource farms or small farms [1]. This category of farms, represent as much as 95% of the total food-crop farming units in the country and produces about 90% of the total food output [36]. It was assumed that the main objectives pursued by the farmers in the study area include provision food for his family throughout the year, accumulation of monetary income and ensuring minimum use of paid labour (in other words improve on the utilization of family labour).

It suffices to say that the knowledge of efficiency of resource use is vital to farmers in agricultural productivity. To this effect, the household food insecurity can be overcome either be by strengthening the household's resources or by enhancing their control and management of these resources [24, 9]. It therefore becomes very imperative to examine the efficiency of resource use and current food security status of farming households in Abia state of Nigeria.

2. Methodology

The study was conducted in Abia State of Nigeria. Abia is a State in South Eastern Nigeria. It is located latitude $4^0\ 40^1$ and 6^014^1 North and longitude 7^010^1 and 8^0 East of the equator. Abia has a total land area of 5,243.7km^2 approximately 5.8%land area of Nigeria. It has a total population of 2,833,999 from the 2006 population census, with a population density of 448.4 persons per square kilometre [28, 49]. Agriculture is the major economic sector of the rural inhabitants.

Multi-stage sampling technique was adopted in selecting the samples used for the study. In the first stage, all rural Local Government Areas (LGAs) were purposively selected. From the list, two LGAs were randomly selected. This formed the second stage and the third stage involved the selection of two communities. In the fourth stage, five villages were selected. The list of crop farm households in

each chosen village formed the respective sampling frames from which four farm households were randomly selected. In all, a total of eighty rural households were used for the study.

Primary data was collected using structured questionnaire and interview schedules. The data was collected in 2011 and re-validated in 2016. Information collected include, labour input, capital input, output and prices of inputs and outputs, farmer socio-economic characteristic such as age, farming experience in crop production, level of education, household size and credit use, income, farm size, age of household head, membership of cooperative society, educational status, access to consumption credit, input and output data, quantity of food consumed from own production as well as from purchases and household size etc.

A stochastic profit function is given as:

$$\Pi i = f(P_{ij}, Z_{kj}) \exp.(V_j - U_i) \quad (1)$$

Where Πi is the normalized profit of the j-th farm defined as gross revenue less variable costs divided by farm specific output price; P_{ij} is the price of the i-th variable input faced by the j-th farm divided by the price of output; Z_{kj} is the level of the k-th fixed factor on the j-th farm; f is an appropriate function such as Cobb-Douglas, translog, etc; V_j is stochastic disturbance term representing the effect of random factors beyond the control of the farmer e.g. weather, diseases outbreaks, measurement errors, etc. V_i is assumed to be independently and identically distributed as N (O, δ_v^2) random variables independent of the U_is which is a nonnegative random variable representing profit or economic efficiency. The U_is are assumed to be non-negative truncations of the N (O, δ_v^2) distribution (i.e. half normal distribution) or have exponential distribution. If $U_i = 0$, the farm lies on the profit frontier obtaining maximum profit given the prices it faces and levels of fixed factors. If $U_i > 0$, the farm is inefficient and losses profit because of inefficiency. The stochastic frontier model was independently proposed by [2, 23]. The economic efficiency of an individual farmer is defined in terms of the ratio of the observed profit to the corresponding frontier profit given the prices and levels of fixed factors of production of the farmer.

$$\text{Economic (profit) efficiency (EE)} = \Pi/\Pi^* = f(Pij, Zkj) \exp.(Vj - Ui)/ f(Pij, Zkj) \exp.(Vi) \quad (7)$$

$$= \exp(-Ui) \quad (2)$$

Where Π is the observed profit and Π* is the frontier profit and other parameters were as previously defined. The parameters of the stochastic frontier models are estimated using the maximum likelihood techniques [2]

The economic efficiency was analyzed using the Cob-Douglas profit function. It is given by:

$$\Pi^*P = Inb_0 + b_1 InP^*_1 + b_2 InP^*_2 + b_3 InX_3 + b_4 InX_4 + V_1 - U_1 \quad (3)$$

Where P^*_1 = normalized price of fertilizers; P^*_2 = normalized price of labour; X_3 = farm size (ha); X_4 = capital inputs in naira; b_0, b_2, b_3, b_4 are parameters to be estimated.

In order to determine the factors contributing to economic efficiency, the following model was formulated and estimated jointly with the stochastic frontier profit model in a single stage maximum likelihood estimation procedure using the computer software frontier version 4.1 [5]:

$$EE_i = [\exp(-U_i)] = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7 + \delta_8 Z_8 + \delta_9 Z_9 + \delta_{10} Z_{10} \quad (4)$$

Where EE_i = economic inefficiency effect of the ith farm; Z_1 = educational level of farmer in years of formal education completed; Z_2 = household size; Z_3 = sex of farmer (dummy; 1= male, 0 female); Z_4 = age of farmer in years; Z_5 = primary occupation; Z_6 = years of farming experience; Z_7 = farm size (ha); Z_8 = credit access (dummy: 1 for access and 0 if otherwise); Z_9 = Membership of association (dummy: 1 for membership and 0 if otherwise); Z_{10} = extension contact (numbers of contacts); and δ_i = parameters to be estimated.

The food security line was used to determine the food security status of the farm households. Food security line classified households into either food secure or food insecure depending on which side of the line they fall. The food security line was the recommended daily per capita calorie intake of 2470kcal 38]. The household calorie intake was obtained through the household consumption and expenditure data. The quantity of every food item consumed by the household in 3 days was converted into its calorie content. This was further converted into per capita calorie by dividing the estimated total household calorie intake by the adjusted household size in adult equivalent. Furthermore, the per capita calorie intake was converted into daily per capita intake by dividing by 3 days. A household whose daily per capita calorie intake is up to 2470 kcal capita intake is regarded as food secure and those below 2470 kcal relevant for targeting assistance and for the formulation were regarded as food insecure households.

The shortfall/surplus indexes were calculated for the sampled households based on the food security line. The shortfall/surplus index (P) measures the extent to which households are below or above the food security line.

It is expressed as:

$$P = 1/M \sum_{J=1}^{M} G_J \quad (5)$$

Where:
GJ = (YJ-R)/R
GJ= Deficiency or surplus face by households
M = Number of food insecure households
YJ = Calorie available to the jth household
R = Recommended per capita calorie intake

3. Results and Discussion

3.1. Economic Efficiency

The maximum likelihood (ML) estimates of the stochastic frontier Cobb-Douglas profit function of the respondents is presented in Table 1. The estimated variance (δ^2) was statistically significant at 1 percent indicating the goodness of

fit and correctness of the specified distribution assumptions of the composite error. Gamma (γ) is 0.631 and is statistically significant at 1 percent. These imply that 63.1 percent of the variations in farm profit was due to economic inefficiency.

Table 1. *Estimated Cobb-Douglass profit function of respondents.*

Production Factor	Parameters	Coefficient	t-ratio
Intercept	B_0	-6.428	-4.063***
Price of fertilizer	B_1	-0.221	-2.026**
Price of labour	B_2	0.419	0.297
Farm size	B_3	1.053	36.281***
Capital	B_4	0.189	1.646*
Diagnostic statistics			
Sigma squared (total variance)	δ^2	0.557	6.237***
Gamma (variance ratio)	γ	0.631	3.852***
Log likelihood		-90.138	
Sources of Economic Efficiency			
Education of farmers	Z_1	0.043	3.194***
Household size	Z_2	0.011	0.232
Sex of farmers	Z_3	0.258	1.353
Age of farmers	Z_4	-4.244	-3.194***
Primary occupation	Z_5	0.369	1.688*
Farming experience	Z_6	1.411	1.073*
Farm size	Z_7	-0.387	2.621***
Credit	Z_8	0.1E-04	0.417*
Membership of association	Z_9	0.549	1.882*
Extension contact	Z_{10}	0.367	3.165***

Source: computed from frontier 4.1/ survey data, 2016
*** Coefficient Significant at 1% ** Coefficient Significant at 5% * Coefficient Significant at 10%

The coefficients of the price of fertilizer has the theoretically expected negative sign indicating that profit decreases with increase in the price of fertilizer, *ceteris paribus*. Farm size and capital show positive relationship with profit indicating that farm profit increases with increase in the quantities of these fixed inputs.

3.2. Sources of Economic Efficiency

Table 1 shows that education, age of the farmer, primary occupation, farming experience, farm size, credit, membership of association and extension contact were the significant factors influencing the economic efficiency of respondents.

Education is positively related to economic efficiency and implies that higher the education attainment of the farmer the higher his efficiency. According to [16, 17], education increases the ability of the farmers to adopt agricultural innovation and hence improve their efficiency and productivity. Educating the farmers is of great importance as snail farming requires technical skills. Therefore, education and training programmes should be organized for these farmers to enable them acquire the necessary skills for the operations as snail farmers.

Age of household head was significant at 10 percent and negatively related to economic efficiency in concordance with *a priori* expectation. This result is consistent with [10, 12, 16, 17]. They reported that the risk bearing abilities and innovativeness of a farmer, his mental capacity to cope with the daily challenges and demands of farm production activities and his ability to do manual work decrease with advancing age; and the more he or she is unable to combine his or her resources in an optimal manner given the available technology. Therefore, economic policies for enhancing arable crop production should be skewed more towards encouraging the youths to get involved in farming.

Primary occupation is significant at 10 percent and positively related to economic efficiency. This implies that the economic efficiency of the farmer increases if his primary occupation is farming. Farming experience is significant at 10 percent level of significance and positively related to economic efficiency. This result is consistent with *a priori* expectations and has some positive implications for increased crop productivity because according to [30], the number of years a farmer has spent in the business of farming may give an indication of the practical knowledge he has acquired on how to overcome certain inherent farm production problems. Therefore, policies that harness the experience and practical knowledge of the farmers for increased production should be used.

Farm size, credit, cooperative membership/ farmers' associations, and extension contact were significant at 1 percent, 10 percent, 10 percent and 1 percent level of probability respectively and positively related to economic efficiency.

Arable land rather than land *per se* has remained the greatest constraint in arable crop production in Nigeria [11, 30]. The result is consistent with [41, 44, 43, 45, 33]. However, researchers have observed that given the severe scarcity, unsustainability and insecurity of land and its fast deterioration [29, 11]; increase in arable crop output should be expected more from the application of superior technology rather from land area expansion.

Credit is essential in the purchase of production inputs, improves access to land, and in adoption of innovations which enhances productivity. Hence, the positive and significant (P = 0.10) relationship between credit and economic efficiency conforms to *a priori* expectations. This result agrees with [15, 17, 14, 42, 43, 45]; but is not consistent with [34] found a negative relationship between credit and economic efficiency.

Coooperative membership/ farmers' associations are sources of good quality inputs, labour, credit, information and organized marketing of products. This explains the significant (P = 0.10) and positive relation between membership of association and economic efficiency. This result is consistent with [43 42, 34] posited that members of cooperative societies have enhanced ability to adopt innovations than non members.

Extension services provide informal training that helps to unlock the natural talents and inherent enterprising qualities of the farmer, enhancing his ability to understand and evaluate new production techniques leading to increased farm productivity and incomes with concomitant increase in the welfare of the farmer [30]. It is hoped that farmers' interactions with extension agents would help them to receive and synthesize new information on economic activities in his

locality and beyond. The positive and significant relationship between extension contact and economic efficiency implies that the higher the number of contacts a farmer made with an extension agent, the higher his economic efficiency, which is in consonance with *a priori* expectations.

3.3. Distribution of Economic Efficiency

The frequency distribution of economic efficiency of farmers in the study area was presented in Table 2. From the table, 90% of the respondents were to be found to be more than 70% economically efficient. The most efficient farmers are found to operate at 99 percent while the least efficient farmers were found to operate at 13.4 percent efficiency level. The average level of economic efficiency was 85.5 percent. The level of economic efficiency obtained in this study suggests that ample opportunities exist for the farmers to increase their productivity and income through increased efficiency in resource utilization in their farm operations.

Table 2. *Distribution of economic efficiency among the respondents.*

Range of Efficiency	Frequency	Percentage
0.01 - 0.20	3	3.75
0.21 – 0.40	2	2.5
0.41 – 0.60	3	3.75
0.61 - 0.80	15	18.75
0.81 – 1.00	57	71.25
Total	80	100
Mean Value of Efficiency	0.855	
Minimum Value of Efficiency	0.134	
Maximum Value of Efficiency	0.990	

Source: computed from frontier 4.1/ survey data, 2016

3.4. Food Security Status Among Farming Household

The distribution of the respondents based on their food security status is presented in Table 3. Based on the recommended daily calorie intake of 2470kcal, 31.25% of the farming households were food secured, while 68.75% were found to be food insecure. This conforms to the findings of Ibrahim and Bello (2009). Thus more than half of the households were consuming less than the daily per capita calories content. The shortfall/ surplus index (p) measured the extent to which household are below or above the food security line. Households that are termed food secured have the shortfall or surpluses greater than 1 that is, they exceeded the minimum daily per calorie requirement while the food insecure households were below the minimum daily capita calorie requirement.

Table 3. *Distribution of respondents' household based on their food security status.*

Food security status	Frequency	Percentage
Food secure	25	31.25
Food insecure	55	68.75
Total	80	100

Source: Field survey, 2016

The result above therefore indicate that a higher proportion of the households in the study were still food insecure. This may be attributed to seasonality of agricultural crops, low crop yields and resource productivity [47], adoption of inappropriate land use practices which have resulted to soil degradation and loss of fertility [12]) and instability in food production, food price increases or income shortfalls [9].

4. Conclusion

It could be concluded from this study that food insecurity is prevalent among the farm households and that absolute was not achieved by any of the households. Education, age of the farmer, primary occupation, farming experience, farm size, credit, membership of association and extension contact were the significant factors influencing the economic efficiency of the farm households. Adequate enlightenment and education of the farm households is therefore recommended for the farm households so as to improve their efficiency. This calls for the strengthening of the agricultural extension system which provides a medium for the transfer of innovation. Also, farm households should be further enlightened on the nutritional implication of various food items such as fish, soybean and egg especially for growing children to increase protein intake in their diet and their calorie content.

References

[1] Adejobi, A. O., P. M. Kormawa, V. M. Manyong, and J. K. Olayemi 2008. 'Optimal Crop Combinations under Limited Resource Conditions: Application of Linear Goal Programming (LGP) Model to Smallholder Farmers in the Drier Savannah Zone of Nigeria.' Journal of Sustainable Agriculture Vol. 6 No. 4 Pp 17-42.

[2] Aigner, D, C. A. K. Lovell and P. Schmidt 1977. Formulation and Estimation of Stochastic Frontier Production Function Models, Journal of Econometrics, 6 (1): 21-37

[3] Aniedu, O. C. (2007), Impact of Technological Change on Output, Income, Employment and Factor Shares in Potato Production in Plateau State, Nigeria, Ph.D Dissertation. Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike.

[4] Babatunde, R. O., A. O. Omotesho, E. O. Olorunsanya and A. Amadou 2007. 'Optimal crop Combination in Small Scale Vegetable Irrigation Farming Scheme; Case Study from Niger Republic.' Research Journal of Applied Sciences 2 (5) 617-622, 2007

[5] Coelli, T. J., (1996). A Guide to Frontier Version 4.1: A Computer Programme for Production and Cost Function Estimation. Department of Econometrics, University of New England, Armidale, Australia

[6] Conradie B, Piesse J, Thirle C. (2009). District-level total factor productivity in agriculture: Western Cape Province, South Africa, 1952-2002. Agricultural Economics. 40(3):265-280.

[7] Fan S. and Brzeska J. (2011). The Role of Emerging Countries in Global Food security, Policy Brief 15, International food Policy Research Institute (IFPRI).

[8] Food and Agriculture Organization. 2000. 'The State of Food Insecurity in the World; 2001.' Rome, pp: 4-7.

[9] Ibrahim, H. and Bello, M. (2009). 'Food Security and Resource Allocation among Farming Households in North Central Nigeria.' Pakistan Journal of Nutrition 8 (8): 1235-1239.

[10] Idiong, I. C. (2005). Evaluation of Technical, Allocative and Economic Efficiency in Rice Production Systems in Cross River State, Nigeria. PhD Dissertation, Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Nigeria.

[11] Iheanacho, A. C. (2001) "Relationship between Land Sustainability and cropping Systems in Millet Based Mixtures in the Arid Zone of Nigeria: A Case Study of Borno State". Journal of Sustainable Agriculture and the Environment, 3 (2): 263-269.

[12] Iheke, O. R. (2006). 'Gender and Resource use Efficiency in Rice Production systems in Abia state of Nigeria.' Unpublished M.Sc. Thesis. Michael Okpara University of Agriculture, Umudike.

[13] Iheke, O. R. (2010). Impact of Migrant Remittances on Efficiency And Welfare of Rural Smallholder Arable Crop Households in South Eastern Nigeria. PhD Dissertation, Michael Okpara University of Agriculture, Umudike.

[14] Iheke, O. R. and Nwankwo, N. K. (2016). Analysis of the Technical Efficiency of Snail Farmers in Abia State, Nigeria. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development.16 (1): 205-212.

[15] Iheke, O. R. and Nwaru, J. C. (2010) Comparative Analysis of the Economic Efficiency of Men and Women Rice Farmers in Abia State: A Stochastic Frontier Profit Function Approach. Journal of Food and Fibre Production, Vol. 3(1)441-454.

[16] Iheke, O. R., and Nwaru, J. C. (2014). Impact of Innovation on Smallholders' Productivity and Poverty Status: The Case of Arable Crop Farmers in South-East, Nigeria. Asian Journal of Agricultural Extension, Economics & Sociology 3(4): 301-318, 2014.

[17] Iheke, O. R., Nwaru, J. C., and Onyenweaku, C. E. (2013). The Impact of Migrant Remittances on the Technical Efficiency of Arable Crop Farm Households in South Eastern Nigeria. Invited paper presented at the 4th International Confer of the African Association of Agricultural Economists, September 22-25, 2013, Hammamet, Tunisia.

[18] Iheke. O. R., and Nwaru, J. C. (2013). Innovation Adoption, Farm Productivity and Poverty Status of Rural Smallholder Farm Households in South-East, Nigeria. Invited paper presented at the 4th International Conference of the African Association of Agricultural Economists, Hammamet, Tunisia; 2013.

[19] IITA (1988). IITA Strategic Plan (1989-2000). IITA Ibadan.

[20] International Food Policy Research Institute (IFPRI) (2011). Concept Note for an International Conference, Increasing agricultural productivity & enhancing food security in Africa: New challenges and opportunities held in Addis Ababa, Ethiopia from 1-3 November 2011. International Food Policy Research Institute.

[21] International Fund for Agricultural Development (IFAD) (2012). Rural Poverty in Nigeria. Available: www.ruralpoverty.org.

[22] Maziya-Dixon, B. I. O., E. B. Akinyele, S. Oguntona, R. A. Nokoe, S. Hariss 2004. Nigeria Food Consumption and Nutrition Survey 2001-2003 Summary, International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria.

[23] Meeusen, W. and J. Van den Broeck 1977 Efficiency Estimation from Cobb-Douglas Production Function with Composite Error, International Economic Review 18 (2): 123-134.

[24] Morris, S. S. 2001. Measuring nutritional dimension of Household Food Security. Food Security in Practice, Methods for Rural Development Projects, International Food Policy Institute -IFPRI, Washington D.C., 11-29.

[25] National Bureau of Statistics. (NBS) (2006). Nigeria Living Standards 2004: An Overview: National Bureau of Statistics, Abuja Nigeria.

[26] National Bureau of Statistics (NBS) (2010). Formal and Informal Sector Split of Gross Domestic Product. National Bureau of Statistics, Abuja, Nigeria.

[27] National Bureau of Statistics (NBS) (2014) Annual Abstracts of statistics, National Bureau of Statistics, Abuja, Nigeria.

[28] National Population Commission (NPC) 2006. National Population and Housing Survey. National Population Commission, Abuja, Nigeria.

[29] Nnadozie, B. C. and Nwaru, J. C. (2002). Measuring and explaining allocative efficiency in resource use in Arable crop production in Abia State of Nigeria, pp 84-89. In Ogazi, O. D., P. B. Oguneye and W. J. Oyaide (eds), Economic Refvorms and Management of Nigerian Agriculture, proceedings of the 19th Annual conference of the Farm Management Association of Nigeria held at Delta State University, Asaba Campus, Delta State, 18th-20th October.

[30] Nwaru, J. C. (2004). Rural Credit Markets and Resource Use in Arable Crop Production in Imo State of Nigeria. PhD Thesis Michael Okpara University of Agriculture, Umudike.

[31] Nwaru, J. C., Onuoha, R. E. and Onwukwalu, S. I. (2008). Dterminants of Agricultural Intensification among Ccrop farmers in Ikwuano Local government Area of Abia State, Nigeria. Ethopian Journal of Development Research, 30 (2): 1-20.

[32] Obasi, F. C. and Agu, S. E. (2000). "Economics of Small Scale Rice Farming Under Different Production Systems in South Eastern Nigeria". J. Agric. Business Rural Development., 1: 2.

[33] Ohajianya, O. O and Onyenweaku, C. E. (2001). "Gender and Relative Efficiency in Rice Production Systems in Ebonyi State, Nigeria: A Profit function Analysis," Journal of Sustainable Agriculture and Environment. 3 (2): 384-392.

[34] Okike, I. (2000). 'Crop-Livestock Interaction and Economic Efficiency of Farmers in the Savanna Zone of Nigeria'. Un-published Ph.D Thesis, Department of Agricultural Economics, University of Ibadan.

[35] Okorji, E. C. and Obiechina, C. O. B. (1985). 'Bases for farm Resource allocation in Traditional farming system: A comparative study of productivity of farm resources in Abakaliki Area of Anambra State.' Nigeria Agric. Sys., 17: 197–210.

[36] Okuneye, P. A. and Okuneye, M. Y. (1988). "Underdevelopment and Increased Labour Productivity: A Linear Programming Analysis of Family Farms in Nigeria.

[37] Olayemi J. K (1996). Food security in Nigeria. Development policy Centre Policy Report 2, Ibadan.

[38] Olayide, S. O. (1982). Food and Nutrition Crises in Nigeria. Ibadan, University Press.

[39] Onyebinama, U. A. U. (2004). 'Farm Business Management for Smallholder farm firms in Nigeria'. Owerri alphabet publishers.

[40] Onyenwaku, C. E. and Tanko, L. (2003). Farm Enterprise Combinations and Resource Use among Smallholder Farmers in Bunza, Kebbi State, Nigeria. Nigerian Agricultural Journal.

[41] Onyenweaku, C. E. and Okoye, B. C. (2007). "Technical Efficiency of Smallholder Cocoyam Farmers in Anambara State, Nigeria: A Translog Stochastic Frontier Production Function Approach", International Journal of Agriculture and Rural Development, 9 (1): 1-6.

[42] Onyenweaku, C. E. and Ohajianya, D. O. (2005). Technical efficiency of swamp and upland rice farmers in south Eastern Nigeria, Journal of Sustainable Tropical Agricultural Research. 14: 81-88.

[43] Onyenweaku, C. E. and Effiong, E. O. (2005). Technical efficiency in pig production in Akwa Ibom state, Journal of sustainable Tropical Agricultural Research. Vol. 6, pp51-57.

[44] Onyenweaku, C. E. and Nwaru, J. C. (2005). Application of stochastic frontier production function to the measurement of technical efficiency in food production in Imo State, Nigeria. Nigerian Agricultural Journal, 36: 1-12.

[45] Onyenweaku, C. E., Igwe, K. C. and Mbanasor, J. A. (2004). Application of stochastic Frontier Production Function to the Measurement of Technical Efficiency in Yam Productionn In Nassarawa State, Nigeria. Journal of Sustainable Tropical Agricultural Research, 13: 20-25.

[46] Sanusi, R. A., Badejo, C. A. and Yusuf, B. O. (2006). Measuring Household Food Insecurity in selected local government areas of Lagos and Ibadan, Nigeria. Pakistan Journal of Nutrition. 5: 62-67.

[47] Udoh, E. J. (2005). 'Technical Inefficiency in Vegetable Farms of Humid Region; An Analysis of Dry Season by Urban Women in South- South Zone, Nigeria. Journal of Agriculture and Social Science. 1: 80–5.

[48] United Nations (2017). Population of Nigeria (2017 and historical). United Nations' Department of Economic and Social Affairs, Population Division. Worldometers.

[49] Wikipedia 2008. Encyclopaedia. http://en.wikipedia.org/wiki/Abia_State.