TECHNICAL EFFICIENCY OF YAM PRODUCTION SYSTEMS IN OGBOMOSHO AGRICULTURAL ZONE, OYO STATE, NIGERIA

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Abstract: The technical efficiency of yam farmers in Ogbomosho Agricultural Zone, Oyo State was analyzed in this study using the Stochastic Frontier Production Model. A multistage sampling procedure was employed to select the 135 yam farmers used for the study. A set of questionnaire was used to collect data from the respondents. Data collected were analyzed using descriptive statistics and stochastic frontier production function. The result of the study revealed that the technical efficiency of the farmers range from 0.052 – 1.000 with a mean of 61.79%. This indicates ample opportunity for the farmers to increase their productivity through improvement in their technical efficiency. Farm size (2.004; $p<0.01$) and labour (0.679; $p<0.05$) were found to be statistically significant and positively related to farmers output while educational level (-0.615; $p<0.1$); farming experience (-2.949: $p<0.01$); and off-farm income (-0.823; $p<0.1$) of the respondents negatively influenced farmers' technical inefficiency. The farmers therefore need to increase their output level through more intensive use of land and labour resources, as well as acquiring higher educational endowment for better farming practice and technology adoption.

Keywords: Ogbomosho Agricultural Zone, technical efficiency, yam production

Introduction

Before the discovery of oil, agriculture was the key area contributing to the Nigeria economy and its socio-economic history and development has been very closely tied to its agricultural sector (Toluwase and Sekumade, 2017). It was the main source of foreign exchange earnings and accounted for over 60% of its Gross Domestic Product (GDP) in the 1960s (Tijani *et al.*, 2015). During the period, Nigerian economy was described as an agricultural economy because the engine of growth of the overall economy for the country was agriculture (Wahab and Lawal, 2011). Agriculture is one of the means for diversifying the economy and enabling economic development. Household roles in crop production is not static but tend to be dynamic in response to pressure from the changing social, cultural and economic milieu (Agwu and Chukwu, 2006). Agriculture holds the key to rural development, poverty alleviation and overall economic development (Oluwafemi, 2010), accounting for about 36 - 48% of Gross Domestic Product (GDP) up to the year 2016, and currently accounting for over 70% of the nation's paid and self-employment statistics. The food crop sub-sector alone (with maize, sorghum, millet, rice, yam, cocoyam and cassava as the main food crops grown in the country) contributes about 28% to GDP, representing about 75-76% of the share of the agricultural sector's contribution to GDP (Toluwase and Sekumade, 2017).

Root and tuber crops comprise crop covering several genera. They are staple food crops, being the source of daily carbohydrate intake for the large populace of the world. The term root and tuber crop refers to any growing plant that store edible materials in the subterranean root, corm or tuber. Yam is a member of this important class of food. Yam (*Dioscorea spp*) is among the oldest recorded crop (Ani *et al.*, 2014). It is an important tuber crop of the tropics, and one of the principal tuber crops in the Nigeria economy, in terms of land under cultivation and volume and value of production (Bamire and Amujoyegbe, 2005). The crop is grown throughout Africa with West Africa producing over 90% of the total world production of yam. Nigeria is the world largest producer of yam, contributing over 65% of the world production in 2008 (Shehu *et al.*, 2010), while the nation's yam production volume was once estimated at about 38.92 million metric million tonnes annually (Orewa and Izekor, 2012). Average statistics show that the West African yam belt produced about 85-95% of the world's output of 38.7 million metric tonnes of yam between 2015 and 2018, and Nigeria alone produced over 75% of West African output.

On the basis of quantity of root and tuber crops produced in Nigeria, yam ranks second to cassava (Toluwase and Sekumade, 2017). Yam tuber is widely consumed especially in West Africa and as a major staple food among the Nigerian populace; its place in indigenous diet cannot be overemphasized (Ojo *et al.*, 2009). It is a good source of energy mainly from their carbohydrate contents since it is low in fat and protein. Yam can be eaten when boiled, roasted, baked or fried. It can also be processed into crude flour by drying thin slices in the sun and then pound or ground into flour. Like potato, yam can also be processed into instant flakes or fried as chips. Most of starch industries also make use of yam as an important raw material. Thus, the yam sub-sector ensures food security and provides job opportunities and income to all stakeholders in the yam value chain. Yam peels serve as feed for livestock and as a good component of farm yard manure. It is also used as laboratory crop for scientific investigations. Yam tuber is rich in pharmacologically active substances such as dioscorine, saponin and sapogenin. Dioscorine, which is the major alkaloid in yam, is medicinally a heart stimulant (Shehu *et al.*, 2010). Also, it has been reported that yam is a good source of industrial starch whose quality varies with species.

Despite this enormous importance of yam, its production in Nigeria has not been accorded the needed attention (Umoh, 2006). Therefore, there has been a decline in yam production in the country over the years with the area under cultivation and total yam output declining (Ayanwuyi *et al.*, 2011). This is reflected in the fall in output percentage growth rate of yam from 45% in 2011 to about 18.6% in 2018 despite the increase in land devoted for the production of the crop from 1270 million hectares to 2742 million hectares within the quoted time interval (Shehu *et al.*, 2010). Since increased productivity is directly related to production efficiency, it is imperative to raise farmers' productivity by helping them reduce technical inefficiencies. Efficiency is concerned with the relative performance of the processes used in transforming given inputs into outputs. Previous studies carried out on food crop production in Nigeria have shown that food crop farmers have low productivity because of inefficiency in resource use (Idiong *et al.*, 2002). It is believed that inefficiency in the use

of resources, wrong choice of enterprise combination and cropping system constitute the major constraint to increased food production in Nigeria (Orewa and Izekor, 2012).

Over the years, the difficulties faced by many developing countries in satisfying their population's food requirements with domestic food production have increased (Awoniyi and Omonona, 2007). As a result of widespread food shortages, hunger and malnutrition have persisted particularly among the low-income groups in developing countries. Although, Nigeria is a global leader in yam production, most of the yams produced are readily consumed within Nigeria with little or no provision for exports. Prevalent food scarcity is fast becoming a common problem in Nigeria because as a developing nation, she is gradually tending towards industrial economy from her present agricultural status. To worsen the situation, Nigeria is said to be experiencing a progressive and rapid population growth with the attendant increase in the demand for food crops in the coming years (Awoniyi and Omonona, 2007).

In Nigeria, yam cultivation still depends largely on traditional hoes and cutlass techniques of production. Many aspect of production like clearing, planting, weeding, stalking and harvesting which require considerable inputs of labour are still been done manually. Resources are considered to be at its highest and best use when it is put into use with highest comparative advantage to other uses. Efficiency of resource use can therefore be assessed from the productivity of the yam output. This is an important issue of the present time, because resource use efficiency issues are the core elements of sustainable yam production. Inefficient use of inputs can jeopardize food availability and its security. It is against this backdrop that this study was conducted to analyze the technical efficiency of yam production systems in Ogbomosho agricultural zone, Oyo State, Nigeria.

Materials and Methods

The study area

The study was carried out in Ogbomosho Agricultural zone of Oyo State. Yams, cassava, maize, and tobacco are some of the notable agricultural products of the region. The zone experiences both wet and dry season annually, with the climate of the area favoring both arable and tree crops production. The rainy season usually starts in March and last till November. The dry season is usually very hot except during harmattan period when it is cold and dry. Majority of the farmers in the study area combine subsistence farming with other occupation like trading, civil service and handicraft. According to Nigeria population census of 2006, Ogbomosho is the second largest town in Oyo State with an urban population of about 657,417 and lies between latitude 8º29' North of the equator and between 40º30' North of the Greenwich Meridian (Fig. 1). Ogbomosho has an area landmass covering about 37,984 square kilometers and located in the northern part of Oyo State. The vegetation of Ogbomosho is dominated by derived savannah vegetation and agriculture is the main occupation of the people (Ajijola *et al*., 2014).

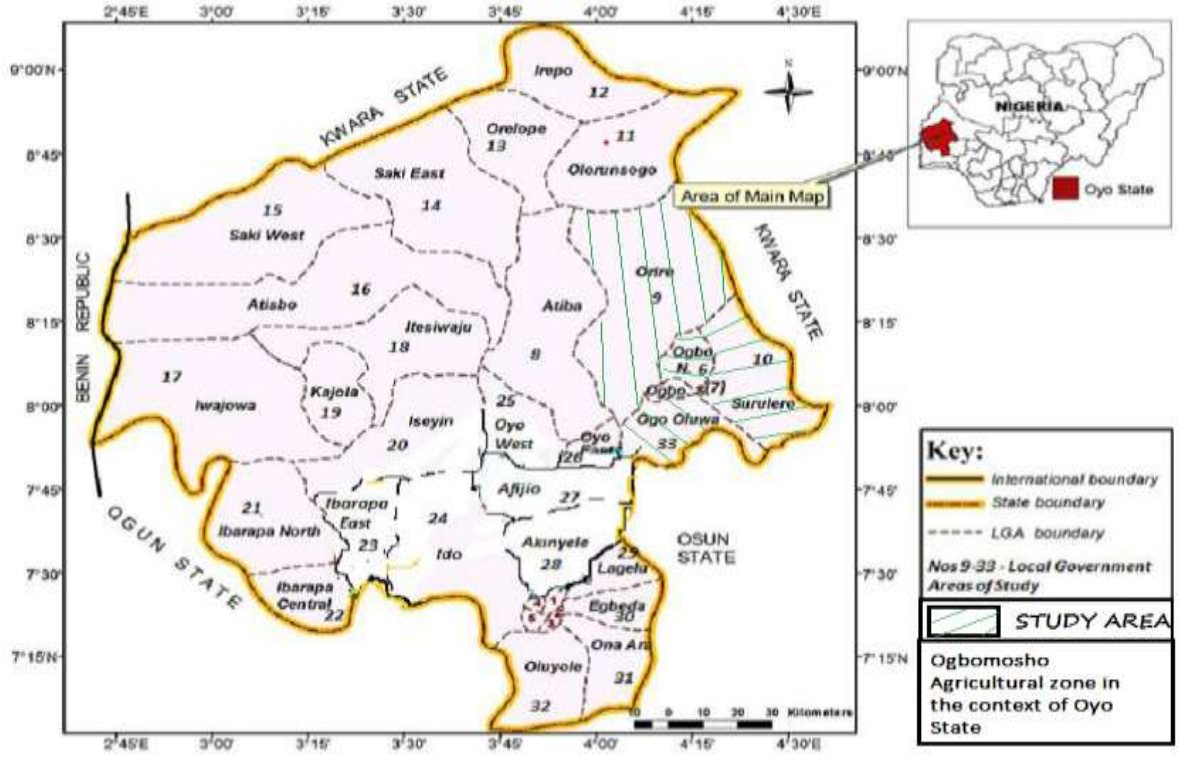

Fig. 1: Geographical map of Oyo State showing the study area

Table 1: Sampling procedure

Study Area	Local Govt. in the State	Purposive Selected LGAs	Random Selected Yam Farmers
Ogbomosho Agricultural zone	5	Ogoluwa	45
		Surulere	45
		Orire	45
Total	**5**	**3**	**135**

Source: Field survey (2017)

Sampling procedure

Yam farmers are the respondents for this study; one hundred and thirty five yam farmers were selected from this area. The sampling technique employed is a multi-stage stratified random sampling technique. The first stage involved purposive selection of Ogbomosho Agricultural zone in Oyo State; this zone comprises of five local government areas, namely: Ogbomosho North, Ogbomosho South, Orire, Surulere and Ogo-Oluwa, respectively. The second stage involved purposive selection of yam farmers from the LGAs which are rural in nature such as, Orire, Surulere and Ogo-Oluwa Local Government Areas respectively, because the yam farmers are more concentrated in this area. The third stage involved simple random sampling, through random selection of forty five (45) yam farmers from each of the three LGAs making a total of one hundred and thirty five (135) yam farmers for the study (Table 1).

Analytical technique

Simple descriptive statistics such as percentage and frequency distribution were used to describe the socio economic characteristics of the respondents. The Stochastic Frontier Production function using the Cobb –Douglas functional form was used to analyze the technical efficiency of yam farmers in the study area. This function have been employed in other studies to determine technical efficiency of agricultural production (Erhabor and Emokaro, 2007; Binuomoto *et al*., 2008; Fatuase *et al*., 2015).

The production function model is explicitly specified as:

$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \varepsilon_i$

Where: *ln* = Natural logarithm *Y* = Quantity of yam produced (Kg); X_1 = Farm Size (Ha); X_2 = Yam Sett/Seed (Kg); X_3 = Labour (Man days); X_4 = Quantity of fertilizer used (Kg); X_5 = Quantity of agro-chemicals used (Litres); βs = Parameters to be estimated (Regression coefficients) ε_i = Composite error term defined as *Vi – Ui*. *Vi* = Random variables which are assumed to be independent of U_i, identical and normally distributed with zero mean and constant variance N (0, Sv2).

U_i = Non – negative random variables which are assumed to account for the technical inefficiency in production and are often assumed to be independent of V_i such that U_i is the non-negative truncated normal distribution. The inefficiency of production, U_i is modeled in terms of the factors that are assumed to affect the efficiency of production of the farmers. Some of the factors related to the socio-economic characteristics of the farmers. The determinant of technical inefficiency is defined by:

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

Where: U_i = technical inefficiency Z_1 = Age (Years); Z_2 = Educational attainment (Years); Z_3 = Farming experience (Years); Z_4 = Household size (number)' Z_5 = off-farm income; εi = Error term $\delta_0 - \delta_5$ = parameters to be estimated.

Results and Discussion

Socio-economic characteristics of the respondent yam farmers

As shown in Table 2, 87.4% of the yam farmers were male while 12.6% were female. This could be attributed to the labour-intensive activities involved in yam production which require men who are naturally endowed with abundant strength necessary for such jobs, in agreement with the findings of Ekunwe and Orewa (2007) who reported about 99% male gender dominance in yam production systems in Kogi State, Nigeria. Table 2 also shows the mean age of yam farmers was 50 years, implying that most of the farmers were adults and expectedly energetic, with high level of productivity.

From the Table 2, 34.1% of the farmers had no formal education, 39.3% had primary education, while 26.7% had secondary education; showing that the farmers were fairly educated people. High educational attainment is expected to have a positive influence on the adoption of improved technologies such as farm mechanization, which would have high potentials to increase farm productivity (Fatuase *et al.*, 2015). About 84% of the farmers were married, with a mean household size of 7 persons, and a mean farm size of 8.6 acres, implying smallholding but labour-intensive farming processes. The respondent farmers had a mean farming experience of 19 years, showing they were relatively experienced implying a significant level of specialization and expertise in yam production. This result compares favorably with the findings of Oluwatusin (2011).

Table 2: Socio-economic characteristics of the surveyed yam farmers

Variables	Frequency	%	Mean
Sex			
Male	118	87.4	
Female	17	12.6	
Age			
30-<40 years	18	13.3	
41-<50 years	50	37.0	
51-<60 years	47	34.8	50 years
>60 years	20	14.8	
Education level			
No formal education	46	34.1	
Primary education	53	39.3	
Secondary education	36	26.7	
Marital status			
Single	8	5.9	
Married	114	84.4	
Divorced	6	4.4	
Widow	5	3.7	
Separated	2	1.5	
Household size			
1-<4 members	34	25.2	
5-<8 members	73	54.1	7 members
9-<12 members	17	12.6	
>12 members	11	8.1	
Farm size			
1.0-<4.0	20	14.8	
4.1-<8.0	62	45.9	
8.1-<12.0	43	31.9	9 Acres
>12.0	10	7.4	
Farm experience			
1-<10 years	32	23.7	
11-<20 years	65	48.1	19 years
21-<30 years	27	20.0	
31-<40 years	7	5.2	
41-<50 years	4	3.0	
Total	**135**	**100.0**	

Source: Field Survey (2017)

Ordinary least squares and maximum likelihood estimates of yam production functions

The estimates generated from the ordinary least squares (OLS) and the maximum likelihood estimate (MLE) results of the production function parameter for yam production in Ogbomoso Agricultural Zone are presented in Table 3. The sigma square (δ^2) value of 3.083 which was positive and significantly different from zero indicated a good fit and the correctness of the distributional assumption specified. The variance ratio (γ) which measures the effect of technical inefficiency on the observed output gave a value of 0.784. This implies that 78.4% of the variation in the output of yam was attributed to technical inefficiency. The ratio of the log likelihood test was also significant, implying technical inefficiency among the farmers.

Table 3: The ordinary least square (OLS) and maximum likelihood estimate (MLE) of yam production systems in Ogbomosho agricultural zone, Oyo State

Variables	Coefficient	OLS	MLE
Constant	β_0	1.740 (1.563)	2.699 (2.474)**
Farm size	β_1	1.419 (3.010)***	2.004 (4.601)***
Yam sett/seed	β_2	-1.419 (-0.830)	-1.095 (-1.114)
Labour	β_3	0.738 (0.252)	0.679 (2.279)**
Quantity of fertilizer used	β_4	-0.409 (-1.306)	-0.414 (-1.341)
Quantity of agro chemicals	β_5	-0.095 (-1.247)	-0.031 (-0.379)
Inefficiency estimates			
Constant	δ_0		-0.345 (-0.223)
Age	δ_1		0.861 (1.292)
Educational level	δ_2		-0.615 (-1.951)*
Farming experience	δ_3		-2.949 (-5.822)***
Household size	δ_4		0.402 (1.345)
Off-farm income	δ_5		-0.823 (-1.986)*
Sigma-squared	δ^2		3.083 (7.621)***
Gamma	γ		0.784 (19.777)***

*****, **** and ***** denotes that the associated coefficient is significant at 1%, 5% and 10% level, respectively

Source: Field Survey (2017)

The maximum likelihood coefficient for farm size and labour were positive and statistically significant. This suggests that more output of yam would be obtained from the use of additional quantities of these variables, *ceteris paribus*. The significance of these variables could be attributed to their importance in crop production in the sense that a shortage would have direct negative effect on production. This agrees with the findings of Shehu *et al.* (2010) who reported that the coefficients of land resource, seed yam, labour and fertilizer were positive and significantly influenced changes in yam output in Benue State. However, from the OLS function, only the coefficient of farm size was positive and statistically significant at 1% level.

The inefficiency variables were specified as those relating to farmers' socio-economic characteristics. The results of the analysis of the determinants of technical inefficiency are presented in the table. The estimated coefficient of the inefficient function provides some explanation for the relative efficiency levels among individual yam farmers. Since the dependent variable of the function represents inefficiency, a positive sign of an estimated parameter implies that the associated variable has a negative effect on efficiency and a negative sign indicates the reverse.

The coefficient for educational level of respondents was negative and significantly related to technical inefficiency at 10% level of significance. This implies that farmers with better educational endowment tend to be more technically efficient in yam production, due to their receptive tendency to improved farming techniques. This result agreed with the findings of Ojo *et al.* (2009), Shehu *et al*. (2010) and Oluwatusin (2011). The result asserted that higher educational attainment is imperative for better understanding and adoption of new technology.

Farming experience was found to be statistically significant and also contributed negatively to farmers' inefficiency. This implies that as the yam farmers' years of experience increases their efficiency also increases. This result is in line with the conclusion of Oluwatusin (2011) for yam farmers in Osun State, that with increased years of experience, farmers become more specialized. Off-farm income coefficient was negative and statistically significant implying that it has the effect of reducing the farmers' technical inefficiency.

Frequency distribution of technical efficiency scores of yam farmers

The estimated technical efficiency (TE) indices of the yam farmers in Ogbomosho Agricultural Zone are presented in Table 4. It showed that majority of the technical efficiency levels of the sampled farmers were less than one (100%) implying that majority of the yam farmers in the study area were producing below the maximum efficiency level. The distribution showed a high technical efficiency variation among the respondents. The best farmer demonstrated a technical efficiency of 1.00 while the worst farmer had a technical efficiency of 0.05 with a mean efficiency score for the yam farms as 0.62 suggests that an average yam farmer in the area still has the capacity to increase technical efficiency in yam production by additional 38% to achieve the maximum possible level. It therefore shows that there is efficiency gap but with scope for improvement in yam production among the farmers in Ogbomosho Agricultural Zone. These results compare favourably with the findings of Shehu *et al*. (2010); Orewa and Izekor (2012); Ajijola *et al.* (2014); Ani *et al.* (2014); Toluwase and Sekumade (2017) that observed efficiency gap from the optimum efficiency level among yam farmers in different parts of Nigeria and with scope for increased efficiency.

Table 4: Distribution of technical efficiency indices among yam farmers

Technical Efficiency Range	Frequency	Percentage
0.0 - 0.20	3	2.2
0.21 - 0.40	32	23.7
0.41 - 0.60	30	22.2
0.61 - 0.80	31	23.0
0.81 - 1.00	39	28.9
Total	**135**	**100.0**
Minimum	*0.0523*	
Mean	*0.6179*	
Maximum	*1.0000*	

Source: Field Survey (2017)

Table 5: Constraints to yam production in Ogbomosho Agricultural zone

Observed constraint	Freq.	%	Cumulative (%)	Ranking in the order of relevance
Incessant pest attack	45	33.33	33.33	1st
Inadequate storage system	28	20.74	54.07	3rd
Shortage of farm input supply	32	23.70	77.77	2nd
High input cost	21	15.56	93.33	4th
Inadequate extension services	9	6.67	100.00	5th
Total	**135**	**100.00**		

Source: Field Survey (2017)

Constraints to yam production in the study area

The result showing the constraints in yam production is presented in Table 5. The result shows that pests attack on yam tuber (especially aphids and yam borer) constituted the major constraint (33.33%) to yam production in the study area, ranking first among other challenges the farmers face. The next prominent problems of yam farmers are short input

supply (23.70%) and shortage of storage/preservation facilities (20.74%). High cost of inputs (especially fertilizer and agro-chemicals) ranked 4th, being reported by about 16% of the yam farmers; while only about 7% f the farmers cited insufficient contact with extension agents as the most prominent challenge they confront in their own location. The result suggests that the major problems face by yam farmers in the study area bother mainly on infrastructural inadequacies (about 60%), which requires larger capital requirements than the farmers could possibly afford. This is where the impact of financial institutions, agro-service firms and farmer-friendly government policies would be tremendously felt.

Summary, Conclusion and Recommendations

The study estimated the technical efficiency of yam farmers in Ogbomosho Agricultural Zone in Oyo State. Results from the study indicated that the production input which could lead to increased production of yam include utilization of larger farmland and labour force. Improved educational endowment, longer years of farming experience, and access to off-farm income sources were the socio-economic characteristics that significantly reduced farmers' technical inefficiency. The attainment of mean technical efficiency of 61.8% indicated that efficiency of the farmers could be increased by about 38.2% to attain maximum possible output level.

Increased productivity and improvement in farmers' technical efficiency can be achieved by addressing those factors responsible for inefficiency in yam production systems. These include allocating more land space to yam production, and increased use of labour input given the prevailing state of technology. Education because of its role in improving yam production efficiency level, should be given a priority among government policies, through such media as adult education and rural literacy campaigns.

Conflict of Interest

Authors have declared that there is no conflict of interest reported in this work

References

Agwu AE & Chukwu PC 2006. Intra-household roles and constraints in rice cropping systems in Aninri Local Government Area of Enugu State, Nigeria. *J. Agric. and Soc. Res.*, 7(1): 1 – 9.

Ajijola S, Awoyemi TT, Oluwatayo IB, Aduramigba-Modupe VO & Odetola SK 2014. Resource use and Economic Efficiency for Yam Production in Oyo State, Nigeria. *Eur. J. Physical and Agric. Sci.*, 2(2): 39 – 43.

Ani DP, Iorkaa JT & Ogebe FO 2014. Technical efficiency of yam production in Ukum Local Government Area, Benue State, Nigeria. *J. Agric and Veterinary Sci. (IOSR-JAVS)*, 7(7): 14 – 19.

Awoniyi OA & Omonona BT 2007. Production efficiency in yam based enterprises in Ekiti State, Nigeria. *J. Central Eur. Agric.*, 7(4): 627 – 636.

Ayanwuyi E, Akinboye AO & Oyetoro JO 2011. Yam production in Orire Local Government Area of Oyo State, Nigeria: Farmers perceived constraints. *World J. Young Researchers*, 1(2): 16 – 19.

Bamire AS & Amujoyegbe BJ 2005. Economic analysis of land improvement techniques in small-holder yam-based production systems in the agro-ecological zones of South Western, Nigeria. *J. Human Ecol.*, 18(1): 1 – 12.

Binuomoto SO, Ajetomobi JO & Ajao AO 2008. Technical Efficiency of Poultry Egg Producers in Oyo State, Nigeria. *Int. J. Poultry Sci.*, 7(12): 1227 – 1231.

Ekunwe PA & Orewa SI 2007. Technical Efficiency and productivity of yam in Kogi State, Nigeria. *J. Appl. Sci.*, 7(13): 1818 – 1820.

Erhabor PO & Emokaro CO 2007. Relative technical efficiency of cassava farmers in the three agro-ecological zones of Edo State, Nigeria. *J. Appl. Sci.*, 7(19): 2818 – 2823.

Fatuase AI, Oparinde LO & Aborisade AS 2015. Performance and resource-use efficiency of yam production in Owo Local Government Area of Ondo State, Nigeria. *Appl. Trop. Agric*., 20(1): 83 – 88.

Idiong IC, Ekpe EE, Charles AF & Udoh EJ 2002. Socio-economic determinants of waterleaf production in Calabar municipality and Calabar South LGAs of Cross River State. *Global J. Pure and Appl. Sci*., 8: 239 – 243.

Ojo MA, Mohammed US, Ojo AO & Olaleye RS 2009. Return to scale and determinants of farm level technical inefficiency among small scale yam based farmers in Niger state, Nigeria: implications for food security. *Int. J. Agric. Econ. and Rural Devt.*, 2(1): 43 – 51.

Ojo SO 2007. Improving efficiency in food crop production for food security in Nigeria. *Agricultural Journal*, 2(1): 9 – 15.

Oluwafemi RAH 2010. The impact of Agricultural credit on livestock production and owners livelihood. The case of livestock farmers in Ovia North East LGA of Edo State, Nigeria. *Int. J. Bus. and Common Market Study*, 6(2): 34 – 35.

Oluwatusin FM 2011. Measuring technical efficiency of yam farmers in Nigeria: A stochastic parametric approach. *Agricultural Journal*, 6(2): 40 – 46.

Orewa SI & Izekor OB 2012. Technical efficiency analysis of yam production in Edo state: A stochastic frontier approach. *Int. J. Devt. and Sust.*, 1(2): 516–526.

Shehu JF, Iyortyer JT, Mshelia SI & Jongur AAU 2010. Determinants of yam production and technical efficiency among yam farmers in Benue State, Nigeria. *J. Soc. Sci.*, 24(2): 143 – 148.

Tijani BA, Tijjani H & Tijjani AN 2015. Resource use efficiency in poultry egg production in Maiduguri and Environs of Borno State, Nigeria. *J. Econ. and Sust. Devt.*, 6(9): 341 – 356.

Toluwase SOW & Sekumade AB 2017. Resource use efficiency of yam production in Ekiti State, Nigeria. *Adv. in Soc. Sci. Res. J.*, 4(2): 20 – 34.

Umoh GS 2006. Resource use efficiency in urban farming: An application of stochastic frontier production function. *Int. J. Agric. and Bio.*, 8: 38 – 44.

Wahab A & Lawal F 2011. An analysis of government spending on agricultural sector and its contribution to gross domestic product (GDP) in Nigeria. *Int. J. Bus. and Soc. Sci.*, 2(20): 244–250.