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Analysis of Resource Use Efficiency in Yam Production in Yakurr Local Government Area of Cross River State Nigeria

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Abstract: The aim of this study was to determine resource use efficiency in yam production in Yakurr local government area of Cross River State, Nigeria. The study covered 3 villages that were purposely selected. The villages are Mkpani, Agoi-Ibami and Agoi-Ekpo. Data were obtained through a structured questionnaire administered to 135 randomly selected yam farmers. A total of 130 questionnaires were retrieved and used for analysis. The stochastic frontier production function model was used for the analysis. The result was used to determine their technical, allocataive and economic efficiencies. Two of the variables, planting material (x_1) and farm size (x_2) were highly significant at 1% level of probability and labour (x_3) was significant at 10% probability level while capital (x_4) was not significant. Allocataive efficiency revealed that planting material and farm size were under utilized while labour and capital were over-utilized. The economic efficiency differed subsequently among the farmers ranging from between 0.089 and 0.861 with mean efficiency of 0.36. The low mean economic efficiency is an indication of inefficiency in resource used by yam farmers in the study area. The study recommended that production inputs especially farm size be increased by yam farmers and improved technology be adopted to increase yam production in the study area.

Key words: Technical, allocative and economic efficiencies, yam production, farm size, capital, Nigeria

INTRODUCTION

Agriculture constitutes a significant sector of Nigeria's economy. The sector is significant in terms of employment of labour, contribution to Gross Domestic Product (GDP) and until early 1970, agricultural exports were the main source of foreign exchange earnings (Amaza and Olayemi, 2002). During the 1960s, the growth of the Nigerian economy was derived mainly from the agricultural sector. However in more recent years, there has been a decline in the performance of Nigeria's agriculture.

The contribution of agriculture to the GDP which stood at an average of 56% between 1960 and 1964, declined to 47% in 1965, 1969 and more rapidly to 32% between 1996 and 1998 (Amaza and Olayemi, 2002) and then to 31.9% in 2011(CIA world fact book July, 2011). The agricultural sector's changing shares of GDP is partly a reflection of the relative productivity of the sector, since increased output and productivity are directly related to production efficiency (Amaza and Olayemi, 2002). In Nigeria due to the rise in population, the demand for agricultural products is continually rising. This has resulted in the need to allocate farm resources efficiently.

Therefore in order to increase food self-sufficiency and agricultural production, efficient allocation of the meager resources at the farmers' disposal should be encouraged.

Although, yams are grown through out Africa, Nigeria is said to be the world's largest producer of yams accounting for >76% of the world's total output (FAO, 2000). It also reported that Nigeria alone in 1985 produced 18.3 million ton of yam from 1.5 million ha representing 73.8% of 28.8 million ton of yam produced in Africa. Yam can be grown in nearly all tropical countries provided water is not a limiting factor (Pius and Odjuvwuederhie, 2006).

In Cross River state Nigeria, yam cultivation still depends largely on labour intensive, traditional hoes-cutlass technique of production. Many aspects of production like clearing, planting, weeding, staking and harvesting requires considerable inputs of labour. However, as rural labour becomes more scarce and expensive and the price of input increase, the cost of yam in the market increases making it a luxury food rather than staple. Although yam can be grown on flat soil, holes, ridges or mounds, it is traditionally planted on mounds in Cross River state. The sizes of the mounds vary from

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place to place depending on the size of the set and the hydromorphic nature of the soil. The most important part of the yam plant is the tuber. The yam tuber is a good source of energy derived mainly from their carbohydrate content since its low in fat and protein, vitamin C has been found in unpeeled yam slices (Pius and Odjuvwuederhie, 2006).

How efficient are the farmers in the utilization of their resources in yam production is what is brought to the fore by this research.

Theoretical framework: The efficient method of producing a product is that which uses the least amount of resources to get a given amount of the product. The analysis of efficiency is generally associated with the possibility of farms producing a certain optimal level of output from a given bundle of resources or certain level of output at least cost. Increase in production and productivity are direct consequences of efficiency input combination given the available technology (Ogundari and Ojo, 2007). In a stochastic frontier production function approach, an efficient farm is said to operate on the product frontier while inefficient ones operate below the production frontier. The various types of efficiency to be studied are technical, allocative and overall or economic efficiencies (Farrel, 1957; Olayide and Heady, 1982). Technical efficiency shows the ability of a farm to obtain maximum output from given inputs. It is the ratio of output to input and the greater the ratio, the more the magnitude of technical efficiency.

Allocative efficiency shows the ability of a farm to utilize the inputs in its disposal at optimal proportions given their respective prices. A firm is efficiently allocative when its production takes place at a point where the Marginal Value Product (MVP) is equal to the Marginal Factor Cost (MFC). Economic efficiency is a product of technical and allocative efficiency (Olayide and Heady, 1982). In one sense, the efficiency of a firm is its success in producing as large an amount of output as possible from given sets of inputs. Maximum efficiency of a firm is attained when it becomes impossible to reshuffle a given resource combination without decreasing the total output, Olukosi and Erhabor (1980) categorized resources into variable and fixed resources. Variable resources include, labour, seeds and fertilizer which are normally used in one production process. Fixed resources include land, machinery, farm building and capital, etc. Abang *et al.* (2008) noted that a resource or an input is ingredient used in the production of an output or product. Output is usually the result of the transformation of the resources utilized in the production process. In yam production, the inputs/resources are land, labour, capital, yam seeds, fertilizers and the management. Olukosi and Ogungbile (1989) agreed that in a production process, inputs are converted into output. They emphasize that output is that which is valuable to the producers. Efficiency measurement is important because it leads to a substantial resource savings (Bravo-Ureta and Rieger, 1991). Efficiency measurements have been attempted in several studies. Yam is a highly valued staple food in Nigeria with the bulk of it consumed boiled or pounded. About 600 yam species are currently grown around the world but only three species are known to be grown in West Arica.

The species are white yam (*Discorea rotundata*), yellow yam (*Discorea caynesis*) and water yam (*Discorea alata*) and these are also the species cultivated in Nigeria (International Institute of Tropical Agriculture, 1998; Okaka and Anajekwu, 1990; Okaka *et al*., 1991). A study carried out in Kogi state, Nigeria found that roughly 70% of yam production costs were for planting materials. As the campaign for household to food security gains momentum all over the world and since extreme poverty and hunger must be eradicated by year 2015, yam are some of the food crops whose production has got to be emphasized (Michael, 2011). Yam being an important food crop for at least 60 million people in West Africa, it is necessary to lower its production cost and scale up its production through an efficient use of its production resources.

Allocative efficiency: Allocative efficiency is the ratio between total cost of producing one unit of output using actual factor proportions in a technically efficient manner and total cost of producing one unit using optimal factor proportions in a technically efficient manner. In his research on resource productivity, allocative efficiency and determinants of technical efficiency of rain fed rice farmers came out with a result showing that none of the farmers optimally use their inputs (i.e., $MVP_x = P_x$). However with respect to land, about 72 and 28% of the farmers under and over utilized their inputs, respectively. About 3 and 97% under-and-over utilized labour, respectively.

Almost 64 and 36% under-over-utilized fertilizer, respectively while about 80 and 20% under-and-over utilized herbicides, respectively. The implication of this findings suggest that increasing the use of land, seeds, fertilizers and herbicides will add to the total profit by minimizing the costs of these variables in an efficient manner while increasing use of labour will reduce the total profit (increasing the cost of labour). Hence, the size of the labour force employed should be reduced to increase the profit margin of the farmers income (*Certis paibus*).

Technical efficiency: Technical efficiency shows the ability of a firm to obtain maximum output from given inputs. It is the ratio of output to input and the greater the ratio, the more the magnitude of technical efficiency (Farrel, 1957). Measurement of technical efficiency is important for the following reasons; firstly, it is success indicator of performance measure by which production units are evaluated. Secondly, measurement of causes of inefficiency makes it possible to explore the sources of efficiency. Finally, identification of sources of inefficiency is essential to the institution of public and private policies designed to improve performance. Idiong (2007) used the stochastic frontier function with the maximum likelihood techniques to provide estimates of technical efficiency in small scale rice farmers in cross river state and found out that the rice farmers in the state were not technically efficient in the allocation of their productive resources and that education (years of schooling) has a positive correlation with technical efficiency and therefore farmers should be encourage to improve their levels of education by registering in adult education centres. Shehu *et al.* (2010) found in their research on determinants of yam production and technical efficiency among yam farmers in Benue state using Cobb-Douglas stochastic frontier production function that the production function estimates indicates the relative importance of factor inputs in yam production. The estimated coefficient of land resources was positive and significant ($p<0.01$). This is in line with the findings of Umoh (2006). Also the coefficient of seed yam was positive which confirms to a prior expectation and significant ($p<0.01$) this indicates that higher seed rate would result in high yam population and subsequently higher yield. The estimated coefficient of family labour was positive and significant ($p<0.005$). This positive sign is in agreement with a prior expectation and imply that as the quantity of man-days of family labour is increased, the output of yam also increased. The coefficient of education was estimated to be negative and significant ($p<0.10$). This indicates that farmers with more years of formal schooling tend to be more technically efficient. This agrees with the findings of Pius and Odjuvwuederhie (2006). Udoh and Etim (2008) used the maximum likelihood estimation of the stochastic production function to examine the land management and resource use efficiency in South-Eastern Nigeria. The study found a mean output-oriented technical efficiency of 0.77 for the farmers, 0.98 for the most efficient farmers and 0.01 for the least efficient farmers.

Economic efficiency: Economic efficiency is a product of technical and allocative efficiency (Olayide and Heady, 1982). Pius and Odjuvwuederhie (2006) used the Cobb-Douglas frontier production and economic efficiency among small-holder farmers in South-East Nigeria and had a low mean economic efficiency which is an indication of inefficiency in resource use by yam farmers in South-Eastern Nigeria. They also agreed that labour and material inputs were however found to be significant factors that influence yam outputs. The decline in average yield per hectares of yam production has been more drastic it dropped from 14.9% between 1986 and 1990 to 2.5% between 1996 and 1999 (CBN, 2002; Amegbeto *et al*., 2002). However, increase in average yield has been recorded (23.4%) between 2001 and 2006 (FAO, 2007). The observed productivity decline in Nigeria before the 2001 period represent a major challenge to increasing yam production and its availability as food in the country. The decline in productivity is due to the decline in the unit output from the various agricultural inputs. These are capital, labour, material input (seed yam), land and management. Also, there are likely constraints in yam production that may have significant effect on overall yield. Such constraints could include factors such as soil fertility decline, soil borne, pest and disease, inadequate planting materials, high cost of labour, labour intensive operations, etc. Also with the movement of Africans to Europe and the new world, the demand for yam is increasing everyday on the export market as people in Diaspora continue to show interest in African foodstuff such as yam. In order to help producers, processors and other entrepreneurs to better participate in the yam sub-sector, there is need to study the economic, technical and allocative efficiency among its producers. Yam is reported to be part of the religious heritage of several Nigerian tribe and up to date, often play a key role in religious ceremony. Hence, Yakurr local government is noted for yam production with a new yam festival (Leboku) which is celebrated annually during the new yam harvest season.

Though, studies have being carried out to determine yam production in the study area (Yakurr local government area of Cross River state) but no published research has been done to determine how technical, allocative and economically efficient the farmers are in terms of resource use efficiency in yam production in the study area. This necessitated the research to be conducted.

Research hypotheses:

H_{O1}: Resources used are not technically efficient in yam production

H_{O2}: Resources used are not allocatively efficient in yam production

H_{O3}: Resources used are not economically efficient in yam production

MATERIALS AND METHODS

The study area: Yakurr local government area lies between latitudes 50°401' and 60°101' North of the equator and longitude 80°21' and 60°101' East of the Greenwich Meridian and 120 km (75 miles) Northwest of Calabar the capital of Cross River state, Nigeria. The people share their Northern and Eastern boundaries with Assiga, Nyima and Agoi clans of Yakurr local government area, the Southern boundary with biase local government area and the Western boundary with Abi local government area of the state.

The Yakurr exhibits a very high degree of social heterogeneity, linguistic, political, religious and cultural homogeneity. In the absence of written records, linguistic, political, religious and cultural homogeneous patterns are the most dependable evidences of establishing descent and biological connections.

All Yakurr people share a common tradition of overland migration and ancestry and their major occupation is farming.

Sources of data collection: Primary sources formed the major source of data collected. This was done through the use of structured questionnaire and interviews designed to capture the objectives of the study. A total of 135 questionnaires were distributed to selected yam farmers in the study area and 130 questionnaires were retrieved. Personal interviews and field observations to farmers' farm was done so as to ensure that the information provided by the respondents reflect the true position of the farming activities in the yam sector of the area. Other field information investigated includes:

Land rent/ha: This was done using the prevailing rent in the area which was ₦3000 ha^{-1}.

Capital/farm equipment: An average farm, tools such as hoes, machetes, weeding hoes, spade, basin etc was taken based on market price sampling with each of item having ₦1200, 1000, 400, 1100 and 900 prices, respectively.

Labour wage rate/₦: This was calculated per man-day based on the wage rate prevailing in yam farming in the area which was ₦500 per man-day.

Cost of seed yam/₦: Cost of seed yam was examined. An average price of seed yam was calculated to be ₦80 per yam tuber.

Output price/₦: An average price of yam output was calculated. This was calculated to be ₦150 per yam tuber.

Sampling procedure: A multi-stage sampling technique was used for the study. It is involved 3 stages. The 1st stage was the random selection of three clans from Yakurr local government area. The 2nd was a purposive selection of 3 communities each from the selected clans in which farmers cultivate yam making a total of 9 communities. The 3rd stage was the selection of 15 yam farmers from each of the 9 communities giving a total of 135 yam farmers.

Techniques for data analysis: The Stochastic Frontier Production Function (SFPF) was used to analyse the efficiency of inputs used in the production of yam in the study area. A production frontier is defined in terms of the maximum output given the technology available to the farm. This is specified by the Cobb-Douglas frontier production function defined by Coelli (1994) as:

$$\log Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + (V_i - U_i) \quad (1)$$

Where:

Log = Natural logarithm
Y = Qquantity of yam produce in kg/ha
X_1 = Area cultivated/ha
X_2 = Planting material (seed yam) kg/ha
X_3 = Labour (man-days/ha)
X_4 = Fertilizer, kg/ha
b_0-b_4 = Regression coefficients
V_i = Random variables which are assumed to be independent of U_i
U_i = Non-negative random variables which are assumed to account for technical efficiency in production

The inefficiency of production, U_i is modeled in terms of the factors that are assumed to affect the efficiency of production of the farmer. Such factors are related to the socioeconomic variables of the farmers. The determinants of technical efficiency are as defined by Coelli (1994):

$$U = \delta_0 + \delta_1 Z_{1i} + \delta_2 Z_{2i} + \delta_3 Z_{3i} + \delta_4 Z_{4i} + \delta_5 Z_{5i} + \delta_6 Z_{6i} + \delta_7 Z_{7i} \quad (2)$$

Where:

U = Technical efficiency
Z_1 = Gender
Z_2 = Age
Z_3 = Marital status
Z_4 = Family size
Z_5 = Educational level
Z_6 = Land tenure
Z_7 = Farming experience
δ_0-δ_7 = Inefficiency parameter

Allocative efficiency: The Allocative Efficiency Index (AEI) was used to determine whether the farmers were efficient or inefficient in the allocation of their productive resources in yam farming. This is expressed thus:

$$A_i = MVP_X / P_Y$$

Where:

A_i = The allocative efficiency index
MVP_x = Marginal Value Product (MPP x P_Y)
P_x = Unit price of input
MPP = Marginal Physical Product
P_Y = Unit price of output

Decision rule:

- If A = 1, then the farmers are allocatively efficient
- If A ≠ 1, then the farmers are allocatively inefficient
- If A>1, then the resources are under utilized
- If A<1, then the resources are over utilized

RESULTS AND DISCUSSION

The socio-economic characteristics of the yam farmers in the study area and the results of the regression analysis of the respondents are discussed and shown in Table 1-4.

The study revealed from Table 1 that majority of the yam farmers (83%) were males while 17% were females. This might be due to the labour intensive nature of yam production, hence female farmers may prefer to grow other crops with lesser labour requirements. This result agrees with Izekor and Olumese (2010). Majority of respondents (56.9%) were between the age of 41 and 60 years. The mean age was 51 years. This implies that majority of the farmers were adults who are little above their active age a condition that may affect their overall efficiency since yam production is labour intensive. Most of the respondents (93.1%) are married. This contributed widely to the use of family labour by the households as their wives and children constituted the labour force with 35.7% having >11 members household size, this finding is in line with Rahman and Umar (2009).

The literacy level among the farmers in the study area was relatively high with primary and secondary school leavers dominating with 83% and tertiary education accounting for 13.9%. Njoku (1991) observed that formal education has a positive influence on adoption of innovation. Majority of the respondents (56.2%) had between 11 and 30 years of farming experience and this shows that the managerial ability of the farmers can be inferred to be reasonably good. It is of the general opinion that experienced farmers would be more efficient have a better knowledge of climatic conditions and market situation and are thus expected to run a more efficient

Table 1: Socio-economics characteristics of yam farmers in Yakurr LGA of Cross River state Nigeria

Characteristics	Frequency	Percentage
Gender		
Male	108	83.0
Female	22	17.0
Total	130	100.0
Age (years)		
21-30	5	3.9
31-40	25	19.2
41-50	30	23.1
51-60	44	33.8
>60	26	20.0
Total	130	100.0
Marital status		
Married	121	93.1
Others	9	6.9
Total	130	100.0
Farming experience		
1-10	37	28.5
11-20	40	30.8
21-30	33	25.4
31-40	20	15.3
Total	130	100.0
Household size		
0-10	84	64.6
11-20	44	33.9
≥20	2	1.5
Total	130	100.0
Educational level		
Primary school	54	41.5
Secondary school	56	43.0
Tertiary education	18	13.9
No formal education	2	1.6
Total	130	100.0
Farm size		
<1	88	67.7
≥1	42	32.3
Total	130	100.0
Land tenure		
Inheritance	114	87.7
Others	16	12.3
Total	130	100.0

Field survey, 2011

Table 2: Presentation of the maximum likelihood estimates of the parameters

Variables	Parameters	Coefficient	SE	t-ratio
Production factors				
Constant	X_0	2.717	0.460	5.904***
Planting materials	X_1	0.158	0.062	2.553***
Farm size	X_2	0.479	0.108	4.438***
Labour	X_3	0.045	0.030	1.539*
Capital	X_4	0.209	0.258	0.811
Efficiency factors				
Constant	Z_0	6.413	5.262	1.219
Gender	Z_1	0.472	0.414	1.140
Farming experience	Z_2	1.129	0.977	1.155
Land tenure	Z_3	-1.814	1.657	-1.095
Age	Z_4	0.248	0.332	0.741
Marital status	Z_5	-0.746	0.637	-1.171
Education level	Z_6	-0.005	0.095	-0.055
Household	Z_7	0.046	0.009	5.077***
Sigma square	δ^2	0.091	0.091	0.993
Gamma	γ	0.910	0.095	9.653***

***1% level of significance and *10% level of significance

Table 3: Frequency distribution of technical efficiency indices

Technical efficiency index	Frequency	Percentage
<0.20	0	0.0
0.21-0.40	0	0.0
0.41-0.60	6	4.6
0.61-0.80	68	52.3
0.81-1.00	56	43.1
Total	130	100.0
Maximum technical efficiency	0.9998	-
Minimum technical efficiency	0.5415	-
Mean technical efficiency	0.7880	-

Table 4: Estimation of the allocative efficiency

Variables	Mean	MVP = (B. $\bar{Y}$ / $\bar{X}$ .P_Y)	P_x	AEI (MVP/P_x)
Output (Y)	410628			
Planting material	14721	511.24	80	6.391
Farm size	1.2	19013445.16	3000	6337.8
Labour	9249	123.175	500	0.046
Capital	20859	477.265	2503	0.191

Survey Data, 2011; MVP = Marginal Value Product; B = Regression coefficient input; Y = Mean of output; X = Mean of input; P_Y = Unit price of output; P_X = Unit price of input; AEI = Allocative Efficiency Index

and profitable enterprise (Oluwatayo *et al*., 2008). The study also revealed that a larger proportion of the respondent (67.7%) had farm size of <1 ha. This is probably due to land tenure system in the prevailing area that do not allow for large ownership of land through inheritance (Holden *et al*., 2009). Land tenure accounts for 87.7% inheritance in the study area.

Stochastic results using MLE: The Maximum Likelihood Estimates (MLE) of the stochastic production parameters for yam production as shows in Table 2 which presents the coefficients of all the variables in the production function to be positive and conformed with the priori expectations indicating that the estimated production function is an increasing function. The coefficient of farm size, planting material and labour are statistically significant. Gamma (γ) is estimated as 0.916 which implies that 92% of the total variation in yam output is due to technical inefficiency. The coefficient of farm size was positive and highly significant at 1% level. This indicates that the farm size (X_1) has a positive relationship with output. This implies that a unit increase in the variable under static condition of other explanatory variables result in increased output level. This result is in conformity with Shehu *et al*. (2009) that increase in farm size implies more output is expected.

The coefficient of planting material was positive which conforms to a priori expectation and significant at 1% level of significance. This indicate that higher seed rate would result in high yam population and subsequently higher yield except where there is over crowding leading to competition for available nutrient which will consequently lead to lower yield. This result agrees with Shehu *et al*. (2010). The estimated coefficient for labour was also positive and significant at 10% level. Yam cultivation is labour intensive from cultivation to harvesting. Thus, the 0.045 elasticity of labour implies that a 10% increase in labour, certeris paribus will lead to an increase of 0.45% in the farm revenue and vice versa. This shows the importance of family labour in yam production in the area. The findings agreed with several other studies (Umoh, 2006; Okezie and Okoye, 2006; Udoh and Etim, 2008). The coefficient of capital was positive but not significant. This further explains the low external input production status of yam in the study area.

The determinants of technical efficiency in yam production in the study area from Table 2 show that farmers age was positive and not significantly related with technical efficiency. This result agrees with that of Onyenweaku *et al*. (2005). Farming experience is positive and not significantly related to technical efficiency. The result agrees with that of Onyenweaku and Nwaru (2005). Education is negative and shows no significant relationship with technical efficiency. This finding also agrees with that of Onyenweaku and Effiong (2005). But disagree with Onu *et al*. (2000). Gender is positive and not significant with technical efficiency. This result disagrees with Rahman and Umar (2009). Household size was positive and significantly related with technical efficiency. This means that the more the household the more technically efficient the farmers will be leading to more yam output. Finally, land tenure was negative and not significantly related to technical efficiency. Thus gender, farming experience, age, land tenure, marital status and education are not significantly related to technical efficiency while household has a high significant relationship with efficiency. The frequency efficiency for sample is 78.8% with minimum of 54.2%. This implies that on the average, farmers were able to obtain 78.8% potential output from the giving combination of production inputs. The implication of the result is that the average yam farmer requires 21.2%, i.e. (1 - 0.788/0.999) × 100 cost saving to attain the status of the most efficient level of yam production in the area. While least performing farmers would need 45.8%, i.e. (1 - 0.542/0.999) × 100 cost savings to be efficient. A giving resource is allocatively used when MVP = Px, this is in consideration of the acquired cost of all input in the prevailing market price per unit in the study area. It is assumed that the opportunity cost of family labour is valued at cost of hired labour per man-day. The prevailing unit price of labour per man-day at the time of the survey was ₦500 per man-day. The price of land is the rent per hectare which was ₦3000 annum^{-1} at the time of the survey. The unit factor cost of purchased of input (yam seed) was ₦80 and the average capital was ₦20,859 while the unit price of capital was calculated to be ₦2503 using the prevailing interest rate

(12%) as at the time of this research. Unit price of output was determined based on the average prevailing price of yam output which is ₦116. Table 3 shows the result of the estimated allocative efficiency of the production resources of yam in study area. The result indicated that planting material and farm size were underutilized as their allocative efficiency index were found to be >1. This means that for the farmers to maximize output there should be an increase in planting material and farm size. This result agrees with that of the technical efficiency in which they were all positive and significant. Labour and capital were overutilized as their allocative efficiency index were found to be <1. This means that with less labour and less fund, they can produce maximum output if and only if they are able to technically allocate their input resources using adequate planting materials and farm size.

Economic efficiency estimate: The economic efficiency estimates of the yam farmers given the specification of the program Frontier (version 4.1c) production function in Eq. 1 and 2 the economic efficiencies of yam farmers in Yakurr LGA of Cross River state were calculated. The predicted efficiencies differ subsequently among the farmers ranging between 0.089 and 0.861 with mean efficiency of 0.36. The low mean economic efficiency is an indication of inefficiency in resource use by yam farmers in Yakurr. Also, there exist a wide gap between the efficiency of best economically efficient farmer and that of the average farmer. This type of wide variation in farmers-specific efficiency level is a common phenomenon in developing countries (Pius and Odjuvwuederhie, 2006).

CONCLUSION

Stochastic frontier production function was estimated for yam production in Yakurr LGA of CRS, Nigeria with planting material, farm size and labour were found to be the significant factors that influence yam output. The result revealed that technical efficiency in yam production in the study area range from 54-99% with a mean of 79%. This means that there are substantial opportunities to increase productivity and income generation through more efficient utilization of productive resources.

RECOMMENDATIONS

Based on the findings, it is recommended that farm size and planting materials should be increased in order to obtain maximum output while labour and capital should be reduced in order to have optimal output. Improved planting materials should be provided to the farmers to boost their production as it has a significant relationship with production. The expenses on hired labour and capital should be reduced as they are over utilized.

REFERECES

Abang, S.O., D.L. Agom, I.E. Ele and E.A. Enyenihi, 2008. Introductory farm management (principles, plan, budgets and control). King Judah publishers, Calabar.

Amaza, P.S. and J.K. Olayemi, 2002. Analysis of technical inefficiency in food crop production in Gombe State, Nigeria. Applied Econ. Lett., 9: 51-54.

Amegbeto, K.N., V. Manyoung, R. Asiedu and O. Coulibal, 2002. Technology adoption within yam-based production system: Prospects for the diffusion of improved varieties in Nigeria. IITA Project 5 2002, pp: 6-11.

Bravo-Ureta, B.E. and L. Rieger, 1991. Dairy farm efficiency measurement using stochastic frontiers and neoclassical duality. Am. J. Agric. Econ., 73: 421-428.

CBN, 2002. Annual report for the year. 31st December 2002, Lagos Central Bank of Nigeria

Coelli, J.J., 1994. A Guide to Frontier 4.1: A Computer Programme for Stochastic Frontier Production and Cost Function Estimation. NSW, Armidale, Australia.

FAO, 2000. FAO, production yearbook for 1999. Food and Agriculture Organization, Rome, pp: 152.

FAO, 2007. FAOSTAT Database. Food and Agriculture Organisation, Rome, Itlay.

Farrel, M.J., 1957. The measurement of the productive efficiency. J. Stat. Soc., 120: 253-290.

Hang, C.J. and F.S. Bagi, 1984. Technical efficiency on individual farmers on Northwest India. South. Econ. J., 15: 108-115.

Holden, S.T., K. Deininger and H. Ghebru, 2009. Impacts of low-cost land certificate on investment and productivity. Am. J. Agric. Econ., 91: 359-373.

Idiong, I.C., 2007. Estimation of farm level technical efficiency in small-scale swamp rice production in cross River state, Nigeria: A stochastic frontier approach. World J. Agric. Sci., 3: 653-658.

International Institute of Tropical Agriculture, 1998. Annual report. pp: 1-15.

Izekor, O.B. and M.I. Olumese, 2010. Determinants of yam production and profitability in Edo State, Nigeria. Afr. J. Gen. Agric., Vol. 6

Michael, O.F., 2011. Measuring technical efficiency of yam farmers in nigeria: A stochastic parametric approach. Agric. J., 6: 40-46.

Njoku, J.E., 1991. Factors Influencing the Adoption of Improve Oil Palm Production Technologies by Small Holders in Imo State, Nigeria. In: Appropriate Agricultural Technologies for Resource Poor Framer, Olukosi, J.O., A.O. Ogungbile and B.A. Kalu (Eds.). Nigerian Farming System Research Network, Nigeria, pp: 207-218.

Ogundari, K. and S.O. Ojo, 2007. Economic efficiency of small scale food crop production in Nigeria: A stochastic frontier approach. J. Soc. Sci., 14: 123-130.

Okaka, J.C. and B. Anajekwu, 1990. Preliminary studies on the production and quality evaluation of dry yam snacks. Trop. Sci., 30: 67-72.

Okaka, J.C., P.A. Okorie and O.N. Ozon, 1991. Quality evaluation of sundried yam chips. Trop. Sci., 30: 265-275.

Okezie, C.A. and B.C. Okoye, 2006. Determination of technical efficiency among egg plant farmers using the stochastic frontier model in Isialangwa area of Abia State, Nigeria. Medwel Agric. J., 1: 113-122.

Olayide, S.O. and E.O. Heady, 1982. Introduction to Agricultural Production Economics, Ibadan. University of Ibadan Press, Nigeria.

Olukosi, J.O. and A.O. Ogungbile, 1989. Introduction to Agricultural Production Economics; Principles and Applications. Agitab publishers limited, Zaria.

Olukosi, J.O. and P.O. Erhabor, 1980. Introduction to farm management economics: Principles and applications. AGIIAB Publishers, Zaria.

Oluwatayo, I.B., A.B. Sakumade and S.A. Adesoji, 2008. Resource use efficiency of maize farmers in rural Nigeria: Evidence from Ekiti State. World J. Agric. Sci., 4: 91-99.

Onu, J.K., P.S. Amaza and F.Y. Okunmadewa, 2000. Determinant of cotton production and economic efficiency. Afr. J. Bus. Econ. Res., 1: 27-30.

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

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

Onyenweaku, C.E., K.C. Igwe and J.A. Mbanasor, 2005. Application of a stochastic frontier production functions to the measurement of technical efficiency in yam production in Nasarawa State, Nigeria. J. Sustainable Trop. Agric. Res., 13: 20-25.

Pius, C.I. and E.I. Odjuvwuederhie, 2006. Determinant of yam production and economic efficiency among small-holder farmers is Southeastern Nigeria. J. Central Eur. Agric., 7: 337-342.

Rahman, S.A. and H.S. Umar, 2009. Measurement of technical efficiency and its determinants in crop production in Lafia Local Government Area of Nasarawa State, Nigeria. J. Trop. Agric. Food Environ. Extension, 8: 90-96.

Shehu, J.F., S.J. Mshelia, A.K. Tashikalma and B.H. Gabdo, 2009. Economics of small-scale rain-fed upland rice production in Adamawa State, Nigeria. J. Res. Agric., 4: 91-99.

Shehu, J.F., J.T. Iyortyer, S.I. Mshelia and A.A.U. Jongur, 2010. Determinants of yam production and technical efficiency among yam farmers in Benue State, Nigeria. J. Soc. Sci., 24: 143-148.

Udoh, E.J. and N.A. Etim, 2008. Measurement of farm level efficiency of waterleaf production amongs city farmers in Akwa Ibom State, Nigeria. J. Sustainable Dev. Agric. Environ., 3: 47-54.

Umoh, G.S., 2006. Resource use efficiency in urban farming: An application of stochastic frontier production function. Int. J. Agric. Biol., 8: 38-44.