ASSESSMENT OF FARM FACTOR PRODUCTIVITY OF SMALL SCALE CASSAVA FARMERS IN ORUK ANAM LOCAL GOVERNMENT AREA OF AKWA IBOM STATE, NIGERIA

Akpan[1], S. B., Adah[1], A. J. and Udoh[2], E. J.

ABSTRACT

[1]*Department of Agricultural Economics and Extension, Akwa Ibom State University, Obio Akpa Campus, Akwa Ibom State, Nigeria. E-mail: sundayakpan10@yahoo.com; Phone Number: 08036728337*
[2]*Department of Agricultural Economics and Extension, University of Uyo, Akwa Ibom state*

The study employed stochastic production frontier function to estimate farm-level technical efficiency and it determinants among cassava based farmers in Oruk Anam Local Government Area of Akwa Ibom State, Nigeria. A combination of sampling methods was used to select 100 small scale cassava farmers in the study area. Primary data were obtained from selected farmers using questionnaire. Descriptive analysis of farmers revealed an average age of 45 years and household size of 6 members. About 68% of cassava farmers were poor, while farmers' average years of social capital formation and education stood at 1.08 years and 9 years respectively. Maximum likelihood estimates of the specified models revealed an average technical efficiency of about 0.683. The result further showed that, farmers' farming experience and membership in social organization are positive drivers of technical efficiency among cassava farmers in the State. Alternatively, farmers' age, household size, gender and poverty status were identified as negative movers of technical efficiency of cassava farmers. In order to improve technical efficiency of cassava farmers in the region, government should strengthen family planning programme in the rural communities' in order to reduce household size. Policies to reduce poverty among farming households is strongly advocated, while youths involvement in agricultural production is inevitably given the aged farming population in the region. Akwa Ibom State government should provide partial input subsidies on fertilizer, manure and farm capital through farm cooperatives and well established cassava farmers in the State.

Keywords: *Cassava, Technical efficiency, rural area, poverty, Akwa Ibom State*

INTRODUCTION

Cassava (*Manihot spp*) is one of the most popular food crops grown in the Southern part of Nigeria (Akpan *et al.*, 2013). It is one of the widely consumed root crops in the country and most Nigerians derive their daily calories from cassava being the second most important food staple and supplier of calories after maize (Nweke, 2004, FAO, 2005; Anyaebunam and Okoye; 2010). It does not only serve as a food crop, but also a major source of income and employment for rural dwellers in Nigeria (Abang *et al*., 2001). Cassava has been identified as a very powerful weapon against poverty in Nigeria (Iheke, 2008). It root can be processed into several derivatives such as; garri, fufu, cassava flour and cassava chips among others. Cassava and its derivatives also has excellent potentials in livestock feed formulation, textile industry, plywood, paper, brewing, chemicals, pharmaceutical and bakery industries (Sanni *et al.*, 2008; Adebowale *et al.*, 2008). Following the importance of cassava to the Nigeria's economy, several policies and programmes have been enunciated and implemented at all tiers of government to boost its production in order to meet the rising demand for the commodity (Presidential Initiative on Cassava Reports, 2003).

Despite these lofty interventions, cassava production in the Southern region of Nigeria is still characterized by the use of less productive tools, poor varieties and is affected by uncertainties of rain as well as other exogenous constraints inherent in arable crop production (Akpan *et al.*, 2012). Many aspects of the crop production activities are still done with crude or traditional tools. With the increasing rural – urban migration among youths (Akpan et al., 2016 and Afolabi, 2007), the relative scarcity of rural labour constitutes a serious impediment to cassava production in Nigeria (Afolabi, 2007). The extent an individual farmer is able to cope with the cultural, environmental and economic constraints in production in addition to the level of resource endowment and technology determined the level of investment in farm production (Udoh and Sunday, 2007). Cassava production in most rural communities especially in Akwa Ibom State, has suffered severe setback due to various factors ranging from poor quality input, high cost of inputs and soil deterioration thereby hindering most farmers to attain the optimum level of production (Ohen, *et al.,* 2014). The inability of farmers to adequately address these issues has resulted in sub optimal use of resources, substantial loss of cassava output and drastic reduction in profit accruable to farmers. This connotes that, sustainability of the enterprise is hinged on tackling the issue of farm resource allocation problem.

In addition, agricultural production in this part of the World is still carried out using strength, which declined with age. This has been observed as one of the major constraints in agricultural production in Nigeria (Okewo *et al.*, 1999). Following this condition, most farmers struggle to substitute factors in order to maximize output. This actually affects the level of production and expected revenue from farming. As noted by Ogunniyi *et al.*, (2012), optimum technical and economic efficiencies of such farmers cannot be achieved unless a sound policy is instituted to tackle the issue of insufficient farm inputs. With the massive rural development drive and the menace of labour constrain couple with increase rural poverty in Akwa Ibom State, one could be tempted to ask whether this scenario is obtainable in a rural based farming community like Oruk Anam. Following the continuous decline in the quantity of cassava and its derivatives produced in the state, the issue of increasing population density and continuous influx of cassava products from the neighboring States, it is imperative to investigate the level of resource productivity and the efficiency of resource use by cassava farmers in the rural community of the state.

The issues of land tenure and fragmentation have constituted a serious hindrance to efficient inputs allocation among small scale farmers in Nigeria (Asogwa *et al.,* 2006). Most small scale farmers operate multiple, separate plots of land which leads to increase in production cost (Rahman, and Rahman, 2009). As a result, optimum production cannot be achieved under this situation. Literature has provided evidence that, this situation is peculiar to some rural communities of Akwa Ibom State (Akpan *et al*., 2016). Since such information do not specifically pointed to Oruk Anam, then the need to investigate the productivity of staple crop farms in the areas became overwhelmingly necessary.

In another perspective, the issue of deteriorating farmers' welfare in developing economies is alarming. Yet it is this farmers' that produced almost 90% of farm products meant for consumption. Reports have showed that, more than 80% of rural farmers live below poverty line and are endowed with poor farm resources (Akpan et al., 2016 and Udoh and Akpan, 2007). Given this report; it is pertinent to investigate whether the poverty status of farmers has affected their technical efficiency of resource use specifically in Akwa Ibom State? Hence the need to investigate the efficiency of resource use among rural framers amidst these constraints became pertinent in order to generate appropriate farm level policies for timely intervention. Therefore, issues related to how these problems can be solve and how resources are utilized to enhance farmers' income and its impact on the economy of the State need to be addressed now for future intervention.

Several empirical works have delved into issues related to technical efficiency of arable crops in Nigeria. For instance, Adeyemo *et al.,* (2010) investigated the efficiency of cassava production in Odeda Local Government of Ogun State. Results indicated that most of the farmers were male (90%) and the mean age of 50 years was discovered among them. The input-output relationship showed return to scale of value 1.024. The result further revealed that, farm size and quantity of planting material significantly affected cassava production. In addition, farmers' age and farming experience contributed to technical inefficiency while cost of fertilizer, cost of herbicides, and membership of cooperative as well as the level of education enhanced technical efficiency. The efficiency of cassava growers ranged between 88.69% and 100% with a mean of 89.4%. Also, Adewuyi *et al.,* (2013) examined the technical efficiency of cassava farmers in Ogun State, Nigeria. The study revealed that majority (75.3%) of the sampled farmers were males; while the mean age and years of farming experience of farmers stood at 50.1 years and 19.7 years respectively. Land holding by inheritance (71.3%) was the most prevalent. Most of the respondents (98.0%) cultivated cassava in small land holdings below 3 hectares with a mean farm size of 1.56 hectares. Furthermore, farm size, agrochemicals, family labour, hired labour and quantity of fertilizer used were the significant factors affecting cassava production in the study area. The maximum technical efficiency attained by the farmers was 96%; while the minimum technical efficiency was 40%. The mean technical efficiency was 88%. Similarly, Anyanwu, *et al.,* (2014) studied the technical efficiency among smallholder cassava farmers in Rivers State, Nigeria. The results showed that there was a significant positive and elastic relationship between output of cassava and farm sizes, family labour, cassava stem cuttings, and depreciated value of implement among cassava farmers in Rivers State. Production elasticity estimates showed that the farmers were experiencing increasing returns to scale. The significant determinants of technical inefficiency among these farmers were age, household size and farming experience. The mean technical efficiency of the farms was 70%. Ohen *et al.,* (2014) studied resource use efficiency of cassava farmers in Akwa Ibom State, Nigeria. Data collected from 100 farmers were analyzed using the Ordinary Least Squares multiple regression model. Result revealed that, farmers were operating in stage II in the classical production surface as regards the use of land (farm size), cuttings and labour; whereas for fertilizer use, the result depicted stage III. The result further revealed an increasing return to scale with respect to overall resource use by farmers. Likewise, Eze and Nwibo, (2014), studied economic and technical efficiency of cassava production in Ika North East Local Government Area of Delta State. Their result showed that, female farmers (52.5%) were dominant, 50% of respondents were married with an average household size of 6 members. The result further shows that the farmers were in their middle age of 42years; have 10 years average farming experience; more than 50% attended formal education; while average annual farm income stood at ₦180, 000. The study further confirmed that, cassava cutting, farm size and fertilizer as well as labour were underutilized due to technical inefficiency. In a similar vein, Itam *et al.,* (2015) studied technical efficiency of Small Scale Cassava farmers in Cross River State. In their result, the mean technical efficiency of the cassava farmer's was 89%; while age and sex of the farmers had negative but significant effect on their technical efficiency. In addition, education, family size, farming experience and farm size had significant and positive influence on farmer's technical efficiency. Ettah, and Nweze (2016) also investigated the determinants of technical efficiency among cassava farmers in Cross River State, Nigeria. Their result revealed that, technical efficiency of cassava farmers was less than unity. Majority (57%) of the farmers produced at a production level that is 33% below the production frontier. The least technically efficient farmers had a technical efficiency of 0.31, while the most technically efficient farmers had technical efficiency of 0.95. The mean technical efficiency was 0.72.

From the literature reviewed, limited information is available to assess the technical efficiency of cassava farms in the rural communities of Akwa Ibom State, despite the importance of cassava production in the area. Currently, the Akwa Ibom State government has shown greater commitment in boosting cassava production. In 2016, the State has been enlisted in Fadama III additional financing programme which focused solely on cassava production. Also, the State has renovated 3 moribund cassava processing factories meant to expand the value addition in cassava production chain. The State government in addition, inaugurates the technical committee on agriculture and food sufficiency in a bit to formulate sustainable agricultural policies for the state. Policy makers in the state needs empirical evidence on resource use efficiency of cassava farmers for effective decision making. Hence, this crucial need justify the necessity of this study. The study therefore, specifically analyzed farm resources productivity, technical efficiency and its determinants among cassava based farms in Oruk Anam Local Government Area of Akwa Ibom State.

METHODOLOGY

Study area

The study was carried out in Oruk Anam Local Government Area of Akwa Ibom State. The Local Government Area is located in the Southern part of Akwa Ibom State, Nigeria. It lies between latitude 4^0 40 minutes north to 5^0 N and longitude 70^0 30 minutes east to 70^0 50 minutes east. It has a land mass of 511.73 km^2. The area comprises two political units, the Oruk zone and the Anam zone. It is characterized by a typically humid tropic climate with a two distinct seasons namely: dry and wet season. The agricultural season last for up to 9 months. The mean annual rainfall is high ranging between 2000mm to 4000mm and a temperature range of 26 ^{0}C – 28 ^{0}C. Its inhabitants are mostly farmers, craft men and civil servants. The population of the local government is about 172,654 persons comprising of 86,239 males and 86,415 females (National Population Commission, 2006). Notable food crops like yam, cassava, cocoyam, maize, pumpkin, okra, melon, oil palm, plantain and banana among others are cultivated continuously.

Sampling techniques and Sample size

Combination of sampling methods was used to select respondents in the study. The study area consists of nine (9) Clans namely: Inen, Obio Akpa, Ibesit Nung Ikot, Nung Ikot, Nung Ita, Ndot, Ibesit, Ekparakwa, and Abak/Midim. The first phase involved random selection of five (5) clans out of the 9 Clans in Oruk Anam. In the second phase, two villages were randomly selected from each Clan. A total of 10 villages were used in the study. The third phase involved random selection of 10 cassava farmers from each of the selected village. The grand total of 100 respondents was randomly selected and used in the study. The respondents were mainly cassava farmers who practiced cassava farming either as sole cropping or mixed cropping.

Data collection

Cross sectional data were collected from selected cassava farmers in the study area. Data were collected using structured questionnaires and complemented by personal interviewed to ensure consistency and accuracy of collected data.

Analytical techniques

Descriptive statistics and Cobb-Douglas stochastic production function based on maximum likelihood estimation method were applied to analyze data collected. Stochastic production frontier indicates the maximum expected output for a given set of inputs. It is derived from production theory and is based on the assumption that output is a function of the level of inputs and the efficiency of the producer in using those inputs. The production frontier assumes that the boundary of the production function is defined by "best practice" firms. It therefore indicates the maximum potential output for a given set of inputs. The difference between observed output and the potential output is generally attributed to a combination of inefficiency and random error.

Following Battese and Coelli (1995), Stochastic Production Frontier (SPF) is defined as:

$$Y_j = f(X_j - \beta)exp(V_j - U_j) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y_j is the output of j firm, Xj is a vector of factor inputs, V_j is the stochastic error term and U_j is a one sided error representing the technical inefficiency of firm j. Both V_j and U_j are assumed to be independently and identically distributed with constant variance and zero mean. Technical efficiency (TE) of a firm using SPF is given as:

$$TE = \frac{Y_i}{Y_i^*} = \frac{Observed\ output}{Frontier\ output} = \frac{f(X_j - \beta)exp(V_j - U_j)}{f(X_j - \beta)exp(V_j)} = exp(-U_j) \ldots\ldots\ldots\ldots\ldots (2)$$

Implicitly, it is shown as thus:

$$LogCAO = \delta_0 + \delta_1 LogLAN + \delta_2 LogHHL + \delta_3 LogHIL + \delta_4 LogFER + \delta_5 LogCAS + \delta_6 LogCAP + \delta_7 LogMAN + (V_1 - U_1) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3)$$

Where,

CAO = Output of cassava measured in (kg)
LAN = Land size of farmer measured in hectare
HHL = Household labour (man-days)
HIL = Hired labour (man - days)
FER = Quantity of Fertilizer (Kg)
CAS = Cassava Stem cutting, (kg)
CAP = Depreciation value of farm asset as proxy of farm capital (Naira)
MAN = Quantity of Manure measure in kg
(Vi –Ui) = Composite error term

Note, variables are expressed in logarithm.

Technical inefficiency and factors influencing it among cassava farmers

The stochastic frontier production specified in equation 3 was used to generate indices of technical inefficiency and determinant of technical inefficiency simultaneously. Frontier 4.1 was used to generate these indices in a single stage maximum likelihood estimation procedure. The interpretation of determinants of technical efficiency was opposite of the result on the determinants of technical inefficiency. Implicitly, the determinants of technical inefficiency are specified as thus:

$$TIE = \beta_0 + \beta_1 AGE + \beta_2 EDU + \beta_3 HHS + \beta_4 SOC + \beta_5 EXP + \beta_6 POV + \beta_7 CR + \beta_8 FAS + \beta_9 ICS + \beta_{10} GEN + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where,

TIE = Technical inefficiency
AGE = Age of the farmers (years)
EDU = Education level of the farmer in years
GEN = Gender (dummy 1 for female farmers and 0 for male farmers)
EXP = Farming experience (years)
HHS = Household size (Number)
FAS = Farm size (ha)
SOC = Membership in a social organization (Number of years)
POV = Poverty status of household head (income below poverty line of respondents

RESULTS AND DISCUSSION

Descriptive analysis of variables used in the study

The summary statistics of variables used in the study is shown in Table 1. The average farm area among respondents stood at 0.56ha with about 47% of variability. This implies that, land is a serious constraint to cassava production in the study area. This also showcase the mounting evidence of increasing land fragmentation and it attendant consequence on farm mechanization. The mean output of cassava obtained among respondent was 525.50kg, implying that most farmers are still using crude tools and low yielding varieties. The finding also revealed that more household labour mandays were utilized compared to hired labour mandays. This perhaps shows the subsistence nature of production prevalent in the region and issue of active labour constrained in most farming communities in Nigeria. Result on household size confirms an average household size of 6 members among cassava farmers in the area which is consistent with the finding of Eze and Nwibo, (2014) in Delta State. This represents a moderate household size which is strategic in providing labor in most farm operations involved in cassava production in the region. The significant difference in the quantity used of fertilizer (46.02 kg) and organic manure (76.50 kg) among cassava farmers indicates that farmers either do not have sufficient money to purchase fertilizer or depend more on cheap organic matter to complement soil nutrient lost. The mean age of farmers was 44.89 years, (close to what Eze and Nwibo, 2014 reported) indicating that, most of them are still in their active and productive years. The finding further reveals an average of nine (9) years of formal education and 1.08 years in the business of social capital formation among cassava farmers in the region.

About 68.0% of the cassava farmers sampled had household income below poverty line; while majority (77.0%) were female. This suggests that, most cassava farmers were poor and mostly women who cultivate cassava to augment family income. The mean farming experience of 14.89 years is suggestive of the fact that, cassava cultivation is the long aged vocation as such an integral part of the respondent's culture and a sustainable source of livelihood activity.

Table 1: Summary statistics of variables used in the analysis

Variable	Mean	Minimum	Maximum	Std. Dev.	C.V.
Farmland (ha)	0.5581	0.1772	1.2403	0.2610	0.4676
Cassava Output (Kg)	525.50	200.00	1000.00	176.0240	0.3350
Household labour (Mandays)	74.85	15.00	150.00	34.3721	0.4592
Hired labour (Mandays)	56.53	13.00	112.00	23.4536	0.4149
Fertilizer (Kg)	46.0250	0.00	200.00	41.3728	0.8989
Manure (Kg)	76.50	0.00	1250.00	231.6180	3.0277
Farm capital depreciation cost	14192.50	3100.00	50427.2	9814.16	0.6915
Age (Years)	44.89	20.00	63.00	10.0513	0.2239
Farm experience (years)	14.89	2.00	35.00	8.4434	0.5671
Member of organization (years)	1.08	0.00	10.00	2.3557	2.1812
Educational level (years)	9.10	2.00	36.00	5.4910	0.6034
Household size (number)	5.77	0.00	9.00	2.0094	0.3482
Gender (dummy, 1 for female)	0.7100	0.00	1.00	0.4560	0.6423
Poverty status (income below PL)	1738.57	0.00	40000.0	4476.55	2.5749

Source: Computed by authors. Note PL means poverty line.

Maximum likelihood estimates of cobb-douglas production function and technical inefficiency indices for cassava farms

Table 2 shows the maximum likelihood estimates of the Cobb Douglas production function of cassava farmers in the study area. The coefficient of the sigma square (0.04817) is statistically significant at 1.0% probability level. This indicates a good fit and correctness of the specified distribution assumption of the composite error term for the model. The variance ratio coefficient of 0.7009 is high suggesting that the systematic influences that are not explained by the production function are relatively dominant random error sources. This result means that the existence of inefficiency of resource use among cassava farmers' accounts for about 70.1% of the variation in the output level of cassava cultivated while 29.9% is due to the normal stochastic error. The presence of dominant one-sided error component in the specified model is thus confirmed, implying that the Ordinary Least Squares estimation method would be inadequate representation of the data.

The value of the generalized likelihood ratio (LR) of 1.9537 is highly significant. This also confirms the presence of one sided error term in the specified model (Yao and Liu, 1998 Udoh *et al.,* 2001). Thus this further validates the appropriateness of the specified stochastic model and the choice of maximum likelihood estimation methodology. The empirical results revealed that, the coefficient of household labour is positive and is less than unity; this implies that, cassava output produced has a positive inelastic relationship with household labour in the study area. The result corroborates the finding of Adewuyi, et al., (2013) and Anyanwu, *et al.,* (2014). This means that, as more household labour is used; more cassava output will be produced. On the other hand, quantity of fertilizer, manure and capital employed by cassava farmers has negative coefficients and are statistically significant at various conventional probability levels. Adewuyi *et al,* (2013) has reported similar result among cassava farmers in Ogun State. This means that, these farm factors have negative relationships with cassava output. That is, as these farm factor increases, the quantity of cassava produced decline. However, farm land and hired labour did not have significant association with the quantity of cassava produced in the area.

Table 3 shows the production parameters derived from the estimated Cobb-Douglas production function presented in Table 2. The production parameters are: production elasticity with respect to each farm factor, average productivity and marginal productivity of farm factors. The result revealed that, the production elasticity with respect to farm land is inelastic, while the average productivity of land (942.52) is greater than the marginal productivity (81.31). This implies that, land utilization by cassava farmers in the study area is in stage II in the classical production surface. Ohen *et al.* (2014) reported similar results among cassava farmers in Cross River State. The inference derivable from the result is that, farm land is rationally used by cassava farmers in the region. The same relationship is applied to family labour and hired labour. Their levels of utilization depicted stage II in the classical production surface. Ohen *et al.* (2014) reported similar findings for farm land and labour among cassava farmers in Cross River State. Hence, given these production parameters, it implies that, farm land, hired labour and family labour are rationally used by farmers in the production of cassava and hence their current level of utilization should be continued in the study area.

The implication is that a unit increase in farm land, family labour, and hired labour will lead to significant percentage increase in cassava output. On the other hand, the output of cassava produced had negative inelastic relationship with respect to the quantity of fertilizer used, quantity of manure used and farm capital. This means that, increase in fertilizer, manure and farm capital will negatively impacted on output of cassava produced by farmers in the region. By implication, the extent of utilization of these inputs shows that they are in stage III in the classical production surface. The result is in agreement with Ohen *et al.,* (2014) finding in Cross River State. Several reasons could be linked to these findings. They include high cost of fertilizer, poor quality of manure and increase land intensification. These constraints can negate the good intention of using fertilizer, manure and farm capital by cassava farmers in the region. The scale of return (0.256) is less than unity and connotes decreasing return to scale. This means that, increase use of the specified farm inputs reduces the level of output produced by farmers.

Table 2: Maximum likelihood estimates of Cobb-Douglas stochastic production function for cassava farmers in Oruk Anam LGA of Akwa Ibom State

Variable	Parameter	Coefficient	Standard error	t-value
Constant	δ_0	0.57547	0.35746	1.60988
Farm Land	δ_1	0.08636	0.19149	0.450995
Family labour	δ_2	0.24845	0.10632	2.33688**
Hired labour	δ_3	0.08576	0.07165	1.19682
Fertilizer	δ_4	-0.08153	0.01851	-4.40529***
Manure	δ_5	-0.07159	0.01147	-6.24130***
Farm capital	δ_6	-0.01128	0.00609	-1.84999*
Determinants of technical inefficiency				
Constant	β_0	-0.11676	0.42166	-0.27689
Age	β_1	0.00934	0.00384	2.43120**
Farming experience	β_2	-0.01762	0.00507	-3.47618***
Social capital formation	β_3	-0.03672	0.01507	-2.43622**
Educational qualification	β_4	-0.00762	0.00939	-0.81130
Household size	β_5	0.06025	0.02068	2.91276***
Farm size	β_6	-0.17607	0.45122	-0.39021
Gender	β_7	0.23496	0.10746	2.18649**
Poverty status of a farmer	β_8	0.0000144	0.00000742	1.95008*
Diagnostic statistics				
Sigma squared	∂^2	0.04817	0.01162	4.14403***
Gamma	λ	0.70093	0.18450	3.79901***
Log likelihood ratio	1.9536800			
LR test	5.7483973			

Note: Asterisk *, ** and *** represent 10%, 5% and 1% significance levels respectively. Variables are as defined in equations (3).

Table 4: Farm factor productivity parameters of cassava farms in Oruk Anam

Farm factor	Input Elasticity	Average productivity	Marginal Productivity	Input utilization stage
Farm Land	0.08636	941.5189	81.30957	II
Family labour	0.24845	7.02071	1.744295	II
Hired labour	0.08576	9.29595	0.797221	II
Fertilizer	-0.08153	11.41771	-0.93089	III
Manure	-0.07159	6.86928	-0.49177	III
Farm capital	-0.01128	0.03722	-0.00042	III
Scale of production		0.25617 (decreasing return to scale)		

Source: Computed from output generated from frontier 4.1 MLE.

Technical inefficiency model

The estimated coefficients of technical inefficiency model are presented in the lower portion of Table 2. The result reveals that the slope coefficient of farmers' age (0.00934), gender (0.23496), household size and poverty status (0.0000144) are positive and statistically significant at conventional probability levels. This means that, increase in these variables will lead to increase in technical inefficiency, but decrease in technical efficiency of resource use. It implies that, these variables are negative drivers of technical efficiency among cassava farmers in the study area. For instance, increase in household poverty will constrain farm input's acquisition, innovation adoption and directly stampede production processes. Increase in household size will increase household expenditure and reduce farm expenditure profile. The finding is in consonance with the research report submitted by Itam *et al.,* (2015) in Cross River State and Anyanwu, *et al.,* (2014) in Rivers State.

On the other hand, social capital formation and farming experience are positive significant drivers of technical efficiency among cassava producers in the study area. For instance, increase in social capital formation will enhance information sharing and encourage adoption of new ideas among farmers. This will impact positively on input combinations during production. Increase in farming experience is a promoter of farm adoption.

Technical efficiency distribution

The distribution of respondents' farm according to efficiency class interval, frequency and percentage of each class interval is described in Table 5

Table 5: Frequency distribution of technical efficiency indices of cassava farmers in Oruk Anam LGA

Technical efficiency class	Frequency	Percentage
0.001 – 0.200	0	0.00
0.201 – 0.400	2	2.00
0.401 – 0.600	29	29.00
0.601 – 0.800	45	45.00
0.801 – 1.000	24	24.00
Total	100	100.00
Minimum technical efficiency	0.36596402	
Maximum technical efficiency	0.96301936	
Mean technical efficiency	0.68338864	

Source: Computed from output generated from frontier 4.1 MLE.

Results in Table 5, report the frequency distribution of technical efficiency indices of cassava farmers in the study area. The result revealed that, farmers showed varied technical efficiencies ranging from the lowest 0.366 to the highest 0.963 with an average of 0.683. The degree of variation in technical efficiency among cassava farmers shows that a significant proportion of cassava is not produced by the farmers because of technical inefficiency in the used of the specified farm resources. To be precise, about 31.66% of output is not produced due to technical inefficiency in resource use. About 2.00% of farmers were in the efficiency range of 0.20 to 0.40, while 24.00% of farmers were much closed to the efficiency frontier. However, the least technical efficient farmer needs an efficiency gain of 65.85% (i.e., 1.00 – 0.3659/0.9630)100 in the use of the specified farm resources if such farmer is to attain the technical efficiency of the best farmer in the region. Likewise for an average efficient farmer, he will need an efficiency gain of 32.88% (i.e., 1.00 – 0.6834/0.9630)100 to attain the level of the most efficient farmer. Also, the most technical efficient farmer in the study area needs about 3.70% gains in technical efficiency to be on the frontier efficiency.

CONCLUSION AND RECOMMENDATION

Cassava is the most important food crop in Akwa Ibom State; hence its production is critical in achieving the objective of self-food sufficiency policy in the state. Farm inputs availability and combination have been one of the factors that constrain cassava production in the state. The maximum likelihood estimation of Cobb- Douglas production function for cassava farmers in the study area has revealed the efficiency gap of 31.66% in resource use among farmers. Socio economic factors and poverty status of farmers were identified as crucial in attaining optimum production amidst farm factors at the disposal of farmers. The findings call for relevant farm-level policies aims at promoting social capital formation or farmers' cooperative groups in farming communities. Also, the Akwa Ibom State government should strengthen family planning programme in the rural communities' in order to reduce household size. This will enhance efficiency of resource use among cassava farmers in the state. The need to reduce the burden of poverty among farming households is also essential to achieving increase food production in the state. This could be achieved by provision of free inputs and other farm services to cassava farmers in the region. Youth based agricultural programmes should be formulated and implemented to encourage youth involvement in cassava production in the region. This is because; age of cassava farmers is negatively related to technical efficiency.

REFERENCES

Abang, S.O, Ekpe, E. E., and Usani, W. W. 2001.Technical and Allocative Efficiencies of small scale cassava growers in five selected local government areas of Cross River State, *Global Journal of pure and Applied Science, 3(1); 37-42.*

Adebowale, A. A., O. L. Sanni and M. O. Onitilo 2008. "Chemical composition and pasting properties of Tapioca gifts from different cassava varieties and roasting methods", *African J. Food Sci., Vol. 2; 77–82.*

Adewuyi, S. A., M. U Agbonlahor and Oke, A.T. 2013. Technical Efficiency Analysis of Cassava Farmers in Ogun State, Nigeria. *IJAFS 4 (1&2), Pp. 515-522.*

Adeyemo, R., Oke, J. T. O., and A. A. Akinola 2010. Economic Efficiency of Small Scale Farmers in Ogun State, Nigeria. *TROPICULTURA, Vol. 28, 2, Pp. 84-88.*

Afolabi, M. O. 2007. "Rural-Urban migration and productivity in the Nigerian Agricultural sector", Unpublished MSc thesis, Department of Public Policy, Simon Fraser University, Canada.

Akpan, S. B., Edet J. U. and Inimfon V. P. 2016. Sustaining Small Scale Farming: Evidence of Poverty and income Disparity among Rural Farming Households in South-South Region of Nigeria. Path of Science*: International Electronic Scientific Journal; Vol. 2, No 9(14): 4.9 – 4.23.*

Akpan, S. B., Edet J. Udoh and Veronica S. Nkanta, 2012. "Factors influencing fertilizer use intensity among small holder crop farmers in Abak Agricultural zone in Akwa Ibom state, Nigeria", *Journal of*

Biology, Agriculture and Healthcare, Vol. 2(1), pp. 54-65. SAkpan, S. B., Inimfon V. P., and Samuel James Udoka, 2012. Stochastic Profit Efficiency of Homestead based Cassava Farmers in Southern Nigeria. *Asian Journal of Agriculture and Rural Development, 2(3); 498-505.*

Akpan, S. B., Uwemedimo E. O., Elizabeth N. J., Kesit K. N., and Daniel E. J. 2013. Economic Efficiency of Cassava Based Farmers in Southern Wetland Region of Cross River State, Nigeria: A Translog Model Approach. *International Journal of Humanities and Social Science, 3(12); 173-181.*

Anyagbunam H. N. , Okoye, B. C. Asumugha, G. N. Ogbonna, M. C. Madu, T. U. Nwakor N. and Ejechi M. E. Labour productivity among Small- holder Cassava Farmers in South East agro Ecological zone, *Nigeria African Journal of Agricultural Research Vol. 5(21) (2010), pp. 2882-2885.*

Anyanwu, S. O., A. E. Kalio, S. O. Olatunji and L. Akonye (2014). A Stochastic Frontier Production Function Approach to Technical Efficiency among Cassava Farmers in Rivers State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology 3(6): 746-755.*

Asogwa, B. C., J. C. Umeh and P. I. Ater, 2006. Technical efficiency analysis of Nigerian Cassava farmers: a guide for food security policy. Poster paper prepared for presentation at the international association of agricultural economists conference, gold coast, Australia.

Coelli, T. J, Battese GE. A model for technical inefficiency effects in a stochastic frontier production for panel data. *Empirical Economics, 1995:20:325-332.*

Ettah, O. I., and Nweze, N. J. (2016). Analysis and Determinants of Technical Efficiency among Cassava Farmers in Cross River State, Nigeria. *International Journal of Innovative Research & Development; Vol. 5 Issue 10, Pp. 109-113*.

Eze, A. V. and Nwibo, S. U. Economic and Technical Efficiency of Cassava Production in Ika Noath East Local Government Area of Delta State, Nigeria. Journal of Development and Agricultural Economic Vol. 6 (10), (2014) pp. 429-436. Environment, 2(3&4) 87-90. htt://dx.doi.org/10.5539/j.fae.v2.3n4. 139.

Food and Agriculture Organization (FAO) (2005). Quarterly Bulletin Statistics. FAO Rome, 2(3). 120.

Iheke, O. R. (2008): Technical efficiency of cassava farmers in South Eastern Nigeria. *Agricultural Journal 3 (2): 152-156.*

Itam, K. O, Eucharia A. A., Uket I. O., and Otu E. A., (2015). Technical Efficiency Analysis of Small Scale Cassava Farmers in Cross River State, Nigeria: A Stochastic Production Frontier Approach; *Applied Economics and Finance Vol. 2, No. 4; Pp. 10 -18.*

National Population Commission (NPC), 2006. National Population and Housing census statistics in Nigeria.

Nweke, F. 2004. New Challenges in the Cassava Transformation in Nigeria and Ghana. Environment and Production Technology Division (EPTD) Discussion Paper No. 118, International Food Policy Research Institute, Washington, D.C., USA, June, 2004, 118 pp.

Ogunniyi L. T, Ajao A. O, Olapade-Ogunwole F, and Ganiyu M. O. 2012. Resource-use Efficiency of Cassava Production in Atakunmosa Local Government Area of Osun State. Prime Journal of Social Science, 1(2); 27-30.

Ohen, S B., Ene, D. E., Umeze, G. E. 2014. Resource Use Efficiency of Cassava farmers in Akwa Ibom State, Nigeria, *Journal of Biology, Agriculture and Healthcare, 4(2); 126 – 131.*

Okeowo T. A., Agunbiade J. B., Odeyemi L.A. 1999. “An Assessment of the Level of Involvement of Farm-Children in Farming Decisions in Ikorodu Area of Lagos State.” In Farm Children and Agricultural Productivity in the 21st Century Proceedings of the Second Annual Conference of Children-In-Agricultural Programme (CIAP) held at the Conference Centre, O.A.U., Ile-Ife (eds Stella, B.W.; Oginni, F.O. and Akinloye, J. F.), May. Pp. 275 – 282

Rahman, S. and Rahman, M. 2009. Impact of land fragmentation and resource ownership on productivity and efficiency: the case of rice producers in Bangladesh, *Land Use* Policy 26, 95–103.

Sanni, L. O., A. A. Adebowale, B. Maziya – Dixon and A. G. Dixon, 2008. “Chemical composition and pasting properties of CMD resistant cassava clones planted at different locations”, *J. Food Agric. Environ., Vol. 6; 97- 104.*

Udoh, E. J. and Sunday B. A. 2007. “Measuring Technical efficiency of waterleaf (*Talinum triangulae*) production in Akwa Ibom State, Nigeria”, *American – Eurasian J. Agric. Environ. Sci., Vol. 2; 518 – 522.*