The measurement of productive and technical efficiency of cassava farmers in the North – central zone of Nigeria

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This study was carried out to investigate the productive and technical efficiency of cassava farmers in the North-Central Zone of Nigeria. Given the specification of the stochastic frontier production function, the null hypothesis that the cassava farmers were fully technically efficient is rejected since there was presence of inefficiency effects in the model. The technical efficiencies of the farmers widely varied between 0.329 and 0.920. The study further showed that cassava production was in the rational stage of production (stage II) in the zone as represented by the returns to scale (RTS) 0.757. The variable of interest (age, farm distance, household size, health status, labour and operating expense were effectively allocated and used, as confirmed by each variable having estimate coefficient value between zero and unity. This study further suggested that while age, labour, access to credit facilities, health status and farm size negatively affected farmers’ productivity and technical efficiencies, generally, in increase in other socio-economic variables (operating cost, labour, cost of fertilizers and agrochemicals led to decrease in technical efficiency (TE). More effective extension services, increased farm sizes with less fragmentation, increased subsidies on farm inputs and well-maintained feeder roads, especially during harvesting season will further improve farmers’ TE.

Key words: Productive efficiency, technical efficiency, stochastic frontier production function.

INTRODUCTION

The Nigerian agricultural sector is almost entirely dominated by small scale, resource-poor farmers who produce substantial amount of their food requirements even with the traditional technologies, which are characterized by drudgery and low productivity. Following Schultz’s policy conclusions on traditional agriculture that no significant increase in agriculture production is attainable by reallocating the factors at the disposal of farmers, any effective agricultural policy discussion must invariably center around the issue of raising the production levels.

In recent decades, agricultural policy makers have recognized technological innovations and improved farm practices as the potent tools to increase agricultural productivity. To this extent, efforts have geared towards identifying and eliminating those factors that could inhibit the adoption of improved technologies. Recent studies have shown however, that increased productivity does not absolutely depend on the adoption rate of improved technologies and practices but also on the efficiency of allocation and utilization of the available technologies (Olayide and Heady 1982). The centrality of efficiency to productivity was regrettably not realized for too long until recently by agricultural policy makers in the developing nations, especially Nigeria. Efficient utilization of technology is otherwise called technical efficiency, which generally refers to the performance of process of transforming a set of inputs into a set of outputs.

In Nigeria, cassava had so long been regarded a ‘poor man’s food because of its ease of production and all-year round availability until very recently when the consumption of its products had become a luxury even to the middle class. Cassava was believed to have been brought to Africa from Brazil by the Portuguese about 350
years ago (Okeke and Ene, 1987). Even though it was actually introduced into Nigeria over 300 years ago, its systematic cultivation was never generally accepted and practiced until the late 1980. It became fully integrated into the farming systems of southern Nigeria little over 150 years ago and it is presently cultivated in almost all parts of the country.

Okuneye and Igben (1981) noted that cassava is valued for its outstanding ecological adaptation, low labour requirement, ease of cultivation and high yields. It is also widely cultivated because it can be successfully grown in poor soils and under conditions of marginal rainfall. It has the ability to grow with appreciable yield where many other crops would hardly survive. It gives reasonable good yields under marginal conditions and when conditions is optimal. It produces higher amount of calories per hectare than most tropical food crops. Given improved agronomic practices, yields up to 25-40 metric tonnes per hectare can be obtained from the roots of improved varieties. The Food and Agricultural Organization of the United Nations in Rome (Food and Agricultural Organization (FAO) 2006) reported that Nigeria grows more cassava than any other country in the world in terms of the volume of production, land area and total production.

However, Nigeria ranked low (the 8th) in terms of cassava yield (kg/ha), relative to such countries as Brazil, Thailand etc This situation had been attributed to the variety, farming practice (fertilization, pest and weed control, farm management regime) etc which are poor in Nigeria unlike Thailand and Brazil. FAO estimated Nigeria current productions at 37.9 million metric tonnes per year grown on about 3 million hectares. The Central Bank of Nigeria (CBN) in its 2003 annual report however indicated that Nigeria produced 41.8 million metric tones per year. Interest in cassava cultivation and utilization has grown considerably in recent years in Nigeria and farmers are motivated to cultivate more cassava because of its adaptability to variety of climatic conditions, relative tolerance to drought and poor soils, and its resistance to pests and diseases.

Previous studies have shown that there has been a steady increase in both the cultivated land area for cassava and the tuber output in Nigeria between the periods of 1986-2006 (Food and Agricultural Organization (FAO) 2006; Nweke et al. 1994). However, the yield of the crop has been on the decline since 1991 except in 1997 when higher yields were recorded. A number of factors have been adduced to have contributed to this, among which include losses due to pests and diseases as well as declining soil fertility. Declining opportunities for farmers to embark on large-scale cassava farming and their relatively low technical efficiencies might also be a contributory factor. The major cassava producing areas of the country is the southern states (south-west, South-east and South-south) geopolitical zones and the North-central geopolitical zone. However, there is still some appreciable degree of cassava production in other parts of the country especially Taraba, Gombe and Kaduna.

**Economic importance of cassava to Nigeria**

In Nigeria today, cassava is a major source of dietary energy for low-income consumers including major urban areas. Cassava is primarily produced in Nigeria for its roots (tubers). This is because cassava roots are quite high in carbohydrates, about 60 to 70% for Nigerian cultivars. Cassava is a major cheap source of carbohydrates particularly starch in human diets and is processed by various methods into numerous products utilized in diverse ways depending on local customs and preferences. Cassava has continuously played three vital roles viz: as cash earner for the growers, low-cost food source for both urban and rural dwellers as well as household food.

Cassava is an important source of energy with a caloric value of 250kcal/ha/day as compared with 200kcal/ha/day for maize, 173kcal/ha/day for rice 114kcal/ha/day for sorghum, and 110kcal/ha/day for wheat. Apart from the roots, other parts of cassava plants such as the leaves and the stem have been found useful. Cassava tuber is processed locally or converted to various types of foods such as garri, fufu, tapioca and cassava flower for bakery and confectioneries. Some varieties are even eaten raw or roasted, while some cooked or pounded. In addition to food for humans, cassava is used to produce chips and pellets for livestock feed, and in textile, plywood, paper and pharmaceutical industries. The potentials for market of cassava-based products have been found to be very high in the African region through a recent trade mission by the Presidential Committee on cassava export. It is envisaged that its uses all over the world will continue to grow thereby putting more pressure on the level of availability of cassava for human and animal consumption in Nigeria. This has thrown a huge challenge to cassava farmers, researchers, processors and the three arms of government in Nigeria (federal, state and local).

**Concept of productivity and efficiency**

Olayide and Heady (1982) defined agricultural productivity as the ratio of total farm output to total input used in farm production. Productive efficiency means the attainment of production goal without waste. Beginning with this idea of no waste, economists have built up a variety of theories on efficiency. However, the fundamental idea underlying all efficiency measure is that of the quantity of goods produced and service per unit of input.

Efficiency is often used synonymously with that of
productivity, which relates output to input. In agriculture, 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.

Yao and Liu (2008) defined technical efficiency as the ability to produce maximum output from a given set of inputs, given the available technology. This definition indicates that difference in technical efficiency exists between farmers. In a factor-product relationship, the production function presupposes technical efficiency whereby maximum output is obtained from a given level of input combination. Efficiency measurement is an important issue in agricultural enterprise because it allows the comparison of productivity and efficiency between farming enterprises. Efficiency is a very crucial factor of productivity growth especially in developing agricultural economies, where resources are meager and opportunities for developing and adopting new technologies have continued to dwindle. This is because it is possible to raise productivity by improving efficiency without necessarily increasing the resource base or developing new technologies. Inefficiency studies have also shown that estimates on the extent of inefficiency can help to decide whether to improve efficiency or to develop new technologies to raise agricultural productivity (Kalieajan and Flinn, 1983).

The stochastic production frontier approach

The stochastic production frontier was used in this study. The stochastic frontier production function was independently purposed by Aigner et al. (1977) and Meeusen and Van den Broeck (1977). The modeling, estimation and application of stochastic frontier production functions to economic analysis assumed prominence in economic and applied economic analysis during the last four decades, especially following Farrell’s seminal papers (Farrell, 1957).

Ojo (2003) applied the technique to the pastoral zone of Eastern Australia and more recently, different empirical applications of the technique in efficiency analysis have been reported (Ajibefun and Abdulkadri, 1997; Battese, 1992; Battese and Coelli, 1995; Battese and Tessema, 1993; Iwala et al., 2006; Kalieajan and Flinn, 1983). The stochastic production function assumed that the error term in the regression model is composed of two additive components – random error (Vi) and error due to technical inefficiency effects (U). The frontier function as specified by Xu and Jeffery is defined as:

\[ \gamma = f (X_i \beta + V_i - U_i) \]  

Where \( \gamma \) = output  
\( X_i \) = actual input vector

\[ \beta = \text{vector of production parameter} \]
\[ Vi = \text{random error term. It is independently, identically and normally distributed and independent of } U, \text{ the } U \text{ measures the technical inefficiency relative to the frontier.} \]
\[ U \text{ is assumed to have a non-negative distribution.} \]

The stochastic frontier production function is a measure of maximum potential output for any particular input vector X. the V and U cause actual production to deviate from this frontier.

The variance of the parameters, systematic Vi and one side U, are \( \delta_v^2 \) and \( \delta_u^2 \) respectively and the overall model variance given as \( \delta^2 \) are related thus,

\[ \delta^2 = \delta_v^2 + \delta_u^2 \]  

The measures of total variation of output from the frontier, which can be attributed to technical efficiency, are lambda (\( \Lambda \)) and gamma (\( \gamma \)) (Battese, and Corra 1977). These variability measures are derived as

\[ \Lambda = \delta_v / \delta_u \]  

and

\[ \gamma = \delta_u^2 / \delta^2 \]  

On the assumptions that Vi and Uj are independently and normally distributed, the parameters \( \beta, \delta_v, \delta_u, \Lambda \) and \( \gamma \) will be estimated by method of maximum likelihood estimation (MLE) using the computer program FRONTIER version 4.1 (Coelli, 1994). This programme will also compute estimates of technical efficiency for each farmer.

Following Olowofeso and Ajibefun (1999) a three stepwise procedure in estimating the MLE estimates of the parameters of the stochastic frontier production function will then be used

MATERIALS AND METHODOLOGY

Study area

The study areas purposively selected for this study are Benue and Kogi states in the North-Central geopolitical zone or what is also known as the middle-belt area of Nigeria. The temperature throughout the year ranges from 28°C – 34°C and the annual rainfall varies from 1500mm to 1200mm. The rainfall decreases in amount and distribution from the south to the northern part of the zone. The Guinea savanna zone is found in the area.

Data collection

A structured questionnaire was administered to obtain
both qualitative and quantitative information on the relevant variables such as the physical quantities of production inputs and outputs from a cross sectional survey of cassava farmers in five purposively selected Local Government Areas (LGAs) from each state.

To identify factors that influenced efficiency, detailed information about the farmers’ socio-economic characteristics such as age, level of education, experience, farm size, family size, access to credit facilities, income sources was collected. Information on climatic elements such as amount and distribution of rainfall, temperature and soil characteristics was equally obtained from Agriculture Development Projects (ADPs) and other relevant departments of the Ministry of Agriculture and Rural Development in the respective states.

Primary data were collected from cassava farmers selected from Ado, Gwer-west, Ogbadibo, Ohimini and Vandeikya LGAs from Benue state while Ankpa, Ibaji, Yagba-East, Idah and Ajakuta LGAs were selected from Kogi State.

The sampling method used was multi stage sampling technique. The first stage involved purposively sampling of the 10 LGAs based on the availability of cassava farmers and accessibility to market. The second stage involved a simple random selection of 45 respondent farmers from each Local Government Area making a total sample size of 450.

**Frontier model for the cassava farmers**

The stochastic frontier production function proposed by Battese and Coelli (1995) and used by Yao and Liu (2008) was applied in the analysis of data to capture the efficiency of cassava farmers in the area.

The technical efficiency (TE) was also estimated by finding the ratio of the observed output (Yi) to the corresponding frontier output (Y*i) given the available technology, that is

\[
Y_i / Y^*i \text{ i.e } TE = \beta_0 + \sum \beta_i X_j + V - U / \beta_o + \sum \beta_i X_j + V - - - - - - - - - - - - - - - - - - - - - - - - - - (5)
\]

So that \( 0 \leq TE \leq 1 \)

For this study, a general model specified by a Cobb-Douglas function was assumed and was defined as:

\[
\ln Yij = \beta o + \sum \beta i \ln Xij + Vij - Uij - - - - - - - - - - - - - - - - - - - - - - - - - - (6)
\]

Where subscript i refers to the observation of the ith farmer and j refers to cassava production.

\( Y = \) total value of cassava yield/ha in (Naira)

\( X_1 = \) farm size (hectare)

\( X_2 = \) Total quantity of labour (man-days per hectare).

\( X_3 = \) cost of fertilizers/agro chemicals (Naira /ha)

\( X_4 = \) Operating costs in (Naira)

\( Uij = \) technical inefficiency effects as previously defined.

\( Vij = \) random errors as previously defined

\( \ln = \) natural logarithm (i.e to base e)

It is assumed that the technical inefficiency measured by the model of the truncated normal distribution (i.e Uij) is a function of socio-economic factors \( ^{26} \) as given in equation (7) below

\[
Uij = \delta o + \delta 1i Zij + \delta 2Z2ij + \delta 3Z3ij + \delta 4Z4ij + \delta 5 Dij ----
\]

\( \text{equation (7)} \)

Where \( Uij \) = technical inefficiency of the ith farmer and jth observation of the farmer

\( Z_1 = \) Age of the farmer (years)

\( Z_2 = \) Years of formal education

\( Z_3 = \) Household size

\( Z_4 = \) Frequency of Extension visits per year

\( Z_5 = \) Mode of land acquisition

\( D = \) Dummy variable for mode of land acquisition where one denotes land acquired through outright purchases and zero for land acquired through inheritance.

The \( \beta s \) and \( \delta s \) are scalar parameter to be estimated by the method of maximum likelihood. The variance of the random error and that of the technical inefficiency effects of \( \delta i_u \) and the overall variance of the model are related thus: \( \delta = \delta v / \delta u \) and the ratio, \( Y = \delta v / \delta u \) measures the total variation of output from the frontier which can be attributed to technical inefficiency (Battese and Corra, 1977). The estimates for all the parameters of the stochastic frontier production function and the inefficiency model are simultaneously obtained using the programme frontier version 4.1 (Coelli, 1994).

Two different models were estimated for this study. Model 1 is the traditional response function in which the efficiency effects are not present. It is a special case of the frontier production function model in which the total variation of output from the frontier output due to technical inefficiency is zero, that is \( Y = 0 \)

Model 2 is the general model where there is no restriction and thus \( Y \neq 0 \). The two models were compared for the presence of technical inefficiency effects using the generalized likelihood ratio test, which is defined by the test statistic Chi-square, \( X^2 = 2 \ln (\text{Ho}/\text{Ha}) \).

Where \( X^2 \) has mixed chi-square distribution with the degree of freedom equal to the number of parameters excluded in the unrestricted model. Ho is the null hypothesis that \( Y = 0 \). It is given as the value of likelihood function for the frontier model and Ha is the alternative hypotheses that \( Y \neq 0 \) for the general frontier model.

**RESULTS AND DISCUSSIONS**

**Summary statistic**

The summary statistic of variables for the frontier
estimation is presented in Table 1. The mean farm size per farmer was 1.35 hectare and these were mostly fragmented and scattered in location. This shows that cassava production was generally on either the peasant or smallholding category in the study area. This could be as a result of either the obnoxious land tenure system in Nigeria or low financial bases of the rural farmers compounded by extremely low accessibility to credit facilities, which in any case, could not make large scale cassava farming possible for the resource-poor farmers. The average distance of the farms from the farmers’ villages or settlements was 4.5 kilometer. This implies that available lands for cassava farming were becoming farther away from the farmers’ settlements, which also implies that much time and energies would have been wasted on trekking before the farmers and his labour would finally get to their farms. This would invariably result in reduced productivity per man-day.

The average yield of the cassava farms per hectare was 15.06 metric (fresh tuber weight) tonnes even when this yield appears to be very impressive when compared with the recorded yield figures from other geo-political zones of Nigeria, it is still far below the 25-40 metric tones reported by Breckelbaum et al. (1978), National Root Crops Research Institute (NCCRI) (1982-1997) and International Institute for Tropical Agriculture (IITA) (1976-1996). The reason for this relatively low yield could be because most of the farmers in the study area could still not access the improved cassava (stems) and therefore settled for local varieties coupled with declining soil fertility, short rain fall duration, small farm sizes and generally poor agronomic practices.

The labour used for the production of cassava from land clearing to harvesting is on the average 25 man-days/ha. This is considered to be on the high side, as cassava production does not require much labour. The import of this is that farmers were not using agrochemicals to control weeds; rather they relied heavily on human labour, which might not have been optimally utilized. The farmers spent an average of ₦5,434 as transportation and processing costs on every tonne of cassava produced. This figure is rather high and it was believed to have been as a result of high cost of transportation sequel to very poor road network, especially feeder roads coupled with relatively high cost of processing equipment in the study area. The implication of this is that even when the prices of cassava products could be profitable to the farmers currently, excessive production costs if unchecked could gradually reduce their profit margin and make cassava production unprofitable in the long run except determined efforts are made to further increase the efficiencies of other production inputs.

The value of cassava tubers is about ₦2,100 per tonne on the average. This price regime is inadequate indicating very low returns on investment and could discourage investment in expensive mechanized and large-scale production of cassava tubers. This low value of cassava in the zone could be because there were no cassava processing plants to process cassava tubers into other products such as starch and flour in the study area which could have put more pressure on cassava demand and thereby increase their shelf prices. Relatively low commodity prices with relatively high production cost provide no incentive for technical efficiency to the farmers.

Farmers had relatively very low education as they spent just an average of 0.75 years in either formal or informal educational institutions. Low education is a hindrance to productivity and technical efficiency, as the farmers might not appreciate the need to effectively and efficiently allocate and utilize their production inputs.

Farmers were old with mean average age of 50.9 years. It is expected that as the farmers continue to grow older their productivity and efficiency might continue to dwindle due to reduced vigour and complacency.
Despite the declining soil fertility in the area, the farmers spent an average of ₦500 on fertilizer and other agrochemicals per hectare. The quantity of these inputs that this amount could procure would be too small for any significant or appreciable impact on productivity. Farmers had extremely low accessibility to credit facilities from the financial institutions as only about 9.7% of the respondent farmers had access to loans which were mostly from relatives, local thrift/cooperative societies. The implication of non-availability of credit facilities to farmers is that they would not be able to increase their farm sizes, they may also not be able to procure agrochemicals and fertilizers. Also, a poor farmer without credit facilities would not be able to acquire the available technologies for cassava production. All these would obviously exert negative effects on the productivity and efficiency of such farmer. The household size is relatively large, about 9.5 persons, and this is typical of most rural settings in Nigeria. Large family is expected to increase efficiency by supplying labour at relatively cheap costs. Most of the farmers were not aware of either the existence or the functions of agricultural extension workers as only about 0.94 percent of them claimed to have heard of extension services but were never visited either at home or in their farms. Lack of extension services is pervasive in Nigeria rural areas. This might not be unconnected with poor funding of Agricultural Development Projects (ADPs), which are the autonomous agricultural extension agencies formally financed by the World Bank. This development portends a great danger to sustainable cassava production in Nigeria, as farmers would not be able to know or access emerging production technologies, inputs and improved agronomic practices that could improve their efficiencies and productivity.

Estimates and tests

The maximum likelihood estimates of the stochastic frontier production function for cassava production in the North-central geopolitical zone of Nigeria are presented in Table 2. There were presences of technical inefficiency effects in cassava production in the study area as confirmed by a test of hypothesis for the presence of inefficiency effects using generalized likelihood ratio test, which is very high. The chi-square computed is 7.256 while the critical value of the chi-square at 95% confidence level and 6 degree of freedom $X^2(0.95,6) = 1.734$. The null hypothesis of no inefficiency effects in cassava production, $\gamma = 0$, was strongly rejected. Thus model 1 was not an adequate representation of the data, hence model 2 was therefore the preferred model for further econometric and economic analyses.

The estimated gamma parameter ($\gamma$) of model 2 of

Table 2. Maximum likelihood estimates of the stochastic Frontier production for cassava farmers of Nigeria.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Parameters</th>
<th>Model 1</th>
<th>t ratio</th>
<th>Model 2</th>
<th>t ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>General model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant $\beta_0$</td>
<td>4.378</td>
<td>42.052</td>
<td>3.78</td>
<td>39.16</td>
<td></td>
</tr>
<tr>
<td>Farm size $\beta_1$</td>
<td>0.342</td>
<td>3.29</td>
<td>0.795*</td>
<td>18.62</td>
<td></td>
</tr>
<tr>
<td>Labour (man days) $\beta_2$</td>
<td>-0.091</td>
<td>-0.65</td>
<td>0.094</td>
<td>1.85</td>
<td></td>
</tr>
<tr>
<td>Cost of fertilizer &amp; agrochemicals $\beta_3$</td>
<td>0.026</td>
<td>1.35</td>
<td>0.087*</td>
<td>-2.07</td>
<td></td>
</tr>
<tr>
<td>Transportation &amp; processing cost $\beta_4$</td>
<td>0.032</td>
<td>0.53*</td>
<td></td>
<td>1.94</td>
<td></td>
</tr>
<tr>
<td>Inefficiency model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant $\delta_0$</td>
<td>0</td>
<td>0.168</td>
<td>1.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of the farmers $\delta_1$</td>
<td>0</td>
<td>0.007</td>
<td>2.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health status $\delta_2$</td>
<td>0</td>
<td>0.054*</td>
<td>-3.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household size $\delta_3$</td>
<td>0</td>
<td>-0.069*</td>
<td>-1.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year of formal/informal education $\delta_4$</td>
<td>0</td>
<td>0.025</td>
<td>0.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension contacts $\delta_5$</td>
<td>0</td>
<td>0.002</td>
<td>-0.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of land acquisition $\delta_6$</td>
<td>0</td>
<td>-0.068*</td>
<td>-2.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variance parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sigma squared $\delta^2$</td>
<td>0.34</td>
<td>0.042</td>
<td>6.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gamma $\gamma$</td>
<td>0.50</td>
<td>0.920</td>
<td>207.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log likelihood function $LL_f$</td>
<td>109.64</td>
<td>138.10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Estimate is significant at 5% level of significance
0.920 indicates that almost 92% of the variation in the cassava output among the farmers could be due to differences in their technical inefficiencies. Given a technology to transform physical inputs into outputs, some farmers were able to achieve maximum efficiency up to 92% while other farmers achieved as low as 33 percent maximum efficiency. This discrepancy could be that the later group of farmers did not possess adequate technical knowledge to produce output with a given level of input compared to the former group i.e. efficient farmers.

The estimated elasticities of the explanatory variables of the general model (Table 3) shows that farm size, costs of fertilizers and agrochemicals and labour cost were positively decreasing, indicating that the variables allocation and used were in the stages of economic relevance of the production function (stage 1). The elasticity of transportation and processing expenses was negative decreasing function to the factor indicating over utilization and in stage III. This might not be unconnected with the fact that farmers were spending too much on transportation of cassava tubers from the farms to the villages as a result of poor road network and insufficient means of transportation in the rural areas coupled with high costs of cassava processing, especially grating due to very high cost of diesel to run the graters. Diesel was very scarce and could mostly be found in the cities or local government headquarters in the study area. The productivity of the factors could be further improved by increasing the farm sizes, maintenance of feeder/access roads to reduce cost of cassava haulage from the farms and adoption of cassava grating technologies that would consume less fuel so that the variable of transportation and processing expenses could be reduced, thus be able to move from stage III to stage II of the productive region.

Technical efficiency analysis

The predicted farm specific technical efficiencies (T.E) ranged between 0.329 and 0.920 with a mean of 0.682 as shown in Table 4. Thus, in the short run, there is a scope for increasing efficiency of cassava production by about 31.8% by adopting the cultivars, agronomic practices and production technologies adopted by the most innovative cassava farmer in the area.

Technical inefficiency analysis

The analysis of the inefficiency model (Table 2) shows that the signs and significance of the estimated coefficients in the inefficiency model have critical implications on the TEs of the farmers. The estimated...
coefficient of age, years of education and extension contacts are positive, implying that these factors led to increase in technical inefficiencies or decrease TEs of cassava farmers in the study area, though not significantly, the apriori expectation is that education and extension contacts would have negative and significant impact on technical inefficiency or vice versa. This result might be as a result of the fact that the farmers were mostly uneducated with an average of 0.76 years in schools and the rate of extension contact was extremely low as only 0.94% of the farmers claimed to have had contacts with extension agents. The effects of both factors would therefore be negative on efficiency and negative on inefficiency. The positive and significant coefficient sign of age of farmers implies that age significantly contributed to increased inefficiency. This is expected because the farmers were relatively old (50.9 years on the average) the older the age of farmers, the less vigorous and less efficient they are expected to be in terms of utilization and supervision of production inputs. Studies have also shown that very few older farmers believed in the necessity of adopting new or improved technologies.

The coefficients of health status of the farmers, and mode of land acquisition are positive and significant indicating that they also impacted increasing and significant influence on technical inefficiency and this is not unexpected as farmers’ health is expected to have a profound impact on their efficiencies. This is also not surprising as health centres were almost absent in the villages. The few ones present were dilapidated, ill-equipped and without qualified health personnel to the extent that rural farmers mainly depended on local medication which could not effectively improved their health statuses.

A big household size is expected to increase efficiency because family members could readily provide labour at cheaper costs and easier to monitor. The negative coefficient of mode of land acquisition implies that as land acquisition moved from inheritance to outright purchase, the technical efficiencies of the farmers increased significantly. This is because farmers who acquired their farmlands out rightly see themselves as permanent owners and are therefore more receptive to the adoption of innovations on their lands in other to brake-even. The average household size was 9.5 persons in the area. Household size carried negative coefficient and significant signs, implying that it led to increase in technical inefficiency of the farmers’. Availability of credit facilities is expected to increase farmers’ efficiency, as they will be able to increase their farm sizes, procure inputs and improved technologies. Absence of this factor as noticed in the study area is expected to increase inefficiency.

Conclusion

The study observed that the technical efficiency of cassava farmers varied, widely due to the presence of technical inefficiency effects in cassava production. While the variables of age, extension visits, transportation and processing costs and health statues decreased the farmers’ technical efficiencies, household size and mode of land acquisition increased their TEs. The results also showed a potential for increasing the efficiency of the farmers in the short run by about 31.8 %.

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