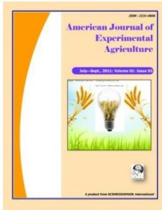


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# Resource Use and Technical Efficiency in Value Addition to Cassava: A Case Study on Gari and Fufu Processing in Ogun State, Nigeria

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***Authors' contributions***

*This work was carried out as a part of contributions to knowledge in the areas of value addition to enhance the shelf life of agricultural raw foods in the Tropics with a view to enhancing Food Security by the collaborating author ORA. The design, management, data collection, analysis and drafting of the manuscript were jointly carried out by the authors. The both authors read and approved the content of the final manuscript.*

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## ABSTRACT

**Aim:** The analysis of efficiency of resources used in value addition to cassava and enterprise economic efficiency for the two products obtained from cassava processing: gari and fufu.
**Study Design:** Structured questionnaires were used to obtain the required information from the major processors of cassava tubers in Nigeria and the consumers of the products.
**Place and Duration:** The study was carried out in the two major areas of production of cassava processing in Ogun state of Nigeria. It covered the period from January to December 2013.
**Methodology:** Primary data were collected from cassava tuber processors, retailers, merchants and final consumers of the two major foods (Gari and Fufu) obtained from cassava tubers.
Descriptive statistics, Budgeting and Stochastic production frontier were used to analyze the data.
**Results:** The ratio of marginal value product of inputs (MVP) to input prices ($P_x$) lower than one indicates that the variables (quantity of cassava tuber, cost of transportation and labour) were highly over utilized. Since none of the inputs used had this ratio equal to one, it indicates that these

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resources were not optimally allocated in the study areas .The enterprise economic efficiency is 1.10 and 1.33 for gari and fufu respectively. The mean technical efficiency index for the entire fufu and gari respondents are 0.59 and 0.45 respectively.

**Conclusion:** The technical efficiency of fufu and gari can potentially be increased through a more judicious use and better management of available resources to increase productivity of both fufu and gari.

* Naira (₦) is the Nigeria Currency; ₦158 is equivalent to $1.00 as at the time of this study.

*Keywords: Resource-use; technical; efficiency; processing; gari; fufu.*

## 1. INTRODUCTION

Cassava is reputed for being a hardy crop, producing economic yield under drought, low fertility, locust attack, poor husbandry and other adverse production conditions where other crops cannot survive. As a result of its hardiness and high food producing potentials, the crop has assumed a place of prominence among other staple food crops in West Africa in general and in Nigeria in particular. Famine rarely occurs in a community where cassava is widely grown because in some places they are harvested continuously throughout the year, thus making it available for farmers over the lean season after other crops have been planted but are not yet mature.

Cassava processing provides sources of income and employment for thousands of farmers. The wide-spread importance of cassava to poor rural farmers, processors and both rural and urban consumers means that investments in the processing of cassava are likely to have a positive impact on both rural and urban livelihoods. Cassava is a very high yielding tuber giving high return to food per unit of energy input; its harvesting is flexible because it can be staggered for up to three years. It is therefore sometimes referred to as an excellent famine reserve crop.

Cassava leaves can be used to make soup or as feed for livestock, the peels can be used for mushroom production, the stems can be used as planting materials or as fire wood; the roots can be cooked and eaten fresh or processed [1]. Cassava has become prominent in Nigeria's drive towards increasing her foreign exchange generation base.

Processing as a form of value addition still appears to be the best method of preserving the highly perishable cassava roots and for removing 'cyanogenic glucosides' which impart toxicity to the roots. The most effective ways of reducing the total cyanide content of cassava products were to adopt the processing methods involving different combinations of soaking, grating, fermentation, boiling and drying/roasting of whole or fragmented roots [2].

Traditionally, cassava roots are processed into different products by a variety of methods according to local customs and preferences [3]. Kaine, quoting from the works of Abolaji and others carried out in 2007, stated that cassava processing in Nigeria involves a number of undesirable attributes such as time and energy consumption and in addition low yields of products [4].

Cassava roots can be processed into many edible products through value addition. These products are abacha (eaten by south-easterners in Nigeria), cassava flour, fufu, gari, starch, tapioca [5,6].

Proper processing leads to production of safe food products and raw materials and this increases the market opportunities for farmers, motivates them to produce more cassava and can provide opportunities for self reliance in the supply of food, feed and industrial raw materials.

Efficiency is a productive use of resources; the degree to which something is done well or without wasted energy or time. There are different measures of efficiency: technical, economic and allocative. The concept of efficiency helps in determining how well the scarce inputs are efficiently allocated in production.

Technical efficiency is the effectiveness with which a given set of inputs is used to produce an output. A firm is said to be technically efficient if it is producing the maximum output from the minimum quantity of inputs such as labor, capital and technology. It is also a point at which the Marginal Physical Product (MPP) equals Zero (0) in the production curve [7]. Allocative efficiency is at an output level where the price of output ($P_y$) equals the Marginal Cost (MC) of production. It also refers to the choice of optimal input proportions given relative prices [8]. Economic efficiency is achieved when the cost of producing a given output is as low as practically possible. In the production curve, it is the point where the Marginal Value Product (MVP) equals the price of input ($P_x$). It is also referred to as the product of technical and allocative efficiency.

This paper attempts to contribute to the existing literature on efficiency of resources use in developing country's agriculture by quantifying the levels of resource availability, use and technical efficiency for a sample of cassava processors in two major cassava producing Local Government Areas(LGA's) selected from Ogun State, Southwestern Nigeria. The objectives are to determine the profitability, measure the technical efficiencies involved in processing gari and fufu by the processors and compare the profitability and the technical efficiency of processing of the two products, gari and fufu, in the selected Local Government Areas.

## 2. DATA AND EMPIRICAL PROCEDURES

Ogun State was purposively selected for study because of the very large number of cassava farmers and processors in the state. The two local government areas covered were also purposively sampled based on the production records of registered cassava farmers available in the state's ministries of Agriculture [9-11]. Simple random sampling procedure was used to capture the respondents among the state registered members of association of cassava processors in the local government areas. The instrument used for data collection was a well structured questionnaire which contains open and close ended questions tailored towards realizing the objectives of the study. The total number of questionnaires administered in the two Local Government Areas was 127 out of which 112 were retrieved and 100 fully completed ones used for the analysis in this study. The Cobb-Douglas functional form was used to estimate the technical efficiency in the stochastic production frontier.

The model is of the form:

$$In\ Yi = \beta 0 + \beta 1\ In\ X1 + \beta 2\ In\ X2 + \beta 3\ In\ X3 + \beta 4\ In\ X4 + \beta 5\ In\ X5 + e$$

where:

$\beta 0$= constant term / vector parameter
$\beta 1 - \beta 5$ = coefficient of variables $X_1 - X_5$
e = error term
Y= total output (kg)
$X_1$= quantity of cassava tubers (kg)
$X_2$= amount spent on hired labour in Naira (₦)
$X_3$= transportation cost in Naira (₦)
$X_4$= packaging cost in Naira (₦)
$X_5$= amount spent on rent in Naira (₦)

A frontier 4.1 package was used to analyze for socio–economic attribute(s) that affect the technical efficiency in the stochastic production frontier. It is given as:

$$TE = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e_t)$$

Where:

TE= Technical efficiency
$X_1$= Quantity of cassava tubers (kg)
$X_2$= Age of farmers (in years)
$X_3$= Gender grouping: Dummy variable female= 1, otherwise= 0
$X_4$= Level of education; if educated= 1, otherwise= 0
$X_5$= Cooperative membership; membership= 1, otherwise= 0
$X_6$= Processors experience (in years)
$X_7$= Marital status; married= 1, otherwise= 0
$e_t$ = the error term

## 3. ANALYTICAL FRAMEWORK

In the analysis of the data for cassava processors, budgetary, resource-use efficiency and stochastic production frontier were employed. Farrell [12] proposition was directed towards the estimation of frontier models of a production technology and obtaining production efficiency measures. The types of model used include non-parametric deterministic models, deterministic full frontier models, stochastic full frontier models and stochastic frontier models. The basic concept of a stochastic frontier production functions as proposed by Aigner et al. [13] was employed in this study. The model is expressed as:

$$In\ Yi = \beta 0 + \beta 1\ In\ X1 + \beta 2\ In\ X2 + \beta 3\ In\ X3 + \beta 4\ In\ X4 + ..... + \beta n\ In\ Xn + e$$

Where:

In = Natural Logarithm
Y= Output

$\beta_0$ = constant term / vector parameter
$\beta_1 - \beta_n$ = coefficient of variables $X_1$-$X_n$
$X_1 - X_n$= vector of inputs
e = Error term

Also, the technical inefficiency effects in the stochastic frontier as indicated above are expressed in terms of various explanatory variables which include the socio-economic characteristics such as gender, age, educational attainment… etc. This is given by:

$V_t = \delta + \delta_1 Z_1 + \delta_2 Z_2 + \ldots\ldots\ldots\ldots\ldots \delta_n Z_n$

Where;

$V_t$ = technical inefficiency
δ = coefficient
$Z_1$- $Z_n$ = socio-economic variables

## 4. RESOURCE USE EFFICIENCY

Resource productivity in agriculture deals with the profitability of resources allocated or how efficiently resources are used. Resource allocation methods can be used for policies of government and labour shift based on whether there is over-utilization on under-utilization of resources. An appropriate function is chosen and marginal physical productivity (MPP) is calculated and when this is multiplied by product unit price, marginal value products (MVP) results. This is eventually compared to the unit price of input. Equality signifies optimum or efficient allocation of inputs. This is shown as:

$$MVP_{xi} = MPP_{xi}.P_y$$

Where:

$P_x$= Unit price of input
$P_y$ =Price of output

If we assume an implicit function as follows:

$Y= f (x_1, x_2, x_3, x_4, x_5, u)$

The explicit forms can be shown in various functional forms as follows:

Linear: $Y_1 = b_0 + b_1x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 +u$
Semi-log: $Y_1 = b_0 +b_1\ln x_1 +b_2\ln x_2 + b_3\ln x_3 + b_4\ln x_4 + b_5\ln x_5 + u$
Double-log: $\ln Y_1 = b_0 +b_1\ln x_1 +b_2\ln x_2 + b_3\ln x_3 + b_4\ln x_4 + b_5\ln x_5 + u$

From the above functional forms, the MPPs can be derived as follows:

In linear form: $MPPxi = b_i$
In semi-log form: $MPPxi = b_i / X_i$
In double log form: $MPP_{xi} = b_i.Y / X_i$
$MVP_{xi} = MPP_{xi}.P_y$

Where:

$P_x$= Unit price of Input.
$P_y$= Price of Output.
$b_i$= Estimate of Regression Coefficient.
Y = Output
$X_i$ = The varying inputs

This thus implies that:

When:

$MVP_{xi} > P_{xi}$ it is under-utilization of resources;
$MVP_{xi} = P_{xi}$ it is optimum use of resources;
$MVP_{xi} < P_{xi}$ it is over-utilization of resources.

## 5. GROSS INCOME ANALYSIS

The gross income analysis was used to compute the difference in terms of costs and benefits, and hence determine the profitability of the enterprise. Thus, subtracting direct costs incurred in the production of the good sold from the revenue gave the gross income. The profitability technique can be expressed as:

NFI = GFI less TC
GM =GFI lessTVC

where:

NFI = Net farm income in Naira
GM =Gross Margin expressed in Naira.
GFI = Gross farm income (P.Q) in Naira.
P = Price per unit of output in Naira.
Q = Total output in Kg.
TC = Total cost of production (TVC +TFC) in Naira.
TVC = Total Variable cost in Naira.
TFC = Total Fixed cost in Naira.

## 6. RETURNS ON INVESTMENT (ROI) MODEL

This analysis is used to determine the amount of profit made when one Naira (₦1.00) is spent on cassava processing. It is the ratio of Gross Margin to the Total Cost of production. The bigger it is, the better the profit made on gari and fufu products.

It is given as:

$$ROI = \frac{G.M.}{T.C.}$$

Where:
G.M. = Gross margin expressed in Naira
T.C. = Total cost in Naira

Results obtained from the application of this model are used for comparative analyses between the processors in terms of profitability of investment.

## 7. EMPIRICAL RESULTS

The socio-economic characteristics of the cassava processors as presented in Table 1 shows that both male and female ventured into gari and fufu products but more females were into cassava processing than males. This might be connected to the fact that most males were more into cassava farming than to full time cassava processing in the study areas. It also revealed that 46.8% and 52.8% of gari and fufu processors respectively had at least the primary education while 19.2% and 13.2% of the gari and fufu processors had no formal education respectively. Education is considered highly necessary in the adoption of new technology and the various technical operations involved in the use of mechanized systems. Marital information revealed that gari (78.7%) and fufu (79.2%) processors were married. This is hoped to have positive impact since it gives opportunity for processors to use their household members labour in the peak periods of processing when hired labour tends to be scarce. A higher percentage of cassava processors did not belong to any cooperative association since, according to them; they did not benefit from the advantages derivable from membership of such associations as members in the past and consequently had to pull out a few years back. (See Table 1).

**Table 1. Socio-economic characteristics of gari and fufu processors in Ogun State**

| Processors | Gari | | Fufu | |
|---|---|---|---|---|
| Variable | Frequencies | Percentages | Frequencies | Percentages |
| Gender | | | | |
| Male | 1 | 2.1 | 1 | 1.9 |
| Female | 46 | 97.9 | 52 | 98.1 |
| Age(in years) | | | | |
| Less than30 | 2 | 4.3 | 8 | 15.1 |
| 31-40 | 17 | 36.2 | 21 | 39.6 |
| 41-50 | 24 | 51.1 | 15 | 28.3 |
| 51-60 | 4 | 8.5 | 5 | 9.4 |
| Greater than 60 | 0 | 0 | 4 | 7.6 |
| Marital status | | | | |
| Married (1) | 45 | 95.7 | 46 | 86.7 |
| Not married (0) | 2 | 4.3 | 7 | 13.2 |
| Membership of Cooperative Associations | | | | |
| Member (1) | 11 | 23.4 | 11 | 20.8 |
| Non member (0) | 36 | 76.6 | 42 | 79.2 |
| Education | | | | |
| Had some (1) | 38 | 80.8 | 46 | 86.8 |
| Had none(0) | 9 | 19.2 | 7 | 13.2 |

The results obtained from the analyses of data using the stochastic frontier package for fufu and gari processing are shown in Tables 2 and 3. The stochastic production coefficient revealed that the quantity of cassava tubers (kg), costs of hired labour, transportation and packaging were statistically significant ($P<0.05$) for fufu processing. This implies that the inputs had significant influence on the total output (the dependent variable) of fufu products. In quantitative terms, a unit percentage increase in quantity of cassava tubers (kg) processed will bring about 0.75 percent increase in the quantity of processed fufu products (kg). The negative costs of hired labour (-0.11) and packaging (-0.007) indicated that an additional Naira invested on hired labour and packaging had the tendency of lowering the processors' revenue by 0.11 and 0.007 percent respectively. For gari processing, the stochastic production coefficient revealed that the hired labour used was positive and significant ($P<0.01$) while the coefficient of packaging cost (₦) was also statistically significant but negative at 10 percent level. This implies that a one percent increase in hired labour used (₦) will result to 0.01percent increase in the quantity (kg) of processed gari products.

The positive coefficients of transportation costs for both fufu (0.072) and gari (0.018) tend to suggest their capabilities for enhancement in the processors' revenue. This is expected since in the circumstances of the processors in the current study, transportation is a means of value addition in space. Farm gate prices are lower than the city market prices for fufu and gari and the increased price more than compensates for the transport costs incurred.

The coefficients of packaging costs for fufu ($P<0.01$) and gari ($P<0.10$) were significant but negative. This tends to suggest the non-necessity of packaging for these products because of the revenue lowering effect of the practice.

As shown in Table 4, the estimated coefficients are 0.002, 0.375, and 2.14 respectively for the quantity of cassava tubers, age and marital status of fufu processors. They were positive and statistically significant at 1 percent level. This implied that a unit increase in each of these technical factors would bring about 0.002, 0.375, and 2.14 increases in the level of technical inefficiency. The coefficients of gender grouping (-3.36), level of education (-0.27), cooperative membership (-0.58), and processors experience (-0.02) were negatively related to technical inefficiency. The negative values of estimated coefficients of education, gender, cooperative membership and processing experience variables were suggestive of their enhancement capability to bring about decrease in inefficiency of fufu processors. This shows that improvements in educational attainment, gender, cooperative membership and processing experience of fufu processors could potentially lead to decreased technical inefficiency. The estimated coefficient of marital status (2.14) was positively related to technical inefficiency. This implies that married people who have large household size reduced the efficiency of the processors. This is so because large household size potentially constitutes a drain on the resources of the processors.

The estimates for gari processors as shown in Table 5 gave the estimated coefficient of quantity of cassava tubers as negative and statistically significant at 1 percent level; the value is 0.0045. This implied that 1 unit decrease in technical factors will bring about 0.0045 increases in technical inefficiency. The coefficients of cooperative membership (-0.0369) and processors experience (-0.0011) are both negatively related to technical inefficiency.

The negative estimates observed for the coefficients of cooperative membership and processors experience variables implied that enhancement of those variables could bring about a meltdown in the level of the currently observed technical inefficiency of the gari processors. The estimated coefficients of age, gender, level of education and marital status were positively related to technical inefficiency. This implied that older people had reduced efficiency. This is so because with advancing age, there is the tendency for the weakening of strength for strenuous job as entailed in gari processing. Increased level of education may not be in favour of processors staying long on the job since such individuals would prefer other more remunerative and less strenuous jobs available in the urban or sub-urban centres. The observation on gender here is as a result of fewer processors (mostly females) of gari than fufu in the study area.

The Technical Efficiency model Estimation results derived from the fitted stochastic frontier model for the processors of fufu and gari gave results as shown in Tables 4 and 5.

**Table 2. Maximum likelihood parameter estimates of stochastic production frontier (fufu)**

| Variables | Parameter | Coefficients | Standard error | t-ratio |
|---|---|---|---|---|
| Constant | $b_0$ | -1.043 | 0.0050 | -225.5*** |
| Quantity of cassava tubers (kg) | $b_1$ | 0.750 | 0.0024 | 315.2*** |
| Hired labour (₦) | $b_2$ | -0.110 | 0.0025 | -43.1*** |
| Transportation cost(₦) | $b_3$ | 0.072 | 0.0006 | 129.4*** |
| Packaging cost(₦) | $b_4$ | -0.007 | 0.0004 | -17.3*** |
| Sigma-square | Σ | 1.42 | 0.2204 | 6.5*** |
| Gamma | Γ | 0.999 | 0.0363 | 27.54*** |

*Log likelihood function = -39.68; Statistical significance: ***1%; ** 5%; *10%*

**Table 3. Maximum likelihood parameter estimates of stochastic production frontier (gari)**

| Variables | Parameter | Coefficients | Standard error | t-ratio |
|---|---|---|---|---|
| Constant | $b_0$ | 6.143 | 0.132 | 46.484*** |
| Quantity of cassava tubers(kg) | $b_1$ | -0.007 | 0.012 | -0.596 |
| Hired labour (₦) | $b_2$ | 0.014 | 0.004 | 3.639*** |
| Transportation cost(₦) | $b_3$ | 0.018 | 0.018 | 0.986 |
| Packaging cost(₦) | $b_4$ | -0.016 | 0.0085 | -1.890* |
| Sigma-square | Σ | 0.0092 | 0.0021 | 4.296*** |
| Gamma | Γ | 0.7966 | 0.0858 | 9.287*** |

*Log likelihood function = 56.67; Statistical significance: ***1%; ** 5%; *10%*

**Table 4. Technical efficiency model estimation of fufu processors**

| Variables | Coefficients | Standard error | t-ratio |
|---|---|---|---|
| Constant | 36.15 | | |
| Quantity of cassava tubers (kg) | 0.002 | 0.0009 | 1.87* |
| Age (years) | 0.375 | 0.1714 | 2.19** |
| Gender (dummy) | -3.365 | 0.8902 | -3.78*** |
| Level of education (dummy) | -0.276 | 0.6257 | -0.44 |
| Cooperative membership (dummy) | -0.580 | 0.5944 | -0.98 |
| Processors experience (years) | -0.019 | 0.0216 | -0.86 |
| Marital status (dummy) | 2.144 | 0.8806 | 2.43** |

*Mean technical efficiency for fufu processors = 0.59; Statistical significance: ***1%; ** 5%; *10%*

**Table 5. Technical efficiency model estimation by gari processors**

| Variables | Coefficients | Standard error | t-ratio |
|---|---|---|---|
| Constant | 1.68 | | |
| Quantity of cassava tubers (kg) | -0.0045 | 0.0002 | -23.05*** |
| Age (years) | 0.0465 | 0.0409 | 1.14 |
| Gender(dummy) | 0.0280 | 0.1571 | 0.18 |
| Level of education (dummy) | 0.0997 | 0.0538 | 1.85* |
| Cooperative membership (dummy) | -0.0369 | 0.0528 | -0.70 |
| Processors experience (years) | -0.0011 | 0.0037 | -0.30 |
| Marital status (dummy) | 0.0809 | 0.0951 | 0.85 |

*Statistical significance: ***1%; ** 5%; *10%. Mean technical efficiency for gari processors = 0.45*

The result obtained from budgetary analysis is shown in Table 6. As at the time of this study, the average price of raw cassava tubers was ₦16.00 per kilogramme while those of processed gari and fufu were ₦115.40 and ₦109.10 per kilogramme weight respectively. The three indices used to compare the economic performance in terms of profitability of fufu and gari processing were all in favour of fufu. The net benefit of the fufu processing was more than double that of gari processing in the study area. The major items of costs were those of raw materials (cassava tubers) and processing. Gari processing entailed larger quantities of cassava tubers and processing costs than fufu. The costs of additional operations of grating and pressing, firewood and frying made the cost of gari processing much higher than that of fufu. Although the value of processed gari per measure was higher than that of fufu, this could not at all compensate for the additional costs of processing the former over the latter. It could also be observed that fufu products required additional costs for transportation and packaging prior to marketing while in most cases gari processors stayed in situ and customers/consumers came to their processing site to purchase the products. However, at times when there was low patronage, gari products too needed to be packaged and transported to the markets for sale and these further reduced the realizable profit by gari processors.

In order to provide a clear interpretation of the production behaviour of the processors and their resource use pattern, three estimates derived from the fitted production function were used. They were elasticity, marginal physical product (MPP) and marginal value product (MVP). These estimates are shown in Tables 7 and 8.

**Table 6. Budgetary analysis (average per processor) per month**

| Gari | Amount (₦) | Fufu item | Amount (₦) |
|---|---|---|---|
| Total revenue | 230,400 | Total revenue | 179,200 |
| Raw tubers | 192,000 | Raw tubers | 128,000 |
| Labour | 4,800 | Labour | 4,480 |
| Grating and pressing | 9,600 | Transportation | 400 |
| Firewood and Frying works | 4,000 | Packaging | 1,500 |
| Total variable cost | 210,400 | Total Variable Cost | 134,380 |
| Total fixed cost | 508.4 | Total fixed cost | 837.47 |
| Total Cost (TVC + TFC) | 210,908.4 | Total Cost (TVC + TFC) | 135,217.47 |
| Net Return (TR – TC) | 19,491.6 | Net Return (TR – TC) | 43,982.53 |
| Gross Margin (TR –TVC) | 20,000 | Gross Margin (TR –TVC) | 44,820 |
| Return per Naira (₦) Invested | 0.10 | Return per Naira (₦) Invested | 0.33 |

**Table 7. Estimation of resource use efficiency in gari processing**

| Resource use | MPP= $b_i$ | $P_x$ | $P_y$ | MVP=$MPP_x.P_y$ | MVP/ MFC | Decision |
|---|---|---|---|---|---|---|
| Cassava tubers (₦) | 0.358 | 106.38 | 36.17 | 12.95 | 0.12 | Over utilization |
| Labour cost(₦) | 0.688 | 150 | 36.17 | 24.89 | 0.17 | Over utilization |
| Transportation cost(₦) | -0.069 | 700 | 36.17 | -2.50 | -0.00 | Over utilization |

**Table 8. Estimation of resource use efficiency in fufu processing**

| Resource use | MPP= $b_i$ | $P_x$ | $P_y$ | MVP= $MPP_x. P_y$ | MVP/MFC | Decision |
|---|---|---|---|---|---|---|
| Cassava tubers (₦) | 0.026 | 37.74 | 60.38 | 1.57 | 0.04 | Over utilization |
| Labour cost(₦) | -0.11 | 50 | 60.38 | -6.64 | -0.13 | Over utilization |
| Transportation cost(₦) | 0.006 | 50 | 60.38 | 0.36 | 0.00 | Over utilization |

Where,

MPP= Marginal Physical Product (Coefficient of variable ‘x’)
$P_x$= Price per unit of inputs (₦)
$P_y$= Price per unit of the processed output (₦)
MVP= Marginal Value Product
MFC= Marginal Factor Cost ($P_x$)

As evident from observations in Tables 7 and 8, none of the inputs used by cassava processors for processing was efficiently utilized in Ogun State. The ratio of marginal value product of inputs to input prices being less than one in all cases indicated that these variables were highly over utilized. It also indicated that the resources were not optimally allocated in the study areas. The implication is that production may be enhanced by reducing the costs of these inputs. For increased efficiency in the level of resources used in cassava processing in the study area, there is the need to decrease the quantity of inputs used by the amount of their deviations.

## 8. CONCLUSION

The ratio of marginal value product of inputs to input prices less than one in all cases indicated that the variables were highly over utilized. This indicates that production may be enhanced by reducing the costs of inputs. This can partially be resolved if there is mass production of cassava tubers that will force down its price. Also an economic policy towards stabilization of prices of resource inputs is highly necessary. The results of the profitability analysis of cassava processing in the study areas showed that fufu processing was more profitable than gari. Factors such as high cost of transportation and raw cassava tubers were the most critical factors inhibiting profitability of gari and fufu processing.

The result of the determinants of production shows that transportation cost, quantity of cassava tubers (kg) and labour used had significant influence on the total output of gari. The negative coefficient of transportation cost shows that processors were spending more on transportation due to unregulated fares payable on haulage. The results of the determinants of fufu net return showed that the coefficient of cassava tubers was positive and significant in relation to the net return.

The mean technical efficiency index for the entire fufu and gari respondents were 0.59 and 0.45 respectively. The implication of this is that the mean technical efficiency of fufu can be increased by 41percent while that of gari can be increased by 55 percent through better use of available resources to increase their productivity.

Based on the findings of this study, the following recommendations are suggested: In order to accelerate the net returns in cassava processing in the state, governments should build linkage roads in the areas where they do not exist and maintain existing ones for easy access to raw cassava tubers. There should be regulated transportation fares in order to reduce transportation cost thereby boosting the revenue of the processors. Governments and Non-Governmental organizations' should invest more on cassava production to reduce the scarcity of cassava tuber and also to enhance cassava processing in the country.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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