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Efficiency Consideration among Selected Small and Medium Scale Enterprises in Ogbomoso Agricultural Zone of Oyo State, Nigeria

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This study investigates the efficiency of selected small and medium scale enterprises in Ogbomosho agricultural zone of Oyo state using cross sectional data randomly collected from 70 micro- enterprises selected from block making Sawmilling, Poultry, Poultry Feed- mill, Sachet water, Charcoal- making and Bakery enterprises. Stochastic Frontier Analysis was employed to examine the efficiency level of the firms. The level of education of enterprise owners, age of business and level of investment into the businesses were found to be major determinants of the level of efficiency of the sampled micro-enterprises. The estimates obtained from the frontier production indicate that the firms were generally inefficient with wide variation in technical efficiencies found within and across firm groups. The wide variation in the level of efficiency is an indication that there is ample opportunity for these enterprises to raise their level of efficiency. Policies that improve the process of industry specific technological adoption via education and increased in level of investment into the micro-enterprises will help move the enterprises towards the efficiency frontier.

Keywords: Microenterprises, Technical Efficiency, Stochastic Frontier, Maximum likelihood

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INTRODUCTION

Prior to the 1960s, many economists attributed the continuous existence of small-scale enterprises in developing countries to lack of capital and entrepreneurial skills to manage large-scale businesses. However, economists began changing their perception in the mid-1960s when new approaches to Small and Medium-sized Enterprises (SMEs) development started to emerge due to three main factors. First, there were increasing concerns over low employment in large enterprises, especially regarding the policies that could not ensure absorption of rapidly increasing labour force. Second, there were concerns that the benefits of economic growth were not being equitably distributed partly due to the large-scale capital intensive enterprises. Third, empirical studies revealed that the causes of poverty were not limited to unemployment, because most of the poor people were employed in a large variety of small-scale low productivity activities (Ekpenyong and Nyong, 1992).

Recently there has been growing assertion that the earlier emphasis on large-scale enterprises in developing countries had minimum success in generating employment, economic growth and alleviating poverty (Rosenzweig, 1988). For this reason, many began to believe that providing a suitable macroeconomic environment that enhances the *self-development* of small and medium-sized enterprises is an effective way of stimulating growth and equity. Studies on industrial development of many countries have shown that small and micro-enterprises constitute an integral part of the over-all industrial sector and play an active and significant role in the growth and development of these countries. These enterprises contribute significantly to employment generation and output growth of different countries of which Nigeria was not an exception.

A number of studies reveal that the contribution of SMEs to economic growth and GDP is quite substantial. For instance, it is estimated that SMEs contribute 50% of Bangladesh's industrial GDP and provide about 82% of the total industrial employment. Also, in India and Pakistan SMEs contribute about 30% of the GDP (Economic Survey of Pakistan 2008-09). In South Africa, SMEs account for 56% of private sector employment and 36% of the GDP (Ntsika, 2002).

In spite of these contributions of the SMEs to the economy of the aforementioned countries and many more, SMEs especially in Nigeria continue to encounter various challenges which are unique to the SMEs sub- sector in almost all developing countries' economies. These challenges include but not limited to, managerial competence, ease of access to finance or credit, right and timely investment in information and communication technology, government policy, access to markets, inadequate infrastructure, corruption and crime. These challenges really have kept the SMEs contributions below their real potential because of the numerous growth obstacles and challenges they face.

The efficiency of an enterprise is measured by the ability to produce output with minimum cost or making maximum profit. The issue of technical efficiency (TE) was first introduced by Kumbhakar and Lovell (2000), who stipulated that efficiency is the decision-making ability to produce to get the maximum output from a set of input (output oriented) or to produce output using the lowest amount of input (input oriented). According to Greene (1993), the level of TE of a firm can be characterized by the relationship between the present and potential level of production.

Although there have been many studies on technical efficiency, there are very few firm-level studies of efficiency in the developing economies, especially Nigeria. Many of the studies that currently exist are macro in nature and generally rely on multi-country or cross-country data rather firm-level survey data. Therefore, policy formulation has been hampered by a lack of relevant empirical studies at firm level. The policy question therefore is what the firms' current levels of efficiency are and what factors influence these levels?

The relevance of this study lies in the fact that it makes an important contribution to the literature in this field as it underscores not only the status of efficiency of SMEs in Nigeria but also unearths important sources of inefficiency in Nigeria's SMEs. The focus of this study therefore is to estimate the current level of technical, as well as the factors that influence the level of efficiency of these microenterprises. The selected Nigerian small and medium scale enterprises this study is assessing are: block making, sawmilling, poultry, feed mill, pure water, and charcoal selling and bakery enterprises. It investigates SMEs' efficiency in Nigeria taking into account the fact that within the limits of scare resources and constrained environment in which the SMEs operate, any misallocation of available resources is capable of precipitating an important economic problem that deserves to be studied. The outcome of the study would serve as a guide to public policy design and implementation. It is thus important to understand clearly the factors that are responsible for efficiency differentials at individual firm levels.

The rest of the study is organized as follows: the next section treats a brief theoretical and empirical framework on technical efficiency. After literature review, the paper discusses the research methodology, presentation of estimated results and its interpretation. Finally, it presents the summary, key conclusions and policy recommendation from the study.

METHODOLOGICAL AND EMPIRICAL FRAMEWORK

Methodological Framework

Farrell (1957) was the first to measure the productive efficiency in terms of frontiers. He opined that economic efficiency should be divided into (a) Technical Efficiency (AE), which measures the ability of a firm to maximize output using a given amount of input; and (b) Allocative efficiency (AE), which measures the ability of firms to use inputs at optimal proportions at a given price to produce certain level of output. The measurement of production frontier and efficiency can be classified into two groups:

a) non- parametric model, known as the *Data Envelopment Analysis* (DEA) developed by Farrell (1957) and Charnes et al. (1978);
b) and b) Parametric model known as Stochastic *Frontier Analysis* (SFA) which was developed by Aigner et al. (1977); Meeusen and Van den Broeck (1977).

Farrell (1957) defines TE as the production of output in relation to certain fixed inputs. Farrell (1957), as the pioneer of efficiency measurement, characterized several instances of how production can be inefficient. Normally, the stochastic production frontier model is used to estimate the TE. The estimated model is often based upon the Cobb-Douglas or translog production function. The present study uses a cob-Douglas production function to analyse the production frontier.

The stochastic frontier model was simultaneously proposed by Aigner *et al.* (1977) and by Meeusen and van den Broeck (1977). Contrary to a deterministic model, it includes a random term representing the noises.
The model for the i-th farm is written as follows:

$$\ln(y_i) = f(x_i, \beta) + v_i - u_i \qquad (1)$$

where

y_i is the observed output quantity of the i-th farm;
f is the production function;
x_i is a vector of the input quantities used by the farm;
□□□is a vector of parameters to be estimated;
v_i is an error term, independent and identically distributed (iid) with N(0, σ_v^2);
u_i is a non-negative random term, accounting for inefficiency iid, with N(μ_i,□$_u^2$), truncated to zero to ensure non-negativeness.

The technical efficiency of the i-th farm is given by $TE_i = \exp(-u_i)$ and has a value between 0 and 1, with 1 defining a technically efficient farm. Since only the difference between both random terms $w_i = v_i - u_i$ can be observed, u_i is predicted by its conditional expectation given the estimated value of w_i: E[$u_i|w_i$] (Coelli *et al.*, 1998). The conditional distribution of $u_i|w_i$ is that of a truncated N(μ_i^*,□□2), where μ_i^*=(w_i□$_u^2$-μ_i□$_v^2$)/□□$_u^2$+□$_v^2$) and □□2=□$_u^2$□$_v^2$/(□$_u^2$+□$_v^2$) (Jondrow *et al.*, 1982). The technical inefficiency effects u_i are frequently estimated in a first step and the determinants of inefficiency are obtained in a second-stage regression. However, this can induce both bias and inefficiency in the estimates. Therefore, inefficiency effects are simultaneously conditioned on several specific factors and estimated using the parameterisation (Battese and Coelli, 1995):

$$\mu_i = \delta_0 + z_i\delta \qquad (2)$$

Where

z_i is a vector of observable explanatory variables;
□$_0$ and □ are respectively a parameter and a vector of parameters to be estimated.

METHODOLOGY

Study Area

The study was carried out in Ogbomoso North Local government area of Oyo State. The local government is strategically sited in the Savannah belt in the north-eastern part of Oyo state. It occupies a land area of 246,641.65Hectares. The people in this local government are predominantly farmers who engaged in subsistence farming, cultivating crops like yam, cassava, maize, guinea corn etc. Apart from these, the indigenes also practice animal husbandry and plays significant roles in the area of commerce and industry. A larger percentage of the population owns and works in microenterprise industries.

Data for the Study

Data for this study were primary data on the inputs and outputs of selected micro-enterprise. Structured questionnaires were administered to collect the necessary data. The micro-enterprises of interest in this study are block -making, Sawmill, Pure water, Bakery, Charcoal Sellers, Feed mill and Poultry enterprises. Ten respondents from each of these enterprises were randomly selected giving a total number of 70 respondents in all. The selection was done in such a way to include different scales of operation in order to ensure heterogeneity among the sampled firms as well as to allow for analysis across scales of operation. The data included information on physical quantities of production inputs as well as output for each group of firms, along with information on prices of inputs and outputs. To identify factors that influence efficiency, data were collected on factors such as the age of the business owners, the age of the business, level of education of business operators/decision makers. Information was also collected on other aspects such as capital investment.

Analytical Techniques

The Stochastic Frontier Analysis (SFA) was used in analyzing the efficiency of each of the selected micro-enterprise while descriptive statistics, specifically, measures of frequency distributions was used to describe the efficiency distribution of the respondents.

The Stochastic Frontier Model (SFA)

The data obtained were analyzed using the Stochastic Frontier Model, to determine the respondents' level efficiency. A SFA model that incorporates inefficiency factors was adopted in the study using the Maximum Likelihood Estimate method. A generalized likelihood ratio test was also carried out to see if the respondents were efficient or not. The estimating equation for the stochastic production frontier will be specified as

$$\mathrm{LnY_i} = a_o + \sum_{i=1}^{n} \mathrm{a_j LnX_i} + \mathrm{v_i} - \mathrm{u_i} \qquad \ldots\ldots\ldots\ldots (3)$$

Where $\mathrm{Y_i}$ = output for a particular firm (measured in Naira)
a_o and a_j are parameters to be estimated
$\mathrm{X_i}$ are the factors of production used.
V_i is the two-sided normally distributed random error. [$v_i \sim [N(0,\sigma^2)]$].
U_i is the half normal distribution [$u_i \sim [N(0, \sigma^2)]$]. It is also the random variable that accounts for the factors of inefficiency and is assumed to be independently distributed as the truncation of the normal distribution with µ and variance

$$\sigma^2 = \sigma_u^2 \ (N(\mu_i, \sigma_u^2)^2$$

$\mathrm{e} = \mathrm{V_i} - \mathrm{U_i}$ is the composite error term, the deterministic error term of the ordinary production function.
The Maximum Likelihood Estimation (MLE) of equation (3) will provide estimators for a's, the variance parameters: sigma-square (σ^2), gamma (γ) and lambda (λ)

$\sigma^2 = \sigma^2 + \sigma u^2$ ... (4)
$\gamma = \sigma v^2 / \sigma^2$ ... (5)
$\lambda = \sigma v^2 / \sigma u^2$ ... (6)

Where σ^2, σv^2, σu^2 will be the overall variance of the model, variance of the random error, and variance of the technical inefficiencies respectively, γ is gamma and λ is lambda. The parameter gamma (γ) has a value between zero and one (Battese and Tessema, 1993). According to Battese and Corra (1977), gamma (γ) is the total output made on the frontier function which is attributed to technical efficiency. Similarly (1- γ) measures the technical inefficiency of the farms. The parameter lambda (λ) is expected to be greater than one. This condition according to Tadesse and Krishnamoorthy (1997) indicates a good fit for the model and the correctness of the specified distribution assumptions for $\mathrm{V_i}$ *and* $\mathrm{U_i}$.

Given the assumption of the stochastic frontier model, interference about the parameters of the model can be based on the maximum-likelihood estimators because the standard regularity conditions hold. Technical efficiency of an individual's firm is defined in terms of the ratio of the observed output Y_i to the corresponding frontier output Y_i^*, conditional on the levels of inputs used by that firm Battese, (1992). Thus the technical efficiency of a firm is expressed as in equation (7).

$Y_i^* =$ represents the firm-level frontier output which is also represented as $\mathrm{f(X_i;\beta)exp(V_i)}$

$Y_i =$ represents the obtained output and it is the same as $Y_i^* \exp(U_i)$

The efficiency of an individual firm is therefore given as

TE = $\mathrm{TE_i = Y_i}/Y_i^*$ Where, $0 < TE_i < 1$ .... (7)

$$\mathrm{TE_i} = f(X_i;\beta)\mathrm{exp(V_i - U_i)/f(X_i;\beta)exp(V_i)}$$

$$\mathrm{TE_i = exp(-U_i)} \quad \text{.................. (8)}$$

The difference between the observed output Y_i and the frontier output Y_i^* is $\mathrm{U_i}$. When $\mathrm{U_i} = 0$, it means that the firm is technically efficient. However, when $\mathrm{U_i} > 0$ the firm is inefficient since the production will lie below the frontier.

Though more flexible forms (e.g. the trans-log) may be chosen for modeling the frontier agricultural technology, the Cobb-Douglas functional form has wide applicability in the analysis of firm level efficiency in both the developed and undeveloped economies. The approach is also relatively straight forward to implement and interpret (Jeffrey and Xu, 1998).

List of Variables

i. Block-making enterprises

Output

Number of blocks produced

Inputs

No. of loads of working sand (Kilogrammes)
Quantity of cement in (kilograms)
Quantity of water (in litres)
Labour (in man-days)
Total material cost (in naira)
Depreciation on equipment (in naira)

ii. Bread-making firms

Flour (in Kilogrammes)
Quantity of water (litres)
Labour (man-days)
Depreciation on equipments (naira)

iii. Saw- Mill firms

Output

Number of planks processed from logs

Inputs

Total labour (man-days)
Depreciation on equipment (naira)
Material cost (naira)
power costs (naira)

iv. Charcoal-making firms

Output

Charcoal (kilogrammes)

Inputs

Wood (kilogrammes)
Labour (Man-days)
Kerosene (litres)
Depreciation on equipments (naira)

v. Feedmill- firms

Output

Feed (kilogrammes)

Inputs

Material costs (naira)
Power
Labour (man-days)
Depreciation on equipments

vii. Poultry Firms

Output

Birds (in kilogrammes)

Inputs

Feed (kilogrammes)
Labour (man-days)
Total costs (naira)
Depreciation (naira)

Determinants of Technical inefficiency

$\delta_1 =$ Education level of operator/decision maker
$\delta_2 =$ Number of employees
$\delta_3 =$ Level of investment
$\delta_4 =$ Age of operator
$\delta_5 =$ Age of business

RESULTS AND DISCUSSIONS

Maximum Likelihood Estimates of the Frontier Production Functions

The coefficients of the variables are of utmost importance in the output of any research work. These, coefficients represent percentage change in the dependent variables as a result of percentage change in the independent variables. The results of each of the enterprises are hereby discussed.

For the block-making industry, Table 1 shows that the coefficients of cement, water, and labour are positive and statistically significant at 5%. This suggests that any increase in these variables would lead to an increase in the output; hence an increase revenue in the block making industry.

For the bread-making industry; the quantity of flour use and the amount of labour employed in bread production are the most important determinants of bread production. Both factors are significant at 1%. The quantities of flour used have negative but significant coefficients of -4.405 and -0.221 respectively. This negative sign might be a result of wastage on the part of the management. Depreciation on assets which represents fixed costs has a positive but insignificant coefficient of 0.228. The study suggests there should be a sound quality control, monitoring and evaluation system in place.

For the charcoal production enterprise; the parameter for quantity of wood used in charcoal production has positive coefficient values of 0.457. This means that a percentage increase in value of this variable will increase charcoal output by 45.7% and it is significant at 5%. The result suggests that quantity of wood used in charcoal production will significantly increase charcoal production if properly harnessed in the production process.

The results for the poultry feed-mill enterprise show that all the parameters considered in the feed mill industry have positive and significant coefficients. This implies that any increase in these variables leads to an increase in the feed output. Materials used in feed mill compounding, power and labour are all significant at 5%.

In the poultry production enterprise, the coefficient of feed has a positive and significant coefficient of 0.665. Labour employed in poultry production has a negative and significant coefficient of -0.139. The negative coefficient of the labour in poultry production could be due inexperience of the employed labourers. This therefore calls for extreme caution on the part of the business managers as the negative and significant value of labour could lead to very significant economic loss in the enterprise.

In pure water production enterprise, as show in the table 1; labour and electric power are the significant determinants of pure water production. Both variables have coefficient of 0.210 and 0.605 respectively and are also significant at 5% and 1% respectively.

In the sawmill enterprise, as show in the table 1 below; labour and materials used in planks production are the significant determinants of planks production. Both variables have coefficient of 0.218 and 0.601 respectively and are also significant at 5% and 10% respectively.

Determinations of Technical Inefficiency

In the analysis of the determinants of inefficiency, the computed technical efficiency is modelled to depend on some identified variables. The coefficients with their corresponding t- statistics of the estimated models are presented in the following.

For the block- making enterprises, age of business and age of operator are significant at 10% level, Level of investment also have negative and significant coefficients. While the age of operator and level of investment have the expected negative sign, the age of business does not. The result suggests that inefficiency in the block- making industry decreases with the increases in age of operators and level of investment.

All the parameters of determinants of technical inefficiency for bread- making enterprises were significant at 5% level with the expected negative sign except for the age of the operator which is also significant at 5% but have a positive sign to it. The result suggests that in the bread production enterprise, efficiency is significantly boosted by the level of investments, age of business, education level of the operator as well as their marital status.

In the charcoal production enterprise, all the parameters of determinants of technical inefficiency for enterprise were significantly different from zero. However, only the age of the operator, age of business and level of investment into the business have the expected negative sign

For the poultry feed- mill enterprise; it was the age of business, level of education and level of investment into the business have the expected negative sign. These parameters are also significantly different from zero. Level of investment is expected to have the negative sign and significant parameter. Efficiency in an enterprise like this is expected to increase and funding increase especially when the experience is also good.

In the poultry enterprises however, age of business and level of investment are the variables with expected negative and significant coefficients. This implies that as the level of investments and age of the business increases, efficiency of the business is expected to increase. Experience is expected to increase with increase in the age of the business and this is a major factor in poultry production. Inexperience in the poultry industry will lead to inexperience and consequently large economic losses.

In the pure water industry, only the age of business and level of investments have the expected negative and significant coefficients. This suggests that it is only these two coefficients that significantly reduce inefficiency in the industry.

For the Saw mill enterprises, the level investment, age of business and level of education have the expected negative and significant parameters. The coefficients expectedly reduces inefficiency in the industry.

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Distribution of Technical Efficiency Block making Enterprise

Table 3 shows the distribution of the technical efficiency of the respondents.

Block-making industry

The table reveals that 50% of the respondents in this industry have efficiency distribution values of between 0.2- 0.49 while 40 % have technical efficiency value of 0.8-1.0. The mean technical efficiency of block making industry is 0.604 which implies that block-making firms in the study area are inefficient.

Bakery industry

The efficiency distribution of the bakers in the study area is shown in table 3. The table reveals that 80% of the bakers in the bakery industry have an efficiency level of between 0.8 - 1.0 while the 20% have technical efficiency is between 0.5-0.79. Meanwhile the mean technical efficiency of the industry is 0.87 and it shows that the bread-making industry is inefficient.

Charcoal making enterprise

For the charcoal producers in the study area, 90% of the respondents have technical efficiencies values of between 0.8 - 1.0, none of the respondents have technical efficiency values of between 0.2 - 0.49 while the remaining 10% have technical efficiency values of between 0.5- 0.79. Meanwhile the Technical efficiency of an average charcoal maker in the study area is 0.92 which implies that the charcoal makers are technically inefficient.

Poultry Feed-mill Industry

The frequency distribution of the technical efficiencies of poultry feed-millers show that 50% of the respondents have technical efficiencies of between 0.2 - 0.49 while another 50 % have technical efficiency values of between 0.5 - 0.79. The mean Technical efficiency is 0.561. The poultry feed- mill industry is inefficient in the study area as the table shows.

Poultry Farmers

From table 3, the efficiency distribution of the poultry farmers show that 60% of the surveyed poultry farmers in the study area have a technical efficiency values of between 0.8 - 1.0 while 30% have technical efficiency values of between 0.5 - 0.79. The mean technical efficiency of the industry is 0.788. This shows that, the poultry farmers are operating below the efficiency line.

Pure Water Industry

The pure water industry in the study areas as the table below shows is inefficient. The table show that 50% of the respondents have a Technical efficiency of between 0.5 - 0.79 while another 50% have a T.E between 0.8 - 1.0. The Technical efficiency for an average pure water manufacturer in the study area is 0.78.

Saw Mill industries

Table 3 shows that all the saw millers have a technical efficiency distribution of between 0.8 - 1.0. The means technical efficiency is 0.928. The respondents in the study area are near to efficiency.

CONCLUSION AND POLICY RECOMMENDATIONS

Conclusion

The study observed that the technical efficiency of the various microenterprises varied widely due to the inefficiency factors. The wide variation in the level of efficiencies indicates that there are ample opportunities for these micro-enterprises to raise their level of efficiencies. Age of business, level of education and level of investment were observed to significantly increase the efficiency level in each of the selected firms in the study area. Operators in these industries should therefore pay attention to these factors as they in addition with other identified factors of production in each of the firms will help each of the firms move towards the efficiency frontier.

Table 1: Determinants of Technical Efficiency among Selected Firms			
Determinants of efficiency in Block-making Firms			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	Bo	-1.633	-1.52
L_n (workink sand)	β1	-1.222	-0.443
L_n (cement)	β_2	0.057	2.003**
L_n (water)	β_3	2.052	1.713*
L_n (labour)	β_4	2.839	2.332**
Ln(Total cost)	β_5	-4.501	1.332
Ln(Depreciation)	β_6	-0.032	0.002
Variance ratio	Γ	3.55	2.215**
Total variance	γ^2	0.0074	1.332
Log likelihood function		9.33	
Determinants of efficiency in Bread-making Firms			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	Bo	0.383	0.542
L_n (flour)	Bi	-4.405	38.304***
L_n (water)	β_2	-0.221	-1.339
L_n (labour)	β_3	0.901	18.770***
L_n (dep)	β_4	0.228	1.285
Variance ratio	Γ	1.000	51.282***
Total variance	γ^2	0.010	4.000***
Log likelihood		0.167	
Determinants of efficiency in charcoal selling enterprise			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	Bo	0.451	0.451
L_n(Wood)	Bi	0.457	2.507**
L_n (labour)	β_2	-0.152	2.172**
L_n (Kero)	β_3	0.453	0.884
L_n (Dep)	β_4	-0.288	0.314
Variance ration	Γ	0.850	0.850
Total variance	γ^2	0.017	0.024
Log likelihood function		0.12	
Determinants of efficiency in Feed- mill Firms			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	Bo	-0.301	-1.205
L_n(Materials used)	βi	0.772 *	3.662***
L_n (Power)	β_2	0.130	2.362**
L_n (labour)	β_3	0072	2.175**
L_n (Dep)	β_4	0.031	0.211
Variance ratio	Γ	0.458	0.288
Total Variance	γ^2	0.012	0.131
Log likelihood function.		0.851	

Table 1. (Continued)

Determinants of efficiency in Poultry Firms			
Variable	Parameter	Coefficient	**T – value**
Constant	Bo	0.579	0.615
Ln(feed)	βi	0.665	2.100**
L_n (water)	β_2	-0.143	0.202
L_n (labour)	β_3	-0.139	-2.435**
L_n (TC)	β_4	0.132	0.214
L_n(Dep)	β_5	-0.371	0.552
Variance ratio	Γ	0.836	0.149
Total variance	γ^2	0.089	0.709
Log likelihood Function		0.142	
Determinants of efficiency in Pure-Water Manufacturing Firms			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	Bo	-0.615	0.989
L_n (water)	β,	-0.228	0.154
L_n (chemical)	β_2	0.201	0.283
L_n (power)	β_3	0.210	2.109**
L_n (labour)	β_4	.605*	3.122**
Variance ratio	Γ	0.534	0.278
Total variance	γ^2	0.079	0.097
Log likelihood Function		0.368	
Determinants of efficiency in Saw-Milling Firms			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	Bo	-0.552	0.989
L_n (Depreciation on equipments)	β,	-0.108	0.154
L_n (Power costs)	β_2	0.301	0.299
L_n (Materials costs)	β_3	0.218	2.807**
L_n (labour)	β_4	0.601	1.822**
Variance ratio	Γ	0.534	0.278
Total variance	γ^2	0.079	2.197
Log likelihood Function		0.469	

Source: Computed from field data (2017)

*** indicates significant at 1%; ** indicates significant at 5%; * indicates significant at 10%

Table 2: Determinants of Technical Inefficiency among selected firms

Determinants of Inefficiency in Block-making Firms			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	δ_0	0.717	1.224
Age of operator	δ_1	-10.916	-1.821**
Age of business	δ_2	0.050	1.933**
Marital Status	δ_3	-0.028	1.677
Level of Education	δ_4	-0.010	-1.055
Level of Investment	δ_5	-0.800	-3.112***
Determinants of Inefficiency in Bread-making Enterprise.			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	δ_0	0.001	1.980*

Table 2. (Continued)

Age	δ_1	0.009	2.254**
Age of business	δ_2	-0.012	-2.209**
Marital Status	δ_3	-0.003	-2.867**
Education	δ_4	-0.03	-2.852**
Level of Investment	δ_5	-0.06	-2.278**
Determinants of Inefficiency in Charcoal- making Enterprise.			
Variable	**Parameter**	**Coefficient**	**T – value**
Constant	δ_0	-0.128	1.857*
Age	δ_1	-0.232*	-2.083**
Age of business	δ_2	-0.033	-2.038**
Marital Status	δ_3	0.0029*	2.891**
Education	δ_4	0.023	1.813*
Level of Investment	δ_5	-0.035	-4.015***
Determinants of Inefficiency in Feed- mill firms			
Variable	Parameter	Coefficient	**T – value**
Constant	δ_0	-0.785	-0.108
Age	δ_1	0.011	1.332
Age of business	δ_2	-0.780	-1.921*
Marital Status	δ_3	0.006	1.772*
Education	δ_4	-0.001	-1.805*
Level of Investment	δ_5	-0.002	-1.765*
Determinants of Inefficiency in Poultry enterprises			
Variable	Parameter	Coefficient	**T – value**
Constant	δ_0	-0.022	0.539
Age	δ_1	0.053	1.071
Age of business	δ_2	-0.034	-1.769*
Marital Status	δ_3	-0.046	-0.902
Education	δ_4	0.011	0.014
Level of Investment	δ_5	-0.034	-3.033***
Determinants of Inefficiency in Pure-water firms			
Variables	Parameter	Coefficient	**T – value**
Constant	δ_0	-0.065	-0.105
Age	δ_1	-0.222	-1.383
Age of business	δ_2	-0.438	-2.252**
Marital Status	δ_3	-0.102	-0.114
Education	δ_4	-0.081	-0.090
Level of Investment	δ_5	-0.109	-2.126**
Determinants of Inefficiency in Sawmill firms			
Variables	Parameter	Coefficient	**T – value**
Constant	δ_0	0.8	1.858*
Age	δ_1	-0.035	-2.071**
Age of business	δ_2	-0.066	-1.027
Marital Status	δ_3	0.022	1.022
Education	δ_4	-0.054	-3.011***
Level of Investment	δ_5	-0.119	-2.627**

Source: Computed from field data (2017)

*** indicates significant at 1%; ** indicates significant at 5%; * indicates significant at 10%

Table 3: Technical Efficiency Distributions of Respondents		
Efficiency level	***Frequency***	***Percentage***
0.2 - 0.49	5	50
0.5-0.79	-	10
0.8-1.0	5	40
Total	**10**	**100**
Mean efficiency level = 0.604		
Distribution of Technical efficiency of Bread makers		
Efficient level	***Frequency***	***Percentage***
0.2 - 0.49	-	-
0.5-0.79	3	30
0.8-1.0	7	70
Total	**10**	**100**
Mean TE = 0.87		
Distribution of technical efficiency of charcoal enterprise		
Efficient level	***Frequency***	***Percentage***
0.2-0.49	-	-
0.5-0.79	1	10
0.8-1.0	9	90
Total	**10**	**100**
Mean TE = 0.92		
Distribution of Technical efficiency of feed mill enterprise		
Efficient level	***Frequency***	***Percentage***
0.2-0.49	5	50
0.5-0.79	5	10
0.6-1.0	-	-
Total	**10**	**100**
Mean TE = 0.561		
Distribution of Technical efficiency of poultry enterprise		
Efficient level	***Frequency***	***Percentage***
0.2 - 0.49	1	10
0.5-0.79	3	30
0.8-1.0	6	60
Total	**10**	**100**
Mean TE = 0.788		
Distribution of Technical efficiency of pure water manufacture		
Efficient level	***Frequency***	***Percentage***
0.2-0.49	-	-
0.5-0.79	5	50
0.8-1	5	50
Total	**10**	**100**
Mean TE = 0.78		
Distribution of Technical efficiency of Saw- Milling Firms		
Efficiency level	**Frequency**	**Percentage**
0.2-0.49	-	-
0.5-0.79	-	-

Source: Computed from field data (2017)

REFERENCES

Aigner, D., K. Lovell, and P. Schmidt. (1977). Formulation and estimation of stochastic frontier production function models. J. Econometrics 6:21-37

Battese G.E. and T.J. Coelli, 1995. A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data. Empirical Economics, 20: 325-332.

Battese, G.E. and G.S. Corra (1977), "Estimation of a Production Frontier Model: With Application to the Pastoral Zone of Eastern Australia", Australian Journal of Agricultural Economics, 21, 169-179.

Battese, G. E. and G. A. Tessema (1993): Estimation of stochastic frontier production functions with time-varying parameters and technical efficiencies using panel data from Indian villages. *Agricultural Economics*, 9(4): 313-333

Battese GE (1992). Frontier production function and technical efficiency: A survey of empirical applications in agricultural economics, *Agric. Econ*. 6: 21-37.

Charnes A, Copper, W.W., and E. Rhodes (1978). Measuring the efficiency of decision making units. European J. Oper. Res. 2: 429-444

Coelli, T.J., Prasada R, and G, E, Battese (1998). An introduction to efficiency and productivity analysis. Kluwer Academic Publishers. Boston.

Ekpenyong, D.B.E., and M. O. Nyong (1992). Small and medium-scale enterprises development In Nigeria. Seminar Paper on Economic Policy Research for Policy Design and Management In Nigeria. NCEMA/AEPC, Nigeria, April 24-25.Ekpenyong and Nyong, 1992).

Farrell, M.J. 1957." The measurement of productive efficiency". Journal of the Royal Statistical society, Series A, 120: 253-90.

Xu, X. and Jeffrey, S. R., (1998). Efficiency and technical progress in traditional and modern agriculture: evidence from rice production in China. Agricultural Economics 18 (1998) 157- 165

Jondrow, J., C.A.K. Lovell, I.S. Materov and P. Schmidt, (1982). On the estimation of technical inefficiency in the stochastic frontier production function model, *Journal of Econometrics* 19, 233-238.

Kumbhaker, S. C. and Lovell C. A. K. (2000). Stochastic Frontier Analysis. Cambridge: Cambridge University Press.

Meeusen W, van den Broeck J (1977). Efficiency estimation from Cobb-Douglas production functions with composed error, Int. Econ. Rev. 18: 435-444.

Ntsika Enterprise Promotion Agency (2002). State and Small Business Development in South Africa Annual Rev. [On-line] Available: http://www.ntsika.org.za.

Rosenzweig, Mark R.(1998). "Risk, Implicit Contracts and the Family in Rural Areas of Low-Income Countries." Econ. J. 98 (December 1988): 1148-70.;

Tadesse, B and Krishnamurthy, S. (1997). Technical Efficiency in Paddy Farms of Tamil Nadu: An Analysis Based on Farm Size and Ecological zone. Agricultural Economics 16: 185-192.