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Efficiency and Determinants of Micro/Small Poultry Business Enterprises in Abia State, Nigeria

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The rate of growth of micro/small poultry business enterprises in Nigeria is tremendous and this has attracted the attention of many researchers, especially as it offered the greatest potential for income generation and poverty reduction thereby addressing the millennium development goal and Nigeria's transformation agenda. The potential of this enterprise would not be realized, if the operators were not productive and efficient. This demands a good knowledge of the current efficiency or inefficiency inherent in this fast growing business and the factors responsible for the level of efficiency attained. The study employed descriptive statistics and Trans-log stochastic frontier production function to estimate the technical efficiency. The determinants were estimated jointly with the Trans-log frontier model in a single stage maximum likelihood estimation procedure using Coelli 1995. The results of the frequency distribution of technical efficiency estimates ranges from 0.45 to 0.99. It further showed that about 16% of the business operated at efficiency below 90%. The mean technical efficiency was 92%, which indicates that about 8% increase in output of the business could be achieved in the short run with the existing technology. The most significant determinants of technical efficiency were business, finance, and labour.

Keywords: micro/small poultry business, efficiency, enterprises

Introduction

Rapid economic growth and development may remain a mirage in the third world countries except they pay adequate attention to micro/small business enterprises, especially as it has been observed that basic raw materials expected for stable growth would (Okpara & Whun, 2007) emerge from them. Micro/small businesses in Nigeria are more evenly distributed than larger businesses which are concentrated in urban areas. They check rural—urban migration and generally have small investment requiremenst, quick payback, high employment

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potential and more flexible in adapting to global warming (Kalu, 2011; Mbanasor & Nto, 2007).

Poultry is a broad classification covering various species of domesticated birds that are raised to provide food for human but this study will be restricted to poultry businesses with not more than 49 person on its employment (Holley & Ahmad, 1990). However, the companies and Allied Matters Decree in 1990, defined micro/small business as one with an annual turnover of not more than one million. CBN (2001) defined it as enterprises whose capital investment (including land and working capital) does not exceed five million or whose annual turnover does not exceed 25 million. In view of the difficulties in determining asset base of the enterprises, the definition on number of workers was used.

The micro/small poultry business is growing rapidly in Nigeria, this might not be unconnected with quick returns on invested capital. The Nigerian government has formulated a number of policies and programmes to enhance poultry business in Nigeria. Take for instance 72% of the credit meant for livestock sector was allocated to poultry industries. Despite of this, the growth rate decreased from 3.3% to 2.0% (Mbanasor, 2002).

The efficient utilization of resources has been the greatest concern of economics. Also efficient utilization of productive resources could be determined by factors like government policies, customs and institutions or cultural configuration, cost structures, resource management, and ownership patterns. Several authors have reported that resources are not efficiently utilized or allocated under small scale businesses.

The questions now are do small/micro business actually maximize their output for a given level of inputs and technology? Are there socio-economic factors that limit the managerial ability to maximize output and are the employees able to optimally utilize inputs?

Efficiency is a vital productivity growth as well as stability measures especially in a young economy. In view of the slow growth and increasing instability in business, the outcome of this study will greatly enhance government thinking in the area of micro/small poultry business.

Methodology

The study was carried out in Abia State, Nigeria. It is located in the south-eastern Nigeria. The state has predominantly lowland rain forest vegetation and maintains heavy economic activities especially micro-business (FOS, 1999; World Bank Report, 2000). The State is divided into three agricultural zones namely, Aba, Ohafia, and Umuahia.

A total of 120 micro/small poultry business were chosen from the three agricultural zones. A list of all the micro/small poultry business were compiled by the extension agents from each zone. Thirty micro/small business were randomly selected from each zone, which gave a total of 120 micro/small business the manager/business head was used as the respondents in all the locations.

Analytical Procedures

Descriptive statistics like percentages, means and tables were used. The Cobb-Douglas and transcendental logarithmic functional forms using the stochastic frontier model were used to examine the technical efficiency as well as determinants of technical efficiency.

Model Specification

The functional forms of the model for estimating technical efficiency of Micro Poultry business are :

(1) Cobb-Douglas

$$Lny_1 = Bo + B_1Lnx_1 + B_2Lnx_2 + B_3\ Lnx_3 + B_4\ Lnx_4 + B_5Lnx_5 + V_i - U_i \quad (1)$$

Where

L_n = Natural logarithan;

Y_1 = Output of micro/small poultry business;

X_1 = Labour in Mondays;

X_2 = Quantity of feed used (kg);

X_3 = Quantity of vaccine/drugs;

X_4 = Day old chicks (kg);

X_5 = Value of depreciated assets;

B_o = Intercept;

$B_1 - B_5$ = Coefficients;

$V_i - U_i$ = Efficience factors.

(2) Translog

The translog functional farm took into consideration the interactions between the variables.

$$Lny_1 = B_o + B_1Lnx_1 + B_2Lnx_2 + B_3Lnx_3 + B_4Lnx_4 + B_5Lnx_5 + 0.5B_6Lnx_1^2 + 0.5B_7Lnx^2_2 + 0.5B_8Lnx^2_3 + 0.5B_{10}Lnx^2_4 + 0.5B_9Lnx_5 + 0.5B_{10}Lnx^2_5 + B_{11}Lnx_1Lnx_2 + B_{12}Lnx_1Lnx_3 + B_{13}Lnx_1Lnx_4 + B_{14}Lnx_1Lnx_5 + B_{15}Lnx_2Lnx_3 + B_{16}Lnx_2Lnx_4 + B_{17}Lnx_2Lnx_5 + B_{18}Lnx_3Lnx_4 + B_{19}Lnx_3Lnx_5 + B_{20}Lnx_4Lnx_5 + V_i - Vi \quad (2)$$

Based on the above models in equations (1) and (2), the determinants of Technical efficiency were jointly estimated:

Exp ($-U_i$) defined by

$$\text{Exp}(-U_i) = b_0 + b_1Z_1 + b_2Z_2 + b_3Z_3 + b_4Z_4 + b_5Z_5 + b_6Z_6 + b_7Z_7 + e_1$$

where Exp (-Ui) = efficiency of the *i*th poultry business

Z_1 = age of the business (years);

Z_2 = level of experience of manager (years);

Z_3 = level of education of manager/head (years);

Z_4 = size of the business;

Z_5 = number of workers;

Z_6 = credit use (dummy, 1 for use, otherwise O);

Z_7 = extension contact (dummy, 1 = visit, no-visit = O);

Z_8 = membership of cooperatives, (dummy, 1 for member, O = non-membership).

Results and Discussions

Estimation of Technical Efficiency

The technical efficiency of micro/small poultry business was estimated using the Cobb Douglas and Transcendental logarithmic functional forms of the Stochastic Frontier Model.

The results are presented and discuss as follows:

(1) Estimation of technical efficiency (Cobb-Douglas).

Table 1 depicts the result of maximum likelihood estimation of the Cobb-Douglas Stochastic Frontier Model

for micro/small poultry business enterprises and their levels of significance. The results showed that the variables included in the model. The signs of the coefficients of the Stochastic Frontier Model were positive for labour, day old chicks and value for depreciated assets. This implies that any unit increase in the use of these resources would lead to increase in the output of micro/small poultry business enterprises. This agrees with a prior expectations.

Day old chicks is the most important variable in micro/small poultry business enterprises with highest co-efficient of 1.43 and significant at one percent. This was followed by value of depreciated assets (0.109) also significant at one percent level of probability while labour, whose co-efficient was 0.105 was significant at five percent. Variances/other drugs were found to be significant at 10% but negatively signed which implies that a unit increase in the use of the resource would reduce output of the business significantly.

The estimate of the variance parameter (σ^2) was significantly difference from zero indicating a good fit and the correctness of the distributional assumption specified. The significance of the variance ration showed that the micro/small poultry business specific variability contributed about 77% variation in output among the business enterprises. This indicates that about 77% of the differences between the observed and maximum production frontier outputs were due to difference in micro/small business levels of technical in efficiency and not related to random variability.

Table 1

Maximum Likelihood Estimation of the Cobb-Douglas Stochastic Model

Business factor	Coefficient	Standard error	*t*-value
Constant term (β_0)	5.5892	0.9077	5.7757***
Labour (β_1)	0.1052	0.0526	2.0004**
Feed (β_2)	-0.0092	0.0290	-0.3176
Vaccine/drugs (β_3)	-0.6602	0.3487	-1.8931*
Day old chicks (β_4)	1.4310	0.3482	4.1089***
Value of dep. assets (β_5)	0.1091	0.0284	3.8324***
Efficiency factors			
Constant terms (Z_0)	0.8658	0.6410	1.3506
Age of micro business (Z_1)	-0.0097	0.0126	-0.7691
Level of experience of managers (Z_2)			
Level of education of managers (Z_3)	-0.2255	0.1048	-2.1505**
Household size of manager (Z_4)	0.0044	0.0210	0.2133
Number of workers (Z_5)	-0.1135	0.0688	-2.3399**
Access to credit (Z_6)	-0.7110	0.3038	-2.3399**
Extension contact (Z_7)	-0.1135	0.1868	-0.6079
Membership of cooperatives (Z_8)	0.4620	0.2813	1.6422
Diagnostic statistics	0.1825	0.1260	1.4487
Total variance σ^2	0.0670		
Variance ratio γ	0.7722		
LR test	35.7736	0.135	4.9402***
Log-Likelihood function	63.4367	0.0677	11.4014***

Notes. Source: Field data 2011. *** Significant at 1.0%; ** Significant at 5%; * Significant at 10%.

Estimate of the Translog Stochastic Model

The result of the Translog Stochastic Model is presented in Table 2. The diagnostic statistics are highly significant at one percent level of probability. The coefficient for total variance (σ^2) is 0.063 indicates a good fit and correctness of the distributional assumption specified in the model. The variance ration is 0.80 which is the

ratio of the variance of micro poultry business specific technical efficiency to the total variance. This would mean that 80% of the variation in output among the micro poultry business is due to technical inefficiency and not related to random variability.

Table 2

Maximum Likelihood Estimates of the Translog Stochastic Model

Business factor	Variables	Coefficient	Standard error	*t*-value
Constant term	β_0	47.2615	0.9964	47.4299***
Labour (X_1)	β_1	-38301	0.9759	-3.9245***
Feed (X_2)	β_2	4.5107	0.9432	4.7820***
Vaccine (X_3)	β_3	-11.5087	0.9938	-11.5801***
Day old chicks (X_4)	β_4	2.8279	1.7466	1.6190
Depreciation (X_5)	β_5	5.4902	0.9958	5.5132***
Labour^2	β_6	0.1217	0.4694	0.2594
Feed^2	β_7	0.3030	0.5837	0.5191
Vaccine^2	β_8	6.6135	0.9260	7.1419***
Chicks^2	β_9	-3.8684	0.7681	-5.0357***
Depreciation ^{2}	β_{10}	-0.0216	0.1027	-0.2402
Labour × feed	β_{11}	1.9860	0.5210	3.8117***
Labour × vaccine	β_{12}	-2.0041	0.7839	-25565***
Labour × chicks	β_{13}	0.2939	0.4690	0.6265
Labour × depreciation	β_{14}	-0.2879	0.1811	-1.5895
Feed × vaccine	β_{15}	-4.6930	0.7058	-6.6487***
Feed × chicks	β_{16}	5.3083	0.7264	7.3069***
Feed × depreciation	β_{17}	-07869	0.4178	-1.8831*
Vaccine × chicks	β_{18}	-2.2532	0.8161	-2,7609***
Vaccine × depreciation	β_{19}	3.7824	0.6839	5.5305***
Chicks × depreciation	β_{20}	-2.8717	0.3999	-7.1794***
Efficiency factors				
Constant	a0	0.6695	0.5546	0.1207
Age	a1	-0.0534	0.0097	-5.3804***
Enterprise experience	a2	0.2079	0.9867	0.2108
Education	a3	0.0070	0.0016	4.3422***
Household size	a4	-0.1392	0.0662	-2.1012**
Labour source	a5	-0.7222	0.3378	-2.1379**
Credit access	a6	-0.0459	0.1158	-0.3962
Extension visit	a7	0.5341	0.2543	2.0997**
Membership of co-op	a8	0.1370	0.1026	1.3354
Diagnostic statistics				
Log-likelihood function		70.4647		
Total variance	$\sigma 2$	0.0639	0.0123	5.1652***
Variance ratio	γ	0.8055	0.0503	15.9908***
LT Test		32.4901		

Notes. Source: Field data 2011. ***, **, and * are significant levels at 1.0%, 5%, and 10% respectively.

These factors are under the control of the business and its influence could be manipulated to improve the technical efficiency of the micro/small poultry businesses.

The result further showed that out of the five production variables, labour and vaccine/drugs had negative coefficients and were highly significant at one percent level of probability. This implies over utilization of the variables. Feed and depreciated assets were directly related to the output and they are significant at one percent. The coefficient for day old chicks was positive but not significant. Both Cobb-Douglas and Translog models showed that day old chicks and depreciated assets had positive coefficients with the later being statistically different from zero. Similarly, both models showed that vaccine had negative coefficients.

However, labour had positive coefficient for the Cobb-Douglas and negative for the translog, whereas feed had positive coefficients for the translog and negative coefficient for Cobb-Douglas.

In selecting the model that best fits and describes the data, the translog model was chosen because it has a higher log likelihood function than Cobb-Douglas and the appropriateness of the signs of the coefficients in line with a priori expectations.

Determinants of Technical Efficiency

In the analysis of the determinants of technical efficiency as presented in Table 2 the various coefficients with their corresponding standard error and *t*-values for the translog frontier model.

Age of the enterprise had a negative and significant effect on efficiency. It implies that aging micro business if not properly managed would lead to low productivity as well as low technical efficiency. Experience of the manager is not significant but was positively signed.

The household size of the manager had a negative relationship with technical efficiency and was significant at 5.0% level of probability. This implies that a unit increase in the household size would decrease the efficiency level. The same interpretation applies to the number of workers. It shows that increasing the number of workers by one percent would decrease efficiency and output. Extension visits significantly influence technical efficiency at 5% level of probability. Access to credit and membership of cooperate organization did not significantly influence technical efficiency.

Technical Efficiency Estimates of Micro-Poultry Business Enterprises

The results of the frequency distribution of technical efficiency estimates is shown in Table 3.

Table 3

Frequency Distribution of Technical Efficiency Indices of Micro-Poultry Business

Technical Efficiency Index	Frequency	Percentage
0.10-0.50	1	0.83
0.51-0.70	2	1.67
0.71-0.90	16	13.33
0.91-1.00	101	84.13
Total	120	99.96
Maximum technical efficiency	0.99	
Minimum technical efficiency	0.45	
Mean technical efficiency	0.92	

Note. Source: Field data 2011.

It was identified that technical efficiency ranges from 0.45 to 0.99. The result indicates that about 15.83 percent of micro-poultry business operated at efficiency below 90%. The mean technical efficiency was 92%,

which implies that 8% increase in output of micro-poultry business would be possible without additional resources at the available technology.

The result also indicates that the most efficient micro-poultry business enterprise would realize about 7.07 (1 – 0.92/0.99) percent cost savings. While the least technically efficient enterprise would have 54.54 (1 – 0.45/0.99) percent cost savings to become most efficient.

Conclusions

The study revealed that micro-poultry enterprises in Abia State are not fully technically efficient in the use of resources at the available technology. The poverty reduction strategy could be actualized by the promotion of technical efficiency among micro-poultry enterprises at the current level of technology.

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