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DIFFERENTIALS IN TECHNICAL EFFICIENCY AMONG BROILER FARMERS IN IMO STATE, NIGERIA

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ABSTRACT
The study evaluated the technical efficiency of broiler producers in Imo State. Data were collected with the aid of a well-structured questionnaire from 40 randomly selected broiler producers. Data were analyzed using descriptive statistics, stochastic production function, multiple regression techniques and the net return analytical models. Results showed that more females (52.5%) were in broiler production. Labour, farm size, feed and capital were significant factors influencing broiler production at 5% level each. Result of the determinants of technical efficiency showed that age and household size had negative coefficients implying reduction in technical efficiency in broiler production while the coefficients of farm size, education, feed, experience, and social organization were all positive and had a positive influence on technical efficiency. The mean technical efficiency of broiler farmers was 54%. The cost and return analysis showed that broiler producers had a net return of N268, 394.80 and return on investment of 78% per production cycle which shows that they earn N78 for every ₦100 invested. The socio economic characteristics that influence their net return were marital status, farm size, experience, education level, occupation and social organization membership. Results further showed that, lack of capital (97.5%) ranked the highest among the constraints militating against broiler production in the study area. The study recommended the need for younger farmers to engage in poultry production to ensure maximum output. There is also need for policies aimed at free and affordable education to enable producers' access and process information on innovations that will enhance poultry production and formation of cooperatives to enhance scale efficiency.

Keywords: Technical, Efficiency, Broiler producers and Imo State

Introduction

The agricultural sector in Nigeria plays an important role according to Ogbalubi and Wokocha (2013) for the overall economy through its significant contributions to rural employment, food security, non – oil foreign exchange earnings, and provision of industrial raw materials for other sectors of the economy. Broiler production has become very important means of bridging the protein, fats, vitamins and minerals supply gap in Nigeria (Adeyonu *et al*., 2016). It is suitable for carbohydrate complement in diets with high nutritional value and profitability. Thus, many Nigerians in the recent times have developed interest in broiler production.

The crucial role of efficiency in increasing agricultural output has been widely recognized by researchers and policy makers alike. According to Yunus, (2012), technical efficiency in broiler production refers to its success in producing as large amount of output as possible given a set of inputs. Technical Efficiency can also be defined as 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 labour, capital and technology. Thiam *et al*., (2001) highlighted the importance of efficiency as a means of fostering production which has led to proliferation of studies in agriculture on technical efficiency around the globe. Analysis of technical efficiency in agriculture has received particular attention in developing countries because of the importance of productivity and growth in agriculture for overall economic development. A measure of producers' performance is often useful for policy purposes and the concept of efficiency provides theoretical basis for such a measure (Jatto *et al*., 2012). To determine the

efficiency of the poultry enterprise, there is need for efficiency measurement. However, the broiler industry in Imo State is characterized by small and medium scale farmers who are poor and tend to practice production systems that may not utilize resources efficiently. The ability to quantify efficiency and its determinants will provide farmers with a control mechanism with which to monitor the performance of the enterprise. The essence of this study therefore, is to present empirical findings on technical efficiency of Broiler producers in Imo State.

Theoretical Framework

Technical Efficiency

Technical efficiency of a firm is defined in terms of the ratio of the observed output to the corresponding frontier output, given the levels of inputs used by that firm (Battese, 1990). In other words, technically inefficient production produces too little output from a given bundle of inputs. According to Nwakalobo, (2000), a poultry farmer who is said to be technically efficient produces as much output as possible from a given set of inputs or if the farmer uses the smallest possible amount of inputs for a given level of output. Technical efficiency is thus calculated as follows:

$$TE = \frac{\text{Actual output}}{\text{Potential output}} \quad (1)$$

A general presentation of Farrell's concept of the production function (or frontier) is depicted in figure 1 involving the original input and output values. The horizontal axis represents the (vector of) inputs, X, associated with producing the output, Y. The observed input –output values are below the production frontier, given that firms do not attain the maximum output possible for the inputs involved, given the technology available. A measure of the technical efficiency of the firm which produces output, Y, with inputs, X, denoted by point A, is given by y/y*, where y* is the "frontier output" associated with the level of inputs, x (point B).

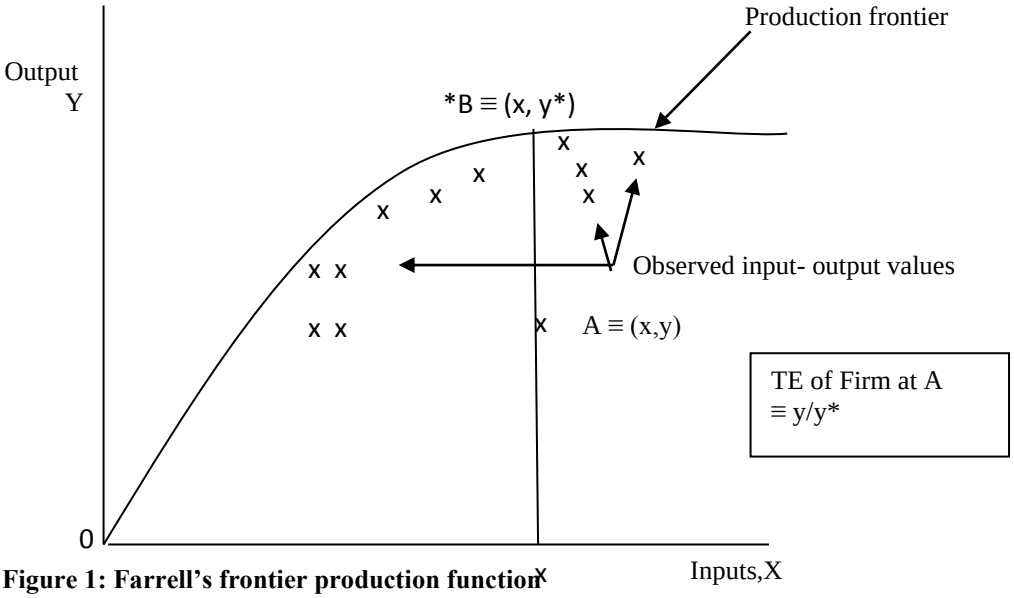

Figure 1: Farrell's frontier production function

Materials and Methods

Study Area

The study was carried out in Imo State which is in the Southeast region of Nigeria. The State has three agricultural zones namely, Orlu, Owerri and Okigwe with 27 Local Government Areas (LGAs). It lies within Latitudes $4^0$45N and $7^0$15N, and Longitude $6^0$50E and $7^0$25E (www.imostate.gov.ng 2013). It occupies the area between the lower River Niger and the upper and middle Imo River. It has boundaries with Rivers State to the South, Abia State to the East and Anambra State to the West. Imo State covers an area of about 5,288sq.km. The State has a population of about 4.8m with a population density of 744 people per sq.km. Its population makes up 2.8% of Nigeria's total population (NPC, 2006). The rainy season begins in April and lasts until October while the rainfall regime varies from 1990 to 2200mm with temperature between 26 and 30^0C and relative humidity between 75 and 90%. The dry season comprises two months of Harmattan from late December to late February. The hottest months are between January and March (www.imostate.gov.ng 2013). The area is mainly agro-based. Agricultural activities in the area include livestock production, staple food crop production, agro forestry and aquaculture. Crops like yam, cassava, maize, cowpea, plantain and banana, are widely cultivated, while trees like oil palm, Iroko, Obeche and Mahogany are predominant.

Sample selection

A multi-stage sampling method was employed in selecting the respondents. The first stage was the purposive selection of two (Owerri and Orlu) out of

the three (Owerri, Orlu and Okigwe) Agricultural Zones in Imo State. The purposive selection was based on the Agricultural Zones that have the highest number of broiler producers given by the extension agents in the areas. The second stage was the random selection of 3 Local Government areas (Owerri Zone: Ahiazu Mbaise, Aboh Mbaise and Owerri North; Orlu Zone: Nwangele, Isu and Njaba) from each of the selected agricultural zones, making a total of 6 LGAs. The third stage involved the random selection of 2 communities from each of the 6 Local Government Areas, making a total of 12 communities (Okwuator and Enyiogugu in Aboh Mbaise; Naze and Emekuku in Owerri North; Ogbor and Ogbe Ahiara in Ahiazu Mbaise LGA; Amaigbo and Nkwere in Nwangele; Isiobishi and Amugbara in Isu; Okwudor and Njaba in Njaba LGA). The fourth stage was the random selection of three villages from each of the twelve selected communities, making a total of 36 villages. The list of broiler producers totaling 95 in the selected villages was compiled with the assistance of extension agents, village heads, and officials of Poultry Farmers Association, and this formed the sampling frame. In the fifth and final stage, proportionate and simple random sampling techniques were used to select 40 broiler producers for the study.

Method of Data Collection

The information supplied by the broiler farmers provided the bulk of the primary data and was achieved through a structured questionnaire administered by the researcher to the farmers for a period of two months from March to May, 2019. It is important to note that the data provided useful information as regards the socio-economic characteristics of the poultry farmers in the study area, the amount of resources used in the production, inputs and prices and output and prices. Data were collected through a face-to-face interaction with the farmers.

Method of Data Analyses

Econometric techniques and descriptive statistics were used in analyzing the data collected. Descriptive statistics, stochastic frontier production function and net return were used for analyses. The stochastic frontier production function and determinants of technical efficiency were jointly estimated using soft-ware package, LIMDEP. The general form of the function is specified as:

$$LnY=\beta_o+\beta_1 InX_1+\beta_2 InX_2+\beta_3 InX_3+\beta_4 InX_4+\beta_5 InX_5+\beta_6 In x_6+(V_i-U_i) \quad (2)$$

Where,
Y = Output of broiler (Value in Naira)
X_1 = labour (mandays)
X_2 = farm size (Number of birds)
X_3 = feed (50Kg bag)
X_4 = expenditure on drugs (₦)
X_5 = capital inputs comprising depreciation of poultry house, rent, interest on loan and implements (₦)
X_6 = expenditure on utilities (Electricity, water supply in ₦)
$\beta_0, \beta_1, \ldots \beta_6$ are the regression parameters estimated
V_l = Random errors which are assumed to be independently and identically distributed with zero mean and constant variance and independent of the U_i's N $(0, \sigma^2_v)$.
U_l = Technical inefficiency which is a non- negative term representing the deviations from the frontier production function which is attributed to controllable factors.

In traditional theory of production function, the value of coefficients for regression can be used to estimate how efficient farmers are in their resource - use (Nwakalobo, 2000). The same principle could be applied to the coefficients of stochastic production function which has the same causal relationship with the output.

Determinants of Technical Efficiency

A stochastic frontier production function was used to determine the technical efficiency of broiler producers. The technical efficiency of the farmers is defined as follows:

$$Y_i = f(X_i ; \beta) \exp(V_i - U_i), \quad i = 1, 2, \ldots, n \quad (3)$$

Where,
Y_i is output of the i-th poultry farm, Xi is the vector of inputs quantities used by the i- th poultry farm, β is a vector of unknown parameters to be estimated, f(.) represents an appropriate function (e.g., Cobb Douglas, translog etc.) The term Vi is a symmetric error, which accounts for random variations in output of broilers due to factors beyond the control of the poultry farmer e.g., weather, disease outbreaks measurement errors etc., while the term Ui is a non-negative random variable representing inefficiency in production relative to the stochastic frontier. The random error is assumed to be independently and identically distributed as N (o, σ^2_v) random variables independent of the U_is which are assumed to be non-negative truncations of the N (o, σ^2_u) distribution (i.e. half –normal distribution) or have exponential distribution.

The technical efficiency of an individual poultry farmer is defined in terms of the ratio of the observed output (broiler) to the corresponding frontier output, given the available technology.

$$\text{Technical efficiency (TE)} = Y_i / Y_i^* = f(X_i ; \beta) \exp(V_i - U_i) / f(X_i ; \beta) \exp(V_i) = \exp(- U_i) \quad (4)$$

Where,
Y_i is the observed output and Y_i^* is the frontier output. The parameters of the Stochastic frontier production

function are estimated using the maximum likelihood methods.

In order to determine factors contributing to the observed technical efficiency, the following model was used and estimated jointly with the stochastic frontier model in a single stage maximum likelihood estimation procedure using the computer software LIMDEP as formulated by Ohajianya (2013).

TE_i: $a_0 + a_1Z_1 + a_2Z_2 + a_3Z_3 + a_4Z_4 + a_5Z_5 + a_6Z_6 + a_7Z_7 + a_8Z_8 + a_9Z_9$ (5)

Where,
TE_i, is the technical efficiency of the i-th broiler farmer,
Z_1 - Sex (a dummy variable which takes the value of unity (1) if the farmer is a female and zero if otherwise)
Z_2 = Marital status (dummy variable; 1=married, 0=otherwise)
Z_3 = Age (yrs),
Z_4 = Household size (number)
Z_5 = Farm size (number of birds)
Z_6 = Farming experience
Z_7 = Educational experience (years)
Z_8 = Income (naira)
Z_9 = Membership of farmers' associations/cooperative societies, a dummy variable which takes the value of unity for members and zero otherwise
Z_{10} = Number of extension contacts the farmers had in the year
a_0, a_1, a_2,…,a_{10} are parameters estimated

Net return
This model is defined as the net income from an investment after deducting all expenses from the gross income generated by the investment. Depending on the analysis required, the deductions may or may not include income tax and/or capital gain tax (Rezitis *et al*., 2003). Net return on sales can be calculated using net profits. It helps to measure how effective an enterprise is. The higher the net return, the more effective the poultry farm will be at converting revenue into actual profit (Onyebinama, 2000). The analysis of Net return of a poultry farm is to estimate production profitability. It is specified as follows:

Profit = TR – TC (6)

Net Return (NR) = Total Revenue – Total Costs (7)

$$NRi = \sum_{n} TVPi - \sum_{n} (TVC^{i}j + FC^{i}j) \quad (8)$$

Where,
n = number of farmers
TVP= Total value of Production (or gross output)
TVC = Total variable Costs
FC = Fixed Costs

Multiple Regression
To determine the socioeconomic characteristics of broiler producers that influence their net return, the Ordinary Least Squares (OLS) multiple regression model was fitted to the data. The multiple regression model is implicitly specified as follows;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}) + e$ (9)

Where,
Y = Net income of poultry farmers (₦)
X_1 = Sex (dummy variable, 1 for male, 0 for female)
X_2 = Marital status (dummy variable, 1 for married, 0 for single)
X_3 = Age of farmer (Years)
X_4 = Household size (Number of persons)
X_5 = Farm size (Number of birds)
X_6 = Farming experience (Years)
X_7 = Level of education (Number of years spent in school)
X_8 = Occupation (dummy variable, 1 for farming, 0 if otherwise)
X_9 = Social Organization membership (dummy variable, 1 for member, 0 for non-member)
X_{10} = Extension contact (Number of extension visits per annum)
e = error term

Four functional forms of the OLS model were tried to determine the functional form that best fits the data on the basis of both econometric and statistical criteria such as highest value of the coefficient of multiple determination (R^2), number of significant variables and conformity to *a priori* expectations.

Results and Discussion
The results in Table 1 show the socio-economic characteristics of the respondents in the study area. The results show that 47.5% of broiler producers were males, while 52.5% were females. This implies that broiler production in the study area is dominated by females. Age is an important factor in any agricultural activity. It reflects the quality and quantity of the physical labour employed because as individuals grow older, the force exerted and ability to withstand stress declines. According to Agbo (2006), age is inversely related to performance. Labour can therefore be sourced from young and vibrant individuals. The percentage distribution of broiler farmers according to age indicates that 35% of the farmers were within the age range of 51-60years on the aggregate. This was followed closely by those within the age range of 31-40years and 41-50years (27.5%). The mean age of the broiler farmers was 44 years. This result implies that most of the broiler farmers within this age bracket (51-60) in the study area may not be very active in broiler production since age is an important factor in poultry production. This follows the study of Olagunju, (2010) and Fasina and Inegbedion (2012) that the average active working age

for poultry business is 40 years and that famers within the age bracket of 51-70 are considered less active due to old age.

Majority (82.5%) of broiler farmers were married. This result shows that broiler producers in the area have greater responsibility that would make them more committed to broiler production in order to take care of the members of their household. This statement agrees with the findings of Ologbon *et al.*, (2011) that married poultry farmers had additional responsibilities to bear which might have propelled them into the enterprise with the intention of generating more income.

The result shows that majority (47.5%) of the broiler farmers spent 7-12 years in school. This was followed closely by those who spent 13-18 years in school (35%). The mean level of formal education was 10 years. This shows that the farmers will be willing to adopt new technologies with ease. Okoro, (1991) and Ajayi, (1992) stated that there exist a positive relationship between education and adoption of new innovation and since majority of the farmers have had some level of education, they are likely to undertake new technologies with ease. About 70% of broiler farmers had 6-10 persons in their households with a mean household size of 7 persons. This corresponds with the findings of Ukwuaba, and Inono, (2012) that respondents with large family size (above 6 persons) would have more hands to work in their poultry which could aid efficiency and increase in output.

It is expected that the occupation of the respondents should have a positive relationship with their poultry production activities. This assumption is that the respondents in farming-related occupation should be more involved in poultry production. About 45% of the broiler farmers engaged in farming as their major occupation. This is in line with the findings of Fasina, *et al.,* (2012) that poultry producers should be full-time farmers because poultry business requires more attention in order to maximize output. Farm size determines how commercialized an enterprise is (Achoja *et al.,* 2010). In this regard, almost all (90%) the broiler producers had farm size of 1-300 birds with mean of 218 birds which falls within the small-scale agricultural production. This result implies that most of the farmers run their poultry business on a small-scale level.

About 65% of broiler farmers have farming experience of 1-5 years with mean farming experience of 6 years. This result implies that almost all the poultry farmers have acquired experience in the broiler business because experience is paramount in broiler business for effective production. Many (55%) of the broiler farmers used family labour. This could be a cost-saving strategy (Olagunju and Babatunde 2011) for the broiler farmers. Majority (85%) of broiler producers use deep litter system of production which is peculiar to what they produce.

Table 1: Socio-Economic characteristics of the broiler farmers

Variable	Frequency	Percentage
Male	19	47.5
Female	21	52.5
Total	**40**	**100**
Age		
21-30	4	10.0
31-40	11	27.5
41-50	11	27.5
51-60	14	35.0
Mean	**44years**	
Marital Status		
Single	2	5
Married	33	82.5
Widowed	3	7.5
Divorced	2	5
Educational Level		
No formal education	1	2.5
1-6	6	15.0
7-12	19	47.5
13-18	14	35.0
Mean	**10years**	
1-5	11	27.5
6-10	28	70.0
11-15	1	2.5
Mean	**7persons**	
Major Occupation		
Artisan	**2**	5.0
Civil Service	**9**	22.5
Farming	**18**	45.0
Trading	**11**	27.5
Farm size (no of birds)		
1-300	36	90
301-600	1	2.5
601-900	1	2.5
901-1200	2	5.0
Mean	**218birds**	
Farming Experience		
6-10	13	32.5
11-15	1	2.5
Mean	**6years**	
Labour		
Family	22	55.0
Hired	18	45.0
System of Production		
Battery cage	5	12.5
Deep litter	85	85.0
Semi Intensive	1	2.5

Source: Field Survey Data, 2019

The maximum likelihood estimates (MLE) for the Stochastic Production Function used in explaining the influence of production inputs on the production of broiler among broiler producers in Imo State is presented in Table 2. The result show that the coefficients of Labour (x1), Farm size (x2), Feed (x3), and Capital (x5) were positive and significantly influenced broiler output. This implies that any increase in the use of these production inputs would bring about increase in the output of broiler. The values of the sigma squared (δ2) was 0.822 and was statistically significant at 1% level. This also indicates a good fit and correctness of the distributional form assumed for the composite error term in the model. The magnitude of the coefficient of labour, which was 0.41, indicates that output in broiler was highly inelastic to changes in labour used. Thus, a 1% increase in the man days of labour used would induce an increase of 0.041% in output of broiler and vice versa. The production elasticity with respect to feed is

positive as expected and statistically significant at 1% level for broiler production. This stems from the fact that, feed is a major production input and necessary for the optimum production of the birds. Increase in the quantity of feed being fed the birds would further increase their productivity. This study is consistent with the findings of Ojok, (1993) who stated that the right quality (containing all the ingredients required in their correct proportions) and quantity of feeds are very essential for improved poultry production and Eze *et al*., (2012) that production and quantity of feed are directly related. The estimated coefficient for capital is positive (0.42) and significant at 1% level. The magnitude of the coefficient indicates that, capital is an essential input in broiler production. Therefore, this implies that a 1% increase in capital would lead to an increase of 0.042% in the output broiler. The table also shows that the estimated coefficients for farm size is positive, which conforms to the a priori expectation and significant at 1% level. The magnitude of the coefficient (0.62) indicates that, the output of broiler is inelastic to changes in number of birds. Therefore, this implies that a 1% increase in the number of birds would lead to an increase of 0.062% in the output of broiler production.

Table 2: Maximum Likelihood Estimates for the Stochastic Production Function for Broiler producers

Variable	Coefficient	t-ratio
Intercept	13.093	(6.999)**
Labour (X_1)	0.411	(3.975)**
Farm Size (X_2)	0.622	(2.961)**
Feed (X_3)	0.291	(2.882)**
Exp.Drugs(X_4)	0.108	(-2.412)*
Capital (X_5)	0.427	(2.658)**
Utilities (X_6)	0.305	(-2.919)**
Sigma-Squared	0.822	(0.167)
Landa	7.064	(3.563)**
Log Likelihood	-106.310	
Chi-Square	71.069	

****Significant at 1% level * Significant at 5% level. Source: Field Survey Data, 2019**

The inefficiency parameters (Table 3) were specified as those relating to farmers' specific socio-economic characteristics. Six out of the ten variables used in the model were significant and also have *a priori* expected signs. The estimated coefficients of the inefficiency function provide some explanations for the efficiency levels among individual respondents. Since the dependent variable of the inefficiency model represents the mode of inefficiency, a positive sign of an estimated parameter implies that the associated variable has a positive influence on efficiency while a negative coefficient indicates that the variable decreases efficiency in broiler production. Hence, age and household size decrease the efficiency in broiler production and were significant at 1% and 5% levels. This implies that the younger the farmer, the more technically efficient he is and the higher the number of persons in a household, the more farmers become technically efficient in poultry production as confirmed in the findings of Ohajianya *et al*., (2013). The coefficient of sex was negative and not significant while the coefficient of education was positive and significant at 1% level. This also indicates that the more the farmers acquire education, the more technically efficient they become in terms of learning new innovations.

Table 3: Maximum Likelihood Estimates of inefficiency parameters for broiler producers in Imo State

Variable	Coefficient	t-ratio
Intercept	15.099	(6.955)**
Sex (Z_1)	-0.104	(-1.099)
M/Status (Z_2)	0.115	(1.411)
Age (Z_3)	-1.093	(-3.515)**
HhSize (Z_4)	-1.056	(-2.404)*
Fmsize (Z_5)	1.140	(3.669)**
Experience (Z_6)	1.391	(2.763)**
Education (Z_7)	1.473	(3.051)**
Income (Z_8)	1.550	(2.027)*
Social Org.(Z_9)	0.084	(2.725)**
Extension (Z_{10})	0.072	(1.062)
Variance Parameters		
Sigma-Squared	0.822	(0.167)
Landa	7.064	(3.563)**
Log likelihood	-106.310	

****Significant at 1% level, *Significant at 5% level. Source: Field Survey Data, 2019**

The technical efficiency was less than 1.0 (Table 4) indicating that none of the farmers was technically efficient. A range of technical efficiency is observed across the sample and the spread is large. The best farmer had technical efficiency of 0.95 (95%) while the worst farmer had technical efficiency of 0.42 (or 42%). The mean technical efficiency was 0.54 (54%). This implies that on the average, broiler farmers were 54% technically efficient. The value of the mean technical efficiency also indicates that half of the output is attributed to resource wastage (not being able to utilize resources well). An enterprise is said to be technically efficient when the mean value equals one (1) and this is at variance with the levels of Technical efficiency obtained from broiler producers. This indicates that substantial amounts of potential outputs are lost due to technical inefficiency which corresponds with the findings of Zahidul Islam, Timo & Sumelius (2011). This is also in line with the findings of Ohajianya, *et al.,* (2013) that a mean technical efficiency of 0.75 indicates that only a small fraction (25%) of the output is attributed to resource wastage.

Table 4: Technical efficiency level of broiler producers in Imo State

Technical Efficiency	Frequency	Percentage
0.41-0.51	13	32.5
0.52-0.62	12	30.0
0.63-0.73	4	10.0
0.74-0.84	6	15.0
0.85-0.95	5	12.5
Total	40	100
Mean		0.54
Maximum		0.95
Minimum		0.42

Source: Field Survey Data, 2019

In Table 5, broiler farmers had total revenue of ₦ 612,820.00 and incurred total a cost of ₦ 344,425.20 which resulted in net return of ₦268, 394.80 per annum and return on investment of 78%. This implies that the broiler farmers earned ₦78 on every ₦100 spent in production of broiler meat per annum. This result implies that broiler production is a profitable venture in Imo State. This is also in line with the findings of Ohajianya, *et al*., (2013) that poultry production is a profitable venture.

Table 5: Cost and Returns component of broiler producers in Imo State

Item	Quantity	Unit Price(₦)	Value (₦/farmer/ annum)
Production cost			
a. Variable Cost			
Feed	37 bags	2,900/bag	107,300
Labour		260/day	70,200
Medication			6,207.41
Utilities (electricity, water, kerosene)			26,000
Transportation			28,350.00
Day old chicks	243	118/chick	28,674.00
Total Variable Cost			**266,731.41**
b. Fixed Cost			
Depreciation on Poultry house			9,616.50
Depreciation on other Capital items			7,167.86
Interest on loan	100.484(loan)	22% int.	23,106.25
Management			37,803.18
Total Fixed Cost			**77,693.79**
Total Cost (a+b)			**344,425.20**
Revenue	218 birds	2,800/bird	**610,400**
	Waste 22bags	110/bag	**2,420**
Total Revenue			**612,820.00**
Net Return (d-c)			**268,394.80**
Return on Investment (%)			**78**

N/B: Return on Investment = $\frac{\text{Net return}}{\text{Total cost}} \times \frac{100}{1}$

The results of the multiple regression analysis in Table 6 show the relationship between the net income of broiler producers and their socio-economic characteristics. Result shows that exponential function was the best functional form with the largest R^2 (75%) value and highest number of significant variables. Six of the estimated coefficients (x2, x5, x6, x7, x8, and x9) were significant at 1% level. From the results, the parameter estimates of Sex (x1), Marital Status (x2), Farm size (x5), Experience (x6), Education (x7), Occupation (x8), Social Organization membership (x9) and Extension contact (x10) were positive. This implies that they have direct relationship with net income such that a unit increase in any of the variables would increase net income of the farmers while the parameter estimates of Age (x3) and Household size (x4) were negative which has an indirect relationship with net income of the farmers as older people with small household size tend to become more passive about what happens in their farms (Godsteven *et al*., 2013).

Table 7: Estimated Socio-Economicdeterminants of net income among broiler producers

Variables	Linear	Semi log	Double log	+Exponential
Constant	329.053	271.355	206.444	188.053
Sex(x_1)	17.302	2.553	0.088	0.007
	(1.074)	(1.350)	(1.269)	(1.029)
M/status(x_2)	16.994	3.461	0.074	0.009
	(1.131)	(1.594)	(1.227)	(3.357)**
Age(x_3)	-17.0846	-2.609	-0.088	-0.007
	(-2.7582)**	(-1.205)	(-1.237)	(-0.029)
HHsize(x_4)	-14.307	-6.509	-0.067	-0.007
	(-1.092)	(-3.235)**	(-3.272)**	(-1.029)
FMsize(x_5)	11.007	3.117	0.068	0.006
	(1.113)	(1.167)	(3.345)**	(2.625)*
Experience(x_6)	13.083	7.922	0.082	0.009
	(1.093)	(1.323)	(3.783)**	(3.250)**
Education(x_7)	11.064	3.714	0.036	0.008
	(1.105)	(3.499)**	(1.230)	(3.571)**
Occupation(x_8)	17.190	3.117	0.047	0.007
	(2.445)*	(1.207)	(1.483)	(3.130)**
Social Org.(x_9)	10.339	2.259	0.065	0.009
	(1.127)	(1.538)	(3.009)**	(3.321)**
Extension(x_{10})	15.221	3.014	0.069	0.007
	(1.089)	(1.379)	(1.349)	(1.127)
R^2	0.49	0.47	0.63	0.75
F	2.8206	2.504	4.913	8.735
N	40	40	40	40

***significant at 5%, **significant at 1%, F=f –ratio. Figures in parenthesis are the t-ratios. +=lead equation. Source: Field Survey Data, 2019**

The constraints militating against broiler production in the study area include; no ready market, high cost of transportation, unavailability of day old chicks (broiler), lack of capital and lack of skilled workforce with percentage levels of 92.5%, 90%, 47.5%, 97.5% and 42.5% respectively ((Table 7). The major constarints were lack of ready market (92.5%) for the product (broiler meat) and lack of capital (97.5%). Government should undertake necessary steps to ensure that accessible markets are cited in the study area as well as making soft loans available to broiler farmers.

Table 8: Production Constraints faced by broiler producers

Constraints	Frequency	Percentage
No ready market	37	92.5
High cost of Transportation	36	90
Unavailability of day old chicks	19	47.5
Lack of capital	39	97.5
Lack of skilled work force	17	42.5

* **Multiple responses were recorded. Source: Field Survey Data, 2019**

Conclusion

The study has shown that broiler farmers in the study area are technically inefficient and still operating below the frontier in the use of resources. The study therefore call for policies aimed at provision of free and affordable education to enable farmers access and

process information on innovations that will enhance efficiency and income for broiler production. Farmers are encouraged to form social organizations to enhance scale efficiency. Younger famers are encouraged to go into broiler production for increased efficiency.

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