

Measurement of profit efficiency among broiler producers in Delta State, Nigeria

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ABSTRACT

This study investigated the factors influencing profit efficiency of broiler producers in Delta State, Nigeria. Specifically, the study identified and described the socio-economic profiles of broiler farmers, the level of profit efficiency and inefficiency in broiler farms and identified the problems affecting broiler producers in the study area. Multistage sampling technique was used for the study. Primary data were obtained using a set of structured questionnaire administered on a sample of 120 broiler producers. The analytical tools for the study were descriptive statistics and stochastic profit frontier production functional model. The results showed an average age of 42 years for broiler producers, and that the respondents are educated while the mean farming experience was 8 years. Majority (76.7%) of the respondents was male, mean household size was 8 persons, 79.2% of them were married and 75.8% of them were non-members of co-operative society. A mean profit efficiency of 65% was recorded in the area of study. The factors which influenced the profit efficiency of broiler production were gender (t-ratio=7.25), age (t-ratio=3.93), experience (t-ratio=3.93) and training (t-ratio=5.45), were negative and significant at 1% level of significance while cooperative membership (t-ratio=3.54) exerted a significant effect on their profit inefficiency level at 1%. The major problems encountered by broiler producers were high cost of feed (71.67%), absence of credit facilities (62.50%), inadequate capital (55.83%) while the least was shortage of veterinary services (31.67%). It is therefore, recommended that government should try and subsidize the inputs specially feeds for the respondents for more efficiency, productivity and profitability

Keywords: profit efficiency, broiler production, stochastic frontier.

INTRODUCTION

The Poultry sub-sector today is an important vehicle for economic development in the agricultural industry through its attractive investment opportunities in Nigeria. Poultry farming may differ from basic backyard poultry keeping to commercial large scale production.

Broiler production has assumed an important position among livestock enterprises due to the short gestation period of production which consequently translates to quick monetary turnover (Amos,

2006).The advantageous afore mentioned reason, amid others have built people's interest in the enterprise among small, medium and large scale poultry farmers. According to Watch (2006) the chicken business in Nigeria is composed of 40% commercial operations and 60% of backyard poultry farmers.

Amos (2006) classified poultry farm size of 50-500 birds as a small scale, 501-1000 birds as a medium scale and above 1000 birds as a large-scale. The working

definition of the scale of production in this study was based on Amos (2006) classification. Broiler production has no known cultural and religious barriers on consumption in any part of Nigeria. Broiler meat is very tender, palatable and acceptable to consumers and broiler enterprises have short production cycles making capital not tied down across a lengthy epoch indicating that it has rapid monetary turnover (Adepoju, 2008).

Owing to these obvious reasons, many people venture into broiler production mostly for the drive of income generation besides meeting the protein needs of their households. Profitability of broiler farmers determines the survival and sustainability of the poultry industry. Profit efficiency is referred to the capacity of a farm to reach the maximum conceivable turnover based on the costs and amount of fixed factors of that farm (Ojo, 2003).

The inputs cost such as feeds, inadequate veterinary services, drugs and poor quality of equipment are noted limitations in commercial broiler production that is responsible for the inefficiency in the industry. This severely abridged the returns of broiler farmers. This indicates that poultry producers are not operating at the maximum and this result in poultry products being inadequate relative to the growing request for such products (Bamiro et al, 2006). The government through its policies over the years supported the poultry industry to boost production. Despite all these interventions by the government and NGO's directed towards increasing returns to broiler production, the growth in the sector still remains low. Therefore, broiler production is yet to receive maximum returns from the resources committed to production even with government commitment. This consequently raises issues of efficiency in

resource use by way of increasing cost of production. A number of studies have looked at broiler production in Nigeria (Ike & Ugwumba, 2011; Chukwuji et al, 2006 & Tijani et al, 2006). Though many scholars have investigated profit efficiency of chicken production in Delta State, paucity of information on poultry enterprise profit remains extant, for the fact that their studies were mostly not qualified for generalization. Hence, this study looked at profit efficiency of broiler farmers in Delta State to fill these knowledge gaps. Identifying the factors explaining variations in the profit efficiency levels in the study will help provide useful information for stakeholders in design of the appropriate policies that can contribute to bridging the efficiency gap and thereby enhancing the productivity of broiler farmers.

METHODOLOGY

Study Area

Delta State is the study area. It comprises of Delta North, Delta South and Delta Central with twenty-five local government areas. It is situated between longitude 5° 00' and 6° 45' East and latitude 5° 00' and 6° 30' North. It is bounded in the North and East by Edo State and Anambra State; in the South East by Bayelsa State and Southern Flank by the Bight of Benin. It has a population of 4,095,391 (NPC, 2006). The principal crops grown are cassava, yam, maize, cocoyams, sweet potatoes and plantain.

Data Collection

Primary source were used for this study. Cross sectional data were collected in 2016 among broiler farmers in Delta State with the help of a well-structured questionnaire. The questions were intended to get satisfactory information about the' socio-economic characteristics of the broiler farmers as well as on their production

activities on prices and quantities of inputs and output.

Sampling Procedure

A multistage sampling procedure was used. Firstly, two (2) local government areas were selected purposively from each agricultural zone giving a total of six (6) local government areas because of their involvement in broiler production activities. Secondly, two (2) communities were selected randomly from each local government area to add up twelve (12) communities. Lastly, ten (10) broiler farmers were selected randomly from each community giving 120 broiler farmers.

Method of Data Analysis

Descriptive statistics such as frequency, percentage and averages were used to describe the socioeconomic characteristics and constraints faced by broiler farmers. The stochastic profit frontier was used to determine the factors influencing profit efficiency.

The Stochastic Frontier Profit Function

The profit function technique pools the ideas of technical and allocative efficiency in the profit relationship and any errors in the production decision are presumed lower profits for the farmer. The normalized profit function can be expressed as:

$$\pi(p, Z) = Y(X^*, Z) - \sum p_i X_i^* \quad , \quad X^* = g(p, Z) \dots \dots \dots (1)$$

Where $Y(\cdot)$ is the production function; the asterisk denotes optimized values; $p_i = W/P$, p_i is the normalized price of input i , and P and W are the output and input prices, respectively. The stochastic profit function can then be expressed as:

$$p = f(p_j, z_{kj}) \cdot \exp(e_j) \dots \dots \dots (2)$$

where π_j is normalized profit of the j th farm, calculated as gross revenue less variable cost, divided by farm specific output price P ; p_{ij} is the normalized price of input for the

j th farm, computed as input price divided by farm specific output price F ; Z_{kj} is the level of the k th fixed factor for the j th farm; and e_j is an error term. The error term, e_j , is assumed to behave in a manner consistent with the frontier concept

$$e_j = V_j - U_j \dots \dots \dots (3)$$

where V_j is the symmetric error term and U_j is a one-sided error term. The V_j s are presumed to be independently and identically distributed as $N(0, \sigma^2_v)$. We assume that U_j has a half-normal nonnegative distribution $(0, \sigma^2_u)$. The error terms U_j and V_j are also assumed to be independent of each other. The error term U_j is used to signify inefficiency. That is, it epitomizes profit shortfall from its maximum possible value given by the stochastic frontier. Thus, if $U_j = 0$, the firm lies on the profit frontier, obtaining potential maximum profit given the prices it faces and the levels of fixed factors. If $U_j > 0$, the firm is economically inefficient, and profit is less than the maximum.

An average frontier model results if the frontier model is estimated without the one-sided disturbance term, U_j . Farrell (1957) has criticized this approach. By contrast, a full deterministic or full frontier model, often estimated by linear programming techniques, results if the random error term V_j is omitted. It is indispensable to estimate the frontier function to provide an estimate of industry best-practice profit for any given level of prices and fixed factors. An estimated value of profit efficiency for each observation can be calculated as $\exp(-U_j)$.

Following Jondrow, Lovell, Materov, and Schmidt (1982) the unobservable value of U_j may be obtained from its conditional expectation given the observable value of $V_j - U_j$. The farm-specific profit inefficiency index (PIE) is given as:

$$PIE = (1 - \exp[-U_j]) \dots \dots \dots (4)$$

Profit loss due to inefficiency is denoted as potential maximum profit given farm-specific prices and fixed factors, multiplied by farm specific profit inefficiency index. The objective of the study was achieved by relating the profit inefficiency index to farm. This can be specified as $PIE = g(X) + w$, where PIE is the profit inefficiency index, X is a vector of broiler production factors and w is the unexplained component of inefficiency, for example, weather and prices peculiar to a particular farm. The profit inefficiency index is therefore hypothesized to be related to attributes of the i th broiler farmer.

The Cobb-Douglas profit functional form was used. It is implicitly stated as:

(i) Cobb-Douglas profit functional form;

$$\ln \pi I = \alpha_0 + \sum \alpha_i \ln(X_i) + (V_i - U_i) \dots \dots \dots (1)$$

Where:

πI = normalized profit of the j th broiler farmer, computed as gross revenue less variable cost divided by farm specific price (Dependent).

X_1 = price of day-old chicks (₦)

X_2 = price of feed (₦)

X_3 = wage rate of labour (₦)

X_4 = drug and medication price (₦)

X_5 = cost of other inputs (electricity, water, transportation and fuel) (₦)

X_6 = depreciated value of poultry house/building, equipment. It will be calculated using straight line method of calculating depreciation.

Profit Inefficiency Model

$$U_i = \delta_0 + \sum_{j=1}^8 \delta_j Z_{ji}$$

where δ is the parameter to be estimated, U is a non-negative error term that is profit inefficiency effects relative to the stochastic profit frontier, Z is a vector of variables explaining inefficiency effects and δ_0 = constant in equation.

Z_1 = gender (male =1, otherwise = 0)

Z_2 = age (years)

Z_3 = broiler farming experience (years)

Z_4 = education (years)

Z_5 = formal poultry farming training (yes =1, otherwise = 0)

Z_6 = cooperative membership (yes = 1, otherwise = 0)

The maximum-likelihood computer package FRONTIER 4.1C was used for the forecast of the profit efficiencies. The profit frontier implies the maximum output that could be achieved from a set of inputs given the available technology.

RESULTS

The results of the analysis of socio-economic characteristics of the poultry producers in the area of study are presented as follows:

Age of broiler farmers

The result in Table 1 revealed that majority (51.7%) of the respondents is within the age group 40-49 years. This was followed 31.7% representing 38 respondents were in age range of 30-39 years. About 14.2% of them were above 50 years while only 3 respondents representing 2.5% had less than 30 years. The average age of the respondent was 42 years.

Educational status of broiler farmers

The result revealed that majority (71.7%) of the respondents had secondary education while those who had primary and tertiary education was 19.2% and 9.1% respectively. All the respondents attended at least primary school

Farming experience of the respondents

The result in Table 1 showed that majority (65%) had between 6-10 years broiler farming experience while 20% of them had between 1-5 years of experience in broiler production. The result further revealed that only 15% had above 10 years broiler farming experience. The mean broiler farming experience was found to be 8 years.

Gender of broiler farmers

The result as presented in Table 1 showed that 92 of broiler farmers were males while 28 were females which account for about 76.7% and 23.3% respectively. This implies that broiler production is principally male dominated.

Household size of broiler farmers

The result showed that majority (86.7%) of the respondents had household size of between 6-10 persons, 10% of the respondents had between 1-5 persons while only 3.3% had above 10 persons. The mean household size was 8 persons.

Marital status of broiler farmers

The result in Table 1 revealed majority (79.2%) of the farmers were married while 20.8% of them were single. It showed that broiler production is dominated by married men and women.

Cooperative society membership

The result as presented in Table 1 revealed that majority (75.8%) of broiler farmers did not belong to any cooperative society. The result showed that only 24.2% belong to cooperative society. This implies that the respondents may be hindered access to certain privileges enjoyed by been a cooperative member.

Table 1: Socioeconomic Characteristics of Broiler Farmers

Variables	Frequency	Percentage	Mean
Age (years)			
<30	3	2.5	42 years
30-39	38	31.7	
40-49	62	51.7	
50-59	15	12.5	
60 and above	2	1.7	
Education			
Primary education	23	19.2	
Secondary education	86	71.7	
Tertiary education	11	9.1	
Years of experience			
1-5	24	20.0	8 years
6-10	78	65.0	
>10	18	15.0	
Gender			
Male	92	76.7	
Female	28	23.3	
Household size			
1-5	12	10	8 persons
6-10	104	86.7	
>10	4	3.3	
Marital status			
Married	95	79.2	
Single	25	20.8	
Cooperative membership			
Member	29	24.2	
Non-member	91	75.8	

Estimates of Profit Efficiency of Broiler Farmers

The result showed that the gamma value (0.795) was significant at 1% level indicating that 80% of the variability in output of broiler farmers was due to disparities in profit efficiency. The gamma ratio showed ratio of the random error effect to the profit inefficiency effect. If the gamma value is greater than unity, the random error dominates the profit inefficiency effect (U_i). Since the gamma was significant at 1% justifies the choice of the selected profit inefficiency variables

used in the model. The sigma square (0.0453) was highly significant at 1% indicating a good fit and the correctness of the specification of the composed error term. This showed that profit inefficiency exist in broiler production in the area of study.

The result on determinants of profit efficiency of broiler farmers in Table 2 showed that cost of day old chick, cost of feed, cost of labour, drug and medication cost, cost of other inputs used for broiler production were highly significant at 1% while equipment significantly contributed to profit efficiency of broiler farmers at 5%.

The return to scale (RTS) value of the elasticities was approximately 0.40.

Table 2: Maximum Likelihood Estimates for Parameters of the Cobb-Douglas Profit Frontier Function for Broiler Farmers

Variables	Parameters	Coefficient	Std. error	t-ratio
Production function				
Constant	β_0	0.3155	0.033	9.56***
Ln(cost of Doc)	β_1	0.1283	0.007	18.33***
Ln (cost of feed)	β_2	0.0256	0.001	25.60***
Ln (cost of labour)	β_3	0.0747	0.012	6.23***
Ln(drug and medication cost)	β_4	0.0890	0.030	2.97***
Ln(cost of other inputs)	β_5	0.0220	0.007	3.14***
Ln(depreciation value of equipment)	β_6	0.0562	0.021	2.68**
Inefficiency model				
Constant	δ_0	0.465	0.0592	7.85***
Gender	δ_1	-0.087	0.012	7.25***
Age	δ_2	-0.982	0.250	3.93***
Experience	δ_3	-0.0240	0.00364	6.59***
Education	δ_4	0.174	0.138	1.26
Training	δ_5	-3.965	0.728	5.45***
Cooperative membership	δ_6	0.0133	0.00376	3.54***
Variance parameter				
Sigma-square	σ^2	0.0453	0.0054	8.39***
Gamma	Γ	0.795	0.286	2.78***
Log-likelihood function		-29.51		
Return to scale (RTS) $\beta_{1+} \beta_{2+} \beta_{3+} \beta_{4+} \beta_{5+} \beta_6$		0.40		

Profit Efficiency Level of Broiler Farmers

The result as presented in Table 3 showed that profit efficiency of the respondent was less than one indicating that the broiler

farmers are below the maximum profit efficiency frontier. The distribution of the profit efficiency indices range from 0.53-0.98 for broiler farmers in the study area. The mean efficiency value was 0.65.

Table 3: Profit Efficiency Level of Broiler Farmers

Efficiency level	Frequency	Percentage
0.51-0.60	15	12.50
0.61-0.70	24	20.00
0.71-0.80	21	17.50
0.81-0.90	16	13.33
0.91-1.00	44	36.67
Total	120	100.0
Mean	0.65	
Standard deviation	0.13	
Minimum	0.53	
Maximum	0.98	

Constraints Affecting Broiler Farmers

The result in a Table 4 showed that majority (71.67%) of broiler farmers experienced high cost of feed as a problem in the study area. This is followed by 62.50% of the respondents that agreed that absence of credit facilities is a problem militating against broiler production. Also inadequate capital was identified by 55.80% of the respondents as a problem militating against broiler production. The result revealed that 51.67% of broiler farmers also pointed out that high cost of drugs and medication was a

serious problem in broiler production. About 45.83% of broiler farmers agreed that problem of high cost of day old chick is a militating factor in broiler production. It was observed by 33.33% of the respondents that disease is a factor militating against broiler production in the study area. The problem of shortage of veterinary services was found to be a problem among broiler farmers (31.67%) in the study area.

Table 4: Constraints Affecting Broiler Production

Constraints	Frequency	Percentage	Rank
High cost of feed	86	71.67	1 st
Absence of credit facilities	75	62.50	2 nd
Inadequate capital	67	55.83	3 rd
High cost of drugs and medication	62	51.67	4 th
High cost of day old chick	55	46.83	5 th
Disease outbreak	40	33.33	6 th
Shortage of veterinary	38	31.67	7 th

DISCUSSION

The result of age of respondent showed that majority fall within the age bracket of 40-49 years with a mean age of 42 years. This implies that broiler production was carried out by respondents who are physically strong and mentally alert to face challenges

which broiler farming in the area of study requires. This put forward high level of vitality for broiler production activities. The result supports previous finding by Onoh and Peter-Onoh (2012) who reported that Nigerian farmers are within the age bracket of 40-60years.

The result on educational level could be deduced that broiler farmers in the area of study were literates. The high literacy level of the broiler farmers would give them the opportunity to understand and adopt modern farm technologies involved in broiler production thereby enhancing productivity and profitability. The result is in tandem with Ikheola and Inedia (2005) who obtained similar result of high literacy level among poultry farmers in Nigeria.

The result on farming experience suggests that majority of the broiler farmers in the study area were fairly new in the business. Years of broiler farming experience are likely to make better decisions to enhance productivity and income, because it is expected that years of experience in broiler production usually determines the effectiveness of farmers' decision with respect to resource allocation. This is in agreement with Onyenweaku and Nwosu (2005) finding that farming experience of farmers positively contributes to business organization's efficiency level.

The result on gender showed that majority of the respondents was males. This was expected given the laborious nature, physical and energy demand as well capital intensive nature of investment required for broiler production.

The result showed an average household size of 8 persons in the study area. This implies that large household size will result to availability of farm labour for broiler production in the study area. The results reach agreement with the findings of Nwaru (2004) on the availability of large family size for agricultural production in Nigeria.

The result reveals that majority of broiler farmers are married. The marital status is in consonance with Ajala et al (2007). The implication of this finding is that majority of

the respondents can be considered to be responsible in taking rational decision that can improve productivity and income.

The result shows that majority of broiler farmers do not belong to co-operative society. The result implies that the respondents may be hindered access to certain privileges enjoyed by been a cooperative member. The result is at variance with Effiong (2005) that, been a member of cooperative society enhance sharing of improved broiler production technologies and easy access to inputs and utilization to ameliorate the constraints faced by the respondents.

The cost of day old chick, cost of feed, cost of labour used for broiler production was highly significant at 1% while drug and medication cost, cost of other inputs and equipment significantly contributed to profit efficiency of broiler farmers at 5%. This implies that 1% increase in these variables would bring about corresponding increase in the profit efficiency of broiler farmers. This is in agreement with Effiong and Onyeweaku (2006) in their study of broiler enterprise in Akwa Ibom State that output will increase with increase in these variables.

The result of the profit efficiency model shows that the coefficient of gender (-0.087) was negative and significant at 1% probability level. This implies that additional increase of male broiler farmer will increase profit efficiency than their female counterpart. The coefficient of age (-0.982) was significant at 1% and the sign is negative. This means that increase in age would lead to decrease in profit inefficiency of the broiler farmers. The coefficient of experience (-0.0240) was negative and significant at 1% level of probability. This showed that the number of years engaged in broiler production by respondents plays

significant role on the profitability of the enterprise. This implies that increase in years of broiler production will decrease profit inefficiency in the study area. The coefficient of training (-3.965) was negatively significant at 1% probability level. This implies that training received by the broiler farmers positively contribute to the profit realized which showed that increase in training would decrease profit inefficiency in the study area. However, the coefficient of cooperative membership (0.0133) was positively significant at 1% probability level. This implies that increase in non-cooperative membership would increase profit inefficiency in broiler production than members. It could also mean that cooperative membership will result to profit efficiency by poultry producers in the area of study.

The return to scale (RTS) of 0.40 was derived from totaling of the coefficients of the estimated elasticities. The result indicated that farmers were in stage II of the profit frontier. The implication is that increase in the variables used would result in less than a proportional change in the profit of broiler farmers.

The result of profit efficiency level of broiler shows that broiler production has not reached frontier threshold, as such, within the context of profit efficiency, which means that broiler production can still be increased by about 35 percent using available technology.

The result on problems encountered by the respondents (71.67%) showed that high cost of feed ranked first as a major constraint militating against broiler production. This was closely followed by absence of credit facilities and the least ranked was shortage of veterinary.

CONCLUSION

The result of the study showed that broiler farmers were profit inefficient but can attain optimum profit efficiency at the frontier line by 35% increase. However, there are several constraints such as high cost of feed, absence of credit facilities, inadequate capital, high cost of drugs and medication, high cost of day old chicks that militate against broiler production in the study area as these have increased the cost of production. Increase in the production level of broiler production will generate more revenue in the future for the farmers. With increased farm size, farmers will be able to break even. It is therefore, recommended that broiler producers should belong to cooperative society to solve the problems associated with absence of credit facilities and other major constraints they encounter.

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