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Original Research Article

Comparative Analysis and Efficiency of Poultry Enterprise in Ezinihitte Mbaise Local Government Council of Imo State, Nigeria

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Abstract

The study was carried out to determine the analysis and efficiency of poultry enterprise in Ezinihitte Mbaise Local Government, Imo State, Nigeria. A multistage sampling technique was used in the selection of 156 respondents. Data were analyzed using descriptive statistics, budget technique and Cobb-Douglas stochastic frontier production model. The result of the study showed that the average age of a poultry farmer in the study area was 43 years with a minimum of secondary school education, 10 years of experience in poultry production and an average family size was 7 members. With an average stock of 396 birds, the gross revenue was ₦ 976,600, the total cost was ₦758,161 and gross margin recorded was ₦87,254. The estimate of the production model revealed that initial stock, medication and feeds were the significant inputs that influenced poultry production. The efficiency estimates of the poultry farmers ranged from 78% and 100% with a mean efficiency of 92.5%. The high cost of feeds, constituted 80% of the total variable cost was identified as the major constraint to poultry production. It is therefore recommended that ways to reduce market price of feeds should be adhered to by relevant agencies of governments.

Keywords: Efficiency, Frontier Function, Poultry Production, Profitability, Stochastic Production

INTRODUCTION

Poultry is a one of the main enterprise in the Nigerian livestock industry. Central Bank of Nigeria (2019) stressed that the poultry enterprise has been the most capitalized agricultural livestock sectors which represents 25% of the agricultural Gross Domestic Product (GDP) contribution to the Nigerian economy. Poultry production comprise of broilers and layers. The poultry production subsector has been very relevant in providing employment opportunities among the subsistence and medium class sector of the Nigerian populace (Aniekan *et al.,* 2020). It has been reported that about 14% of the Nigerian population are involved in poultry farming, mainly on subsistence level (Ameh *et al.,* 2016). Poultry production has also been considered as an important potential source of protein for the teeming Nigerian population, not just because of the prolific tendencies, but also its adaptability to wide range of weather variations. The Nigerian poultry industry has been dimed as highly volatile due to challenges confronting the sector. These challenges include poor growth rate, high price of inputs such as feeds, high incidence of pest and diseases, poor management skills, infrastructural deficits and lack of credit facilities (Ahaotu *et al*., 2019). The cumulative impact of these constraints has limited the development of the sector, in which poultry products are almost always inadequate in supply relative to its demand. Omolayo

(2018) emphasized that the low supply of poultry products relative to its high demand can also be attributed to low returns on investment and poor resource management, hence, the need to raise productivity level through efficient use of resources. A typical poultry farmer in Nigeria is profit oriented where relative income generated are compared to cost of production within the period. Based on the problems mentioned, this study was designed to examine the analyses and efficiency of poultry enterprise in Ezinihitte Mbaise Local Government Council of Imo State, Nigeria. The objectives are to: (i) estimate the gross margin of poultry farms; (ii) examine the input/output relationship in poultry production; (iii) estimate technical efficiency of poultry farms and (v) identify the constraints associated with poultry production in the study area.

MATERIALS AND METHODS

Study Area

This study was carried out in Ezinihitte Mbaise Local Government Area of Imo State. Ezinihitte Mbaise Local Government Area falls within Latitudes 7°25' N and 9°20' N and Longitudes 5°45'E and 7°39'E of the Equator. According to FDLPCS, (2003), the projected population for the Ezinihitte Mbaise Local Government Area in 2013 is 759,829 with a growth rate of 9.3%.

The Ezinihitte Mbaise Local Government Area has two distinct seasons, namely the rainy season (which begins around March and runs through October) and the dry season (which begins from October and ends in March). However, within these seasons is a brief harmattan season that is occasioned by the north east trade winds and the attendant dust haze, increased cold and dryness. The rainy season begins from April and ends in October of each year during which daytime temperatures reach 28°C - 30°C and night time temperatures are between 22°C - 23°C. In the dry season, daytime temperatures can soar as high as 40°C while night time temperatures can drop to 12°C.

Economic activities in Ezinihitte Mbaise Local Government Area are varied including agriculture. Major crops grown include millet, corn, sorghum, rice, yam, cassava, plantain, groundnut and cowpea. Livestock production activities such as cattle, sheep, and goats, chicken, duck and pig, catfish are also important economic activities.

Data were collected on such variables like socio-economic characteristics of the farmers, input quantities and prices, output quantities and prices, as well as constraints to poultry enterprise. Descriptive statistics and budget technique tools were used in achieving the objectives such as gross margin, operating ratio and farm income were used for achieving objective i. Objectives ii, iii and iv. These were achieved using CobbDouglas stochastic frontier production model. Generally, the measurement of efficiency can be done either through classical or frontier approach. In poultry production classical approach simply compares total output (meat or egg) to total cost, while the frontier method identifies efficient farms as any farm operating on the production frontiers that generates more profits (Ogba *et al.,* 2020).

Efficiency of poultry production was estimated using Cobb-Douglas Stochastic Production function. The stochastic frontier production functions have been considered very useful as it is used to measure not only technical efficiency sources in production but also the impact of measurements of errors not considered as inherently related to production (Battese *et al.,* 2004). This model was developed and used by (Bravo-Ureta *et al*., 2020; Kumbhakar and Tsionas, 2021). Technical efficiency of a production is the achievement of maximum possible output for a given quantity of inputs in view of the physical production relationship (Bamiro and Shittu, 2009). Therefore, a farm is said to be inefficient if more output could still be produced from the current level of input (Osinowo and Tolorunju, 2019).

The efficiency of a specific farm is the ratio of observed farm output to the corresponding frontier potential output of that farm given the available Technology (Ojo, 2003) TE= Y*i / Yi = f (Xi; β) exp (Vi-Ui) (4) F (Xi; β) exp Vi TE= f exp (Ui) Model Specification: The SFP function of poultry production was assumed to have the following specification according to Osinowo and Tolorunju (2019): $\ln Yi = \ln\beta 0 + \beta_1 \ln X1i + \beta_2 \ln X_2 i + \beta_3 \ln X_3 i + \beta_4 \ln X_4 i + \beta_5 \ln X_5 i$ Vi – Ui---(5) Where; ln = natural logarithm to base e, Yi= body weight of poultry in kg of the ith farm, β_0= constant term, β_1-β_5= vectors of the unknown parameters to be estimated, While Xs represents the independent variable input bundles used by ith poultry farmer during the production and is defined as follows: X_1 = initial stock (number of day-old chicks) X_2 = feeds in kg X_3 =medication in litre X_4= labour in man-day X_5=water in liter Vi = independent random errors which are assumed to identically distributed with a zero mean and constant variance (0, σv2). Ui= variation arising from technical inefficiencies of the farmer.

RESULTS AND DISCUSSION

The result in table 1 showed the descriptive statistics of some of the key variables employed in the analyses. The minimum initial stock of the birds in the study area was 40 birds, while the maximum was 4,000 birds. The mean of initial stock was 390 birds with a standard deviation of about 520 birds. This confirmed that poultry enterprise in study area was largely operated as a small-scale farm (Omotosho and Oladele, 1988). These authors further stated that poultry farms with less than 1,000 stocks are classified as small-scale enterprise. For the final stock, the minimum of 101 kg of the total stock weight was

Table 1. Descriptive statistics of the variables.

Variables	Minimum	Maximum	Mean	Standard deviation
Final stock (Kg)	101	27000	1297.00	2891.70
Initial stocks (No)	40	4000	390.00	520.00
Feed (Kg)	262	66000	5010.00	9170.39
Medication (liter)	8	3400	361.85	394.42
Labour (man-day)	45	270	77	38
Water (liter)	65	41000	2188	5874.37
Age (year)	25	60	43	6
Education (year)	2	16	14	4
Experience (year)	1	30	10	7
Household size (No)	1	19	7	5

Table 2. Cost and returns per 390 birds per production cycle

Variable	Av. Quantity Price (₦)	Average Unit (₦)	Av. Cost/Ave Revenue Cost	% of Total Variable
A) Output Body Weight at Maturity (Kg)	1298	1361	967,600	GR= ₦ 967,600
B) Variable Inputs				
Initial Stock (No)	390	427	169,092	10.2
Feed (Kg)	5011	253	1,267,783	76.3
Medication (liter)	362	491	177,742	10.7
Labour (man-day)	77	449	34,573	2.1
Water (L)	3,688	3	11,064	0.7
TVC= ₦758,161				
C) Profit GM=₦106,324				
IRT=1.06				

identified, while the maximum was 27,000 kg. The mean of total weight of the final stock was 1,297kg which determined its market value. The minimum kilogram of feeds within the production cycle was 262kg; the maximum was 66,000 kg, while the mean was 5,010kg. The minimum quantity of medication applied throughout the production cycle was 8liters, while the maximum was 3,400 liters.

The minimum labour utilization in poultry production was 45 man-days while the maximum was 270 man-days. The mean labour was 77 man-days with a standard deviation of 38 man-days. The minimum water utilization by the birds within the production cycle was 65liters, while the maximum water usage was 41,000 Liters. However, the mean water use by the birds as identified in the study area was 2,188 Liters. In the case of farmers' characteristics, the average age of poultry farmers was 43 years, which implies that the farmers that were engaged in poultry farming were within their productive age bracket.

On the average, this suggests that the farmers had sufficient energy to cope with the demands of poultry farming. This relates with a previous study that stated that the majority of poultry farmers had a mean age of 45 years (Omolayo, 2018). The average poultry farmers in the study area attended tertiary education with about 14 years of education. This high literacy level afforded them the opportunity to independently acquire better skills in the management of poultry farming. The 10 years of farming experience, on average, suggests that the farmers in the study area were well experienced in poultry farming. The mean household size of seven could be of help in the provision of family labour.

Comparative Analysis Table 2 above shows average revenue and the associated cost of the production for poultry in the study area. The average revenue earned from the production of 390birds was ₦ 967,600 while the associated average cost incurred in the production was ₦758,161, which implies that the gross margin was ₦87,254. This implied poultry farming is profitable enterprise in the study area. In the cost analysis, cost of feeds has been identified as the highest cost of production in the study area as it was made of 76% of the total variable cost of production. Adewale *et al*., (2018), indicated that the vital factor that constituted the highest cost to poultry production was cost of feed.

Input and output Relationship

Table 3 indicates the results of the maximum likelihood estimates of the frontier production function for poultry

Table 3. Maximum likelihood estimation (MLE) of the poultry production function

Variable	Parameter	Coefficients	Std. Error	t-ratio
Constant	β_0	0.953	0.394	2.418**
Initial stock (number)	β_1	0.633	0.115	5.495***
Medication (liter)	β_2	0.105	0.036	2.951***
Feeds (Kg)	β_3	0.209	0.081	2.591***
Labour (man-day)	β_4	-0.056	0.123	-0.451
Water (Litre)	β_5	0.017	0.039	0.435
Return to Scale =	1.90			

*** Significant at 1%; ** significant at 5 %

Table 4. Efficiency distribution among poultry farmers

TE class	Frequency	Percentage (%)
≤80	5	3.2
81-90	50	32.8
91-99	100	95
6	60.2	3.8
Total	156	100
Mean		0.93
Standard deviation		0.06
Minimum		0.78
Maximum		1.00

farming in the study area. Three variables namely initial stock, feeds and medication were highly significant at 1%, which indicates that increasing the use of these inputs favour production of birds. With 1% increase in feeds, birds output and body weight of tested animals increased by 0.21%.

Similarly, 1% increase in medication favours birds output by 0.11% while 1% increase in the number of stocks increased output by 0.63%. Disease control, feed intake and flock size are key determinants of output level in poultry production (Adesiyan, 2014 and Ahaotu *et al*., 2020). Return to scale analysis showed that poultry production in the study area was characterized by increasing return to scale.

Efficiency scores

The distributions of the efficiencies of the farmers are presented in Table 4. The results indicated that the technical efficiency scores range between 78% and 100%. The mean efficiency score was 93%. 93% of the respondents were within the efficiency range of 81%-99%. The findings suggested that an average poultry farmer in the study area could increase poultry production by about 7% given the existing production technology. Only about 4% of the poultry farmers in the study area were producing at efficiency of 100%. The general distribution of the efficiency scores of the poultry farmers in the study has a standard deviation of 0.06.

The results in Table 5 showed that the socio-economic variables included in inefficiency effect model could not explain satisfactorily the behaviour of poultry farmers in relation to the efficiency of resource management in the study area as none of these variables was significant. However, the sigma squared parameter for the birds was 0.152 ($p<0.01$) level of probability. This is an indication of goodness of fit and correctness relative to specified in the poultry farmers estimated model. However, the value of Gamma parameter was very small and insignificant and could be interpreted to mean the differences between frontier output and real (observed) output was not due to technical inefficiency.

Constraints faced by poultry farmers Table 6 showed the constraints faced by poultry farmers in the study area. High cost of feeds was considered as the most severe of all the constraints in the study area. This confirmed with the findings of this research in which the cost of feeds alone was identified to account for over 70% of the total variable cost. This also agreed with the findings of (Otu *et al.,* 2021). Similarly, Mbachu *et al.,* (2023) identified high cost of feeds as the most constraint identified by the poultry farmers. High mortality rate was ranked the second constraint and incidence of diseases was ranked third. This is followed by high cost of medication. Mortality in poultry farming has a close correlation with inadequate control of diseases due to lack of proper medication and poor skills in handling birds. Lack of adequate skills and training was responsible for high mortality in poultry farming (Ezeano and Ohaemesi, 2020).

Table 5. Determinants of technical inefficiency

Variable	Coefficients	Standard error	t-ratio
Constant	0.202	0.849	0.238
Age of farmers	-0.080	0.253	-0.314
Years of experience	-0.102	0.077	-1.333
Education level	0.115	0.081	1.410
Household size	0.0481	0.0749	0.6427
Sigma squared	0.152	0.017	9.167***
Gamma	0.001	0.001	0.753

*** Significant at 1%; ** Significant at 5%; *** Significant at 10%

Table 6. Constraints faced by poultry farmers in the study area

Constraints	Frequency	Ranking
High cost of feed	104	1st
High Mortality rate	46	2nd
Incidence of diseases	23	3rd
High cost of drugs	09	4th

CONCLUSION AND RECOMMENDATIONS

Poultry farming in Nigeria is a profitable enterprise as average gross margin was ₦87,254 per 390 birds, but at the same time ascribed as low in return investment. Three variables (initial stock, feeds, and medication) were highly significant influencing the output of poultry farmers. On farm efficiency, an average poultry farmer in the study area could further increase efficiency-gap of poultry enterprise by 7% given the existing production technology. The high cost of feeds, which constituted 70% of the total variable cost, was identified as the main constraint to poultry production as well as profit limiting factor. It is therefore recommended that initiatives that could reduce market price of feeds. This would not only boost profitability but also encourage enterprise expansion for greater output thus bridging the gap between demand and supply of poultry products.

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