

ASSESSMENT OF TECHNICAL EFFICIENCY OF BROILER FARMS IN KWARA STATE, NIGERIA.

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Abstract

This study examined the Assessment of Technical Efficiency of Broiler Farms in Kwara State, Nigeria. A three-stage sampling technique was used to select the sample. Structured questionnaire was administered to one hundred and twenty broiler farmers in the study area. The data was analysed using descriptive statistics, farm budgetary technique and stochastic frontier production function. Evidence from the results revealed that net farm income was ₦151,443.12 and a gross margin of ₦173,631. Evidence from the stochastic frontier production function revealed that the coefficient household size ($P < 0.05$), household type ($P < 0.05$) was statistically influenced broiler farmers production. Also, the source of light ($P < 0.01$) and age ($P < 0.01$) were positively and significant determinants of technical efficiency. Based on the findings in this study it is recommended that necessary measure must be taken to educate the farmers on the efficient use of various factor inputs particularly feed, through the dissemination of information to them by farmers group or extension services. Also, provision of credit facilities to farmers to enable them scale their production and integrate other agribusiness units to the production, improving the welfare of the farmers and the general welfare of the society through the creation of areas for employment and extending trade.

Keywords: Technical efficiency, Broiler's production, Stochastic frontier, Kwara State.

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Introduction

In Africa, agriculture is the major occupation of livelihood for many rural dwellers. This is generally due to the greater number of people living in rural areas and the distinct infrastructure put in place in these areas especially in Nigeria (Evelyn, Isaac and Nanii, 2019). The agricultural sector in Nigeria holds a share of about 36.5% of the labour force while contributing 24.14% to the country's Gross Domestic Products [GDP] (Ministry of Food and Agriculture, 2017). The development of poultry production has shown a growing importance among small and medium-scale farmers residing in these rural areas (Milkias *et al.*, 2019). Chickens originated from Jungle Fowl in South Eastern Asia around 3200 BC (Farran and Zayed, 2009). Chickens were domesticated and spread to China, India, Africa, Pacific Island, and Europe. The main use of chickens has never changed. They were primarily raised for

human food while in some societies, chickens were used in cock fighting as a source of entertainment and income, mostly in Asia. Moreover, their feathers were used for making cushions and litter for fertilizers (Ali and Riaz, 2014). The importance of poultry sector to the national economy cannot be ignored, as it has large contribution towards earning foreign exchange.

Chickens are the most popular poultry worldwide (Hirwa *et al.*, 2019). The birds are among common livestock species reared in rural areas (Goraga *et al.*, 2018). Milkias *et al.* (2019) notes that the global poultry population is approximately 16.2 billion, of which 71.6% is found in developing countries. Major exporter of broiler are Brazil, United State, Europe Union, Thailand and China with the export stock of 3665.00, 3030.00, 1150.00, 570.00 and 430.00 ('000' MT) respectively (USDA, 2015). While in the race of import, Japan is leading followed by Saudi Arabia, Mexico and Iraq with the import stock of 895.00, 790.00, 760.00 ('000' MT) respectively (USDA, 2015).

According to Emmanuel and Cletus (2021), the potential of broiler farmers to contribute to employment creation, income generation, poverty reduction and food security, is adversely affected by low revenue and profit in broiler farm enterprise resulting from high prices of broiler feeds, drugs, utilities; high interest rates from the financial institutions and low broiler prices due to market structure in terms of high competition.

In addition, broiler farming is constrained by lack of improved poultry farming skills and technology; inadequate input use, small flock sizes, and outbreak of diseases. The effect of these factors is cantered on reduced production capacity, low productivity, high operation costs and low profitability index of smallholder broiler enterprises.

Also, the production system has to be optimum if Nigeria is to meet her domestic requirements for broilers. Hence, production requires the efficient use of scarce farm resources. Efficiency in resource allocation is at the heart of agricultural production because output can be expanded and sustained by farmers through efficient use of resources. The efficiency with which farmers use resources and improved technologies available to them is important in the Nigerian poultry production, more so that agriculture is generally characterized by low productivity and coupled with the post opening of all the borders with the fact that Covid- 19 is subsiding gradually and effectively. The implication is that there is scope for additional increase in output from existing pen, if resources are properly harnessed and efficiently allocated (Rahji, 2005). Production efficiency remains an important focus for empirical investigation particularly in developing economies where majority of the farmers are resource-poor. Production efficiency includes allocative efficiency, technical efficiency and economic efficiency.

According to Boubakar and Abner (2000), the stochastic production function can be defined as the structure of technology of production or deterministic production frontier, and by the external factor to the production process. The combination of both yields the stochastic production frontier. It assumes that part of the deviation from the frontier is due to random events (indicating measuring errors and statistical noise) and also due to firm specific inefficiency (Coelli *et al.*, 1998). It furthers decomposes the error term into a two-sided random error that captures the random effects outside the control of the firm (the decision-making unit) and the one-sided efficiency component.

Consequently, there have been series research that the use of parametric approach to estimate farm level efficiency in developing countries such as in literature. Bravo- Ureta and Pinheiro (1993) present a comprehensive review of the literature on the uses of different parametric approaches (deterministic and stochastic) to measure the efficiency of different farms. These authors established that there is considerable room to increase agricultural output without using additional inputs, giving existing technology. The technical efficiency of small farms in developing countries is positively related to the farmers' level of education, farming years of experience, the ratio of extension agents to the farmers, availability and accessibility of credit or loans, farm size. Most of the inefficiencies identified in these set of studies relate to absence in certain places or the lack and lag of access of some parts of the population of these external resources.

Formulating sound policies on improving productivity and efficiency within the agricultural sector in Nigeria particularly in poultry industry through agricultural analyses requires a good knowledge of the current efficiency or inefficiency levels between these broiler farmers as well as factors responsible for these levels.

Objectives of the study

The main objective of the study is to assess the technical efficiency of broiler farms in the study area while the specific objectives are;

1. Estimate the cost and returns of selected broiler farms in the study area.
2. Estimate the technical efficiency of the broiler producing farms in the study area.
3. Determine the factors affecting efficiency of the farm in the study area.

Methodology

Area of Study

The study was conducted in Ilorin, Kwara state. The state was created in 1967 and is made up of 16 Local Government Areas (LGAs), Ilorin city comprises of three major LGAs/regions namely; Ilorin West, Ilorin East, and Ilorin South.

Sampling Technique

Purposive sampling was used to select Ilorin Metropolis, because of predominant broiler farmers in the area. Three stage sampling technique was used to select target respondent (broiler farmers). In the first stage three (3) Local Government Areas (LGAs) noted for broiler farmers in Ilorin. These are Ilorin East, Ilorin West and Ilorin South LGAs. The second stage involved a random selection of three villages from each local government which are: Agbabiaka, Apado and Oke-Oyi in Ilorin East, Gaa-Saka, Budu-Nuru and Osin Aremu in Ilorin West, Gaa- Osidi, Oke-Foma and Fufu in Ilorin South. The third stage involved random selection of broiler farms from the selected villages. A sampling frame was made based on the list gotten from the Kwara State Ministry of Agriculture and Natural Resources. In all, a total of 120 farms were selected.

Method of Data Collection

Primary data was used for the study. The data were obtained with a semi-structured questionnaire using interview schedule; the questionnaire was used to collect information on the socioeconomic characteristics of broiler farmers. Purposive and three-stage random sampling techniques were used to obtain the relevant data.

Analytical Techniques

The different tools used in analysing the collected data includes; Descriptive analysis, Gross Margin and Stochastic Frontier Production Function.

Descriptive Analysis

Simple descriptive statistics like mean, percentage, frequency distribution was used to achieve objectives (i). These was used to analyse questions on socioeconomic characteristics of the farmers.

Gross Margin Analysis

Gross profit is the revenue remaining after deducting all costs relating to the sale of those goods. Gross margin was used to calculate the returns of the producers. The gross margin represents the percent of total sales revenue that the company retains after incurring the direct costs associated with producing the goods and services it sells. Gross Margin is expressed as

$$GM = TR - TVC$$

Where, GM= Gross Margin

TR= Total Revenue

TVC= Total Variable Cost of Production

Stochastic Frontier Production Function

This analytical tool will be used to determine the efficiency of resource used in layer farms drawing from equation (1), the production technology of broiler producers was assumed to be specified by the Cobb-Douglas Frontier production function (Tadesse and Krishnamoorthy, 1997), which was defined as:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + (V_i - U_i) \text{ ---- (9)}$$

Where:

$\ln$ = Natural logarithms

Y = Value of broilers outputs (value for broilers and spent/culled broilers) (#) 40

X_1 = Farm size (number of birds)

X_2 = Veterinary service (Naira)

X_3 = Feed (kg)

X_4 = Labour (Man-days)

X_5 = Utilities and other expenses (made up of electricity, water supply, litter, transportation in Naira)

$\beta_1 - \beta_6$ = coefficients of parameters estimated.

β_0 = intercept. V_i and U_i are as defined in equation (1). Based on equation (9), equation (10) was specified as below to enable the identification of the factors which influence

$$TE. U_i = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + \alpha_6 Z_6 + \alpha_7 Z_7 + \alpha_8 Z_8 + \alpha_9 Z_9 + \alpha_{10} Z_{10} \text{ -- (10)}$$

Where:

U_i = Technical inefficiency as previously defined

Z_1 = experience (years)

Z_2 = Marital status (MS = 1 for single, MS = 2 for married and 3= divorce)

Z_3 = Gender of farmer (sex = 1 for male and sex = 0 for Female)

Z_4 = Family size (number)

Z_5 = Education Level (Number of years of schooling)

Z_6 = Years of experience (Years of broiler farming)

Z₇ = Number of extensions contact in a production cycle.

Z₈ = Access to credit (CA = 1 for access to credit and CA = 0 Otherwise).

Z₉ = Membership of poultry association (1= member & 0 = Not member)

Z₁₀ = Availability of market outlets (1= yes & 0=no)

Results and Discussion

Table 1: Socio-economic characteristics Distribution of Respondents

Variables	Frequency	Percentage	Mean
Age			
18 – 25	14	12.3	40.5
26 – 35	30	24.8	
36 – 45	44	36.4	
46 – 55	18	14.9	
>55	14	11.6	
Sex			
Male	71	59.2	
Female	49	40.8	
Marital status			
Single	29	24.2	
Married	69	57.5	
Divorced	22	18.3	
Education level			
No formal Education	8	6.7	
Primary	10	8.3	
Secondary	29	24.2	
Tertiary	73	60.8	
Household size			
1 – 5	30	25.0	7.29
5 – 10	65	54.2	
10 – 15	12	10.0	
15 – 20	11	9.2	
20 – 25	2	1.7	
Primary occupation			
Farming	66	55.0	
Civil Servant	49	40.8	
Others	5	4.2	
Farming experience			
1 – 5	30	27.5	8.0
6 – 10	38	31.7	
11 – 15	27	22.5	
>16	22	18.3	
Extension contact			
None	40	33.3	
1 – 4	42	35.0	
4 – 8	23	19.2	
>9	13	10.8	

Age of birds obtained

Day old	79	66.4
Four weeks	40	33.6

Source: Field Survey, 2021

Table 1 shows some socioeconomic characteristics of broiler farmers in the study area. The mean age of broiler Farmers was 40.5. This is a clear indication that they were young farmers based on average life span of 54.5 for Nigeria (World Health Organization, 2015).

Distribution of the respondents according to their sex shows that the majority (59.2%) of them were of the male gender. This agrees with the findings of Nathaniel *et al.* (2015) that majority of broiler farmers in selected areas of Ilorin were males.

The majority (60.8%) of the broiler farmers had tertiary education. This shows that farmers possess the basic education to understand the implications of accepting new technologies (Issa *et al.*, 2016).

Distribution of the respondents by household size of the respondents reveals that the majority (54.2%) of the farmers had household size ranges 10 - 15. This agrees with the findings of Sadiq *et al.* (2013) who noted that majority (70%) of the respondents have household size ranging from 1-10 persons. According to Ozor and Cynthia (2010), a fairly large family size implies more family labour available for the household farm activities and can serve as hired labourers in another farm which helps to increase household income.

More than half (57.5%) of the broiler farmers were married. This implies that married people concentrate on broiler farming probably to provide food for their family members. This finding is similar to that of Issa *et al.* (2016) who found that majority of the farmers were married.

The results further show that the majority of the respondents had been in the business between 6-10 years with the mean years of experience of 8.0, the implication is that most of the farmers were knowledgeable in the business Isito *et al* (2017).

About 66% of the respondents get their birds at day old; this is common among most poultry producers as most of the producers might engage in forward contracting to sell their birds at 8weeks of age to eateries, hotels, restaurants, with about 34% only getting the broilers at 4weeks of age.

Table 2: Cost and Returns of Broiler Production

Variables	Average cost (in Naira)
Number of Birds	120
Total Revenue (A)	363,542.0
Total Variable Cost (B)	189,910.21
Cost of birds	88,158
Pen Rent cost (Storage)	4,542.883
Cost of feed	63,582.5
Electric (materials)	4,192.667
Drugs and vaccines	6,662.158
Labour	16,032.58
Transportation	4,542.883
Others	2,196.5417
Total Fixed Costs (C)	22,788.64
Repairs	4,881.617
Tax	4,540.833
Others	13,366.19
Total Cost (B+C)	212,698.85
Gross Margin(A-B)	173,631.79
NFI(GM-C)	151,443.12

Source: Author's Computation (2021)

The table 2 above shows the result of the cost and return analysis of the sampled broiler farmers. The mean of the total revenue of the sampled farmers in naira is computed to be greater than the mean total of the total cost of production giving a positive gross marginal value which means that poultry production in the study area is worthwhile. The total variable cost includes the cost of birds, cost of pen rented, cost of feed (which constitute most cost in poultry production), and electric materials such as bulb, cost incurred on drugs and vaccine, cost of labour hired, cost of transportation and other miscellaneous costs. The estimation of gross margin is given as; *Gross Margin = Total Revenue (in naira) – Total Variable Costs*

A gross margin of ₦173, 631.79 was obtained on average from broiler production by the sampled respondents. Although poultry production is profitable in the study area but can however be improved through efficient financing. The profitability is computed as;
Net Profit = Gross Margin – Total Fixed Costs

The net profit is ₦151,443.12.64, the result shows a sum of profit of ₦0.91 can be obtained with a unit increase in the production capacity.

Profitability = Total Revenue / Total Variable Cost
 Profitability = 363,542.0/189,910.21 = ₦ 1.91

Table 3: Technical Efficiency of the Broiler Production Farms

Variables	Coefficient	Std. Err.	Z	P> z
Labour	0.0006***	0.0001	9.52	0.000
Feed	-0.0013	0.0008	-1.63	0.682
Stocked birds	1.0993	0.1990	5.52	0.042
Drugs/Vaccine	0.0052***	0.00002	295.42	0.000
Electricity	0.0071***	0.0085	8.27	0.001
Constant	-0.8382	0.2919	2.87	0.000
Sigma_u	3.9464	1.3033	3.03	0.002
Sigma_V	1.1900	8.2600	0.14	0.885
Lambda	3.3103	1.3033	2.54	0.061
Return to Scale	1.1108			

Maximum Likelihood Estimates and Inefficiency Function

Access to credit	0.4647***	0.3046	1.53	0.127
Light source	0.3034	0.1149	2.64	0.008
Broiler type	-0.0691	0.1118	-0.62	0.537
Level of education	-0.0197	0.1501	-0.13	0.895
Household size	-0.0024**	0.0314	0.08	0.039
Farming experience	0.0300	0.1167	0.26	0.797
Age (in years)	0.1966*	0.1231	1.60	0.100
Housing type	-1.5714**	0.1418	-1.11	0.028
Constant	-1.7054	1.3252	-1.29	0.198

***, 1% Significance level; **, 5% Significance level; *, 10% Significance level;

Source: Author's Computation (2021)

From result of technical efficiency analysis, the priori expectation for the production factors that contributes to the efficiency of the production is expected to have a positive coefficient.. The result from Table 4 shows that factors such as Labour, Number of stocked birds, Quantity of vaccines, Amount spend on electricity or lightening significantly contributes to the technical efficiency of poultry production in the study area. However, the result shows that the quantity of feeds used for the production is not at the efficient level. This is in line with the findings of Hadi *et al.*, (2018) and Ahiale *et al.*, (2019)

Broiler type raise, level of education, household size, housing type and the constant. The source of light, household size, age (in years) and housing type are significant at 1%,5%, 10% and 5% levels respectively. However, access to credit, the type of broilers, level of education, and farming experience are not significant. The source of light for the management of the birds is significant at 1% level, with a positive coefficient of .30339. This implies that the light management of the birds is at the inefficient level hence the need for improvement for optimal productivity. The household size is significant at 5% level with a negative coefficient of -.0023967.

This implies that the household size contributes significantly to the technical efficiency of the poultry farms through the use of family labour in some of their activities. Housing type is also significant at 5% level, with a negative coefficient of -1.571426. This implies that the type of

housing used for the farmer's broiler production significantly contributed to the technical efficiency of the production. This is line with Zaman *et al.*, (2018)

Table 5 shows the elasticity of production for each of the variable inputs. It was revealed from the summation of the values (1.1108) that poultry production in the study area was in the positive increasing return to scale. Based on the return to scale of 1.1108, poultry production in the study area is in the first part of stage ii of production region i.e., rational or efficient stage of factor usage in the area. Each additional unit of input results in a more than proportionate increase in output than the preceding unit. This is line with Emokaro and Emokpae (2014).

Table 4 Elasticity of the production

Variables	Elasticity
Labour	.0005779
Feed	-.001322
Stocked birds	1.099346
Drugs/Vaccine	.0051517
Electricity	.0070596
RTS	1.110813

Source: Author's Computation (2021)

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Conclusion and Recommendation

Technical efficiency and profitability are maintained by the broiler farmers with respect to most of their various total inputs, as they are operating in the stage II of the production function with the major limitations to attain efficiency in the production being the inadequate availability of marketing outlet and water for the production processes. Education of the farmers on the efficient use of various factor inputs particularly feed, through the farmers group or extension services. Provision of credit facilities to farmers to enable them scale their production and integrate other agribusiness units to the production, improving the welfare of the farmers and the general welfare of the society through the creation of areas for employment and extending trade.

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