www.idosr.org
©IDOSR PUBLICATIONS
Buba and Offar
ISSN: 2579-079X
International Digital Organization for Scientific Research
IDOSR JOURNAL OF SCIENCE AND TECHNOLOGY 11(2):21-30, 2025.
https://doi.org/10.59298/IDOSR/JST/25/112.213000
IDOSR JST/25/1120000

# Analysis of Economic Efficiency of Broiler Production in Adamawa State, Nigeria

**[1]Buba Saidu and [2]Offar Gwandi**

**[1]Department of Horticultural Technology, Federal Polytechnic, P. M. B. 35, Mubi, Adamawa State, Nigeria**
**[2]Department of Agricultural Technology, Federal Polytechnic, P. M. B. 35, Mubi, Adamawa State, Nigeria**
**Author's email Address: saidubb@gmail.com**

## ABSTRACT

This study examines the analysis of economic efficiency of broiler production in Adamawa State, Nigeria. The specific objectives were to describe the socio-economic characteristics of broiler producers, determine costs and returns to broiler production, determine the technical, allocative and economic efficiencies of broiler production, identify the type of management system that exist in the study area, and identify problems associated with broiler production in the study area. Multistage random sampling technique was adopted to select 240 respondents. Descriptive statistics, gross margin analysis and stochastic frontier production functions were used in analysing the data. Socio-economic analysis revealed that 83.80% were male. 57.90% had age range of 41-50 years with mean age of 43 years. 90.00% were married. 54.20% had household size of 1-6 people the average household size is 6 persons. 77.50% had one form of education or the other. 34.60% had farming experience of 7-9 years with mean rearing experience of 7 years. 58% sources their chicks from industry. 47.90% had extension contact. 59.60% depend on their personal savings. Gross margin analysis indicates that, the average gross margin per broiler was ₦3,253.88. The net farm income per bird was ₦2,890.04. The rate of return on every naira invested was found to be ₦0.60. The stochastic frontier production function analysis showed that stock size was statistically significant at 1%. Feeds is positive and statistically significant at 5%. Family labour was positive and statistically significant at 1%. The inefficiency model shows that age and household size are significant at 1%. Sigma squared was 0.0670 and statistically significant at 1%. Gamma value was 0.7999. Stochastic frontier cost function analysis revealed that, cost of day-old chicks, feeds, cost of housing and cost of hired labour were statistically significant at 5%. The estimate of sigma squared was 0.0694 and is significant at 1%. Gamma value was 0.8335. The computed mean technical efficiency was 58.29% while the minimum and maximum efficiencies were 29.17% and 99.99% respectively. The mean allocative efficiency was 48.27% and the minimum efficiency was 10.17%, while maximum efficiency was 99.64%. The economic efficiency had 71.11% and 99.92% as minimum and maximum efficiencies with the mean economic efficiency of 84.53%. Majority 98.70% of the respondents adopt the method of deep litter. 91.67%, 77.08%, and 70% indicated that they experienced great constraints due to Inadequate and high cost of feeds, Inadequate capital, and Inadequate extension services respectively

**Keywords:** Adamawa State, Broiler, Economic, Efficiency, Poultry

## INTRODUCTION

Poultry are domesticated birds kept by humans for their eggs, meat or feathers. These birds are most typically members of the super order Galloanserae (fowl). Chickens are medium-sized, chunky birds with an upright stance and characterised by fleshy red combs and wattles on their heads. Males, known as cocks, are usually larger, more boldly coloured, and have more exaggerated plumage than females (hens). Chickens are gregarious, omnivorous, ground-dwelling birds [1]. Today's domestic chicken (*Gallus gallus domesticus*) mainly descended from the wild red jungle fowl of Asia, with some additional input from grey jungle fowl. Since then, the keeping of chicken has spread around the world for the production of food with domestic fowl being a valuable source of both eggs and meat [2]. Livestock productivity in Nigeria is low. The low productivity has negative implication on the economy. For instance, the country is unable to meet its domestic demand and had to rely on illegal importation of 70% of its poultry needs. The difference between domestic demand and supply is projected to widen in future [3]. Also, it leads to low income levels of households engaged in livestock production and perpetuates vicious poverty cycle. The low productivity of livestock could be attributed to constraints, such as lack of high yielding local breeds, high cost of feed and feed products, poor infrastructural facilities, and inadequate market integration and value chain. Therefore, modernization of the sector and improving the productivity of livestock by addressing the constraints associated with poultry value chains becomes non-negotiable [3]. Nonetheless, when comparing national poultry production figures with the amount of birds, processed and unprocessed, held in these countries, contrasting levels of efficiency become apparent.

The U.S. is the largest poultry producer in the world [4]. However, one of the concerns that some poultry firms have is the potential imbalance between rising U.S. domestic production and stagnant domestic consumption and its detrimental impact on domestic producer prices. This would also have a major ripple effect on prices and overall poultry revenues as domestic consumption accounts for approximately 80% of their production. The broiler industry in Nigeria has undergone a significant transformation since the early fifties, from a backyard, peasant and primitive household-oriented husbandry of in descript breeds of semi-wild chickens, to the cash- oriented, modern and large-scale broiler. It can be said that broiler keeping has become a business in Nigeria. Broiler meat and eggs together provide 0.82 percent of total daily calories consumed on average, close to the regional average. Per capita consumption of broiler meat and eggs increased by 30 percent from 2007 to 2012, reaching 8.4 kilograms per capita in 2012 [5]. Domestic production shows that Nigeria's domestic broiler production has supplied close to 100 percent of the country's consumption, both before and after the 2002 import ban. Nigeria produced 2.61 kilograms per capita of broiler meat and 4.66 kilograms per capita of eggs in 2012. Per capita production rates increased only slightly from 2006 to 2012. The main objective of the study is to analyse the economic efficiency of broiler production in Adamawa State, Nigeria and the specific objectives were to describe the socio-economic characteristics of broiler producers, determine costs and returns to broiler production, determine the technical, allocative and economic efficiencies of broiler production, identify the type of management system that exist in the study area, and identify problems associated with broiler production in the study area.

## MATERIALS AND METHODS

### The Study Area

The study was carried out in Adamawa State of Nigeria. Adamawa State lies between latitude 7° 28'N and 10° 55'N of the Equator and Longitude 11° 30'E and 13° 45' E of the Greenwich Meridian. Mean monthly temperatures in the State ranges from 26.7 °C in the South to 27.8 °C in the North eastern part of the State. The mean annual rainfall ranges from 700mm in the North western part of the State. Dry season lasts for five months (November to March) while the wet season spans from April to October. Adamawa State consists of twenty-one Local Government Areas (LGAs). The major occupation of the people is farming. The major crops grown in the areas include Groundnut, Maize, Sorghum, Rice, Cowpea, Vegetables such as Tomatoes, Spinach, Garden egg, Onion, Sorell/Roselle, and Okra. Fruits such as Banana, Pawpaw, Water melon, Mango and Guava, Livestock such as cattle, sheep, goats, and pigs. Poultry production is also practice in the state especially Chicken (Broilers and Layers), Duck, Pigeon and guinea fowls.

### Sources and Types of Data

The population of the study comprises of broiler farmers in Adamawa State. Data was collected through administration of questionnaires to sampled broiler farmers in the study area. The services of trained facilitators and extension agents of the Adamawa State Agricultural Development Programme (ADADP) (Research Assistant) was deployed to interview and administer the questionnaires under the supervision of the researcher.

### Sampling Technique

A Multistage sampling technique was use for the study. Adamawa State had twenty-one (21) local government areas, divided into four Agricultural zones (ADADP Zoning) that is, Mubi zone, Gombi zone, Mayo-Belwa zone and Guyuk zone. The first stage involves the purposive selection of two local government areas from each zone, based on high concentration of broiler farmers. The second stage include purposive selection of wards from the local government areas based on their broiler production capacity. Third stage involve identifying list of broiler farmers from each ward using the snowball sampling based on concentration of broiler farmers, and the fourth which is the final stage is the random selection of broiler farmers from each ward using Taro Yamane's Sample size determination formula at one percent margin of error [6].

## METHODS OF DATA ANALYSIS

The analytical tools employed include descriptive and inferential statistics.

**Descriptive Statistics:** This involved the use of means, frequency distribution, tables and percentages to describe the socio-economic characteristics of the respondents, describe the type of management system that exist in the study area, and also to identify the problems associated with broiler farmers in the study area.

**Net farm income:** It is an operation leading to the estimation of total costs and return for the production period. The aim of estimating net farm income (NFI) is to compare the profitability of different kinds of enterprise combinations [7]. The net farm income is presented as:

NFI = TR-TC

Where,

NFI = Net farm income

TR = total revenue (GI)/returns to broiler output in naira

TC = total cost (TVC+TFC) in naira

TVC = total variable cost in naira

TFC = total fixed cost in naira

Total variable cost of production (TVC): TVC comprises expenses on feeds, water, hired labour, medication/Vaccine, litter material, Day old chicks, lightning, disinfectants.

Total fixed cost (TFC): land, equipment, generator, houses, and machineries.

**Inferential Statistics:** The empirical stochastic frontier production model was used to determine the technical efficiency of broiler farmers in the study area and is given by:

$$Ln\,Yi = \beta o + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + Vi - Ui$$

Where:
Ln = Natural logarithm
$Y_i$ = Output of broiler per production period (Kg/pp)
$X_1$ = Numbers of Day old chicks per production period (head/pp)
$X_2$ = Quantity of feeds per production period (kg/pp)
$X_3$ = Total quantity of water used per production period (litre/pp)
$X_4$ = Number of family labour used per production period (man-day)
$X_5$ = Number of hired labour used per production period (man-day)
$B_0$ = constant,
PP = Per production period
$\beta_1 - \beta_5$ = suspected non-fixed input variable parameter
Vi = Error occurred due to random sampling,
Ui = Effects of occurred technical efficiency.

The technical inefficiency effect method to be used is based on the technical inefficiency effects model developed by [8]. It is assumed that the technical inefficiency effects are independently distributed and $\mu i$ arises by truncation (at zero) of the normal distribution with mean, $\mu_i$ and variance $\delta^2$, where $\mu_i$ is defined as:

$$\mu i = \delta o + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5$$

Where:
$\mu i$ = Technical inefficiency effect
$Z_1$ = Age of the farmer (years)
$Z_2$ = Sex of the farmer
$Z_3$ = Educational level (years spent in school)
$Z_4$ = Household size [number of dependents (people)]
$Z_5$ = Extension contact (1 if contacted and otherwise 0)
$\delta_0$ = constant
$\delta_1 - \delta_5$ = Variable inefficiency parameters.

**Empirical stochastic frontier cost model:** The empirical model will be used to determine the allocative efficiency of the broiler farmers in the study is given by:

$$Ln\,Ci = \beta o + \beta_1 LnP_1 + \beta_2 LnP_2 + \beta_3 LnP_3 + \beta_4 LnP_4 + \beta_5 LnP_5 + \beta_6 LnP_6 + \beta_7 LnP_7 + Vi + Ui$$

Where:
Ln = Natural logarithm
$C_i$ = Total production cost per production period (₦)
$P_1$ = Cost of day old chicks (₦)
$P_2$ = Cost of feeds in one production period (₦)
$P_3$ = Cost of medication/vaccination in one production period (₦)
$P_4$ = Depreciated cost of housing/building per production period (₦)
$P_5$ = Cost of water per litre in one production period (₦)
$P_6$ = Cost of family labour per production period (₦)
$P_7$ = Cost of hired labour per production period (₦)
$\beta_0$ = constant,
$\beta_1 - \beta_7$ = assumed input variables parameters;
Vi = Error occurred due to random sampling,
Ui = Effects of occurred economic efficiency.

Technical inefficiency effects method was used base on the technical inefficiency effects model developed by [8]. It is assumed that the cost inefficiency effects are independently distributed and Ui arises by truncation (at zero) of the normal distribution with mean $\mu_i$ and variance $\delta^2$, where $\mu_i$ is defined as:

$$\mu i = \delta o + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5$$

Where:
$\mu i$ = Cost inefficiency of the $i^{th}$ farmer
$Z_1$ = Age of the farmer (years)
$Z_2$ = Sex of the farmer
$Z_3$ = Years of formal education
$Z_4$ = Household size (number)
$Z_5$ = Extension contact (1 or 0)
$\delta_0$ = constant
$\delta_1 - \delta_5$ = Variable inefficiency parameters.

## RESULTS AND DISCUSSION

### Socio-economic Characteristics of the Respondents

The results obtained from Table 1 indicated that 83.70% of the broiler producers were male while 16.30% were female. This implies that broiler production is very strenuous and female are not much involved in broiler production. This is in line with the finding of Essay [9], who reported that 80% of the broiler farmers were males, only 20% were female. The high number of male is attributed to hard task out in broiler production process. Majority (57.90%) of the respondents are within the age range of 41-50 years. The mean age was estimated at 43 years. The maximum and minimum age was 60 years and 23 years respectively. The overall result indicated that most of the respondents fall within the active age group (30-50years) and have potential for greater productivity. This study agrees with the findings of [2], which found out that majority (45%) were between the age range of 31-40 years, while 27.5% were between 21-30 years and the average age of the farmers was 38 years [10]. Studied the economics of small scale broiler production in Abuja, Nigeria: Applications of Stochastic Frontier Model and Principal component analysis and revealed that, the socio-economic characteristics of the small scale broiler farmers shows that, about 40.0% of the small-scale broiler farmers were between the ages of 41 and 50 years. This means that most of the small scale broiler farmers were predominantly youth and in their economically active age with a mean age of 41.3 years. Also, the result reveals that 90.00% of the respondents were married with 9.20% singles and 0.80% widowed.. Majority (54.20%) of respondents have at least household size of 1-6 people, the mean household size is 6 persons. This implies that the larger the household size, the more labour force available for farm activities, that is it provides or constitute family labour. Similarly, the study revealed that 23% of the respondents had no formal education, while 77% had one form of education or the other. This result revealed that, highly educated farmers are expected to achieve higher profitability as higher education improves farmer's ability to make better decisions. This agrees with the finding of [11], who reported that majority (80.0%) of the respondents were literate. Furthermore, 34.60% had farming experience of 7-9 years. The mean, minimum and maximum rearing experience of the farmers in the study area was 7 years, 1 year and 20years respectively. Comparable findings were those obtained by [11], who reported significant relationship between farmers profitability with rearing experience. About 40.4% of the respondents got their chicks from market. Also 58.8% of the respondents purchased their chicks from industry, while 0.8% of the respondents got their supply from other broiler producers. because the industry supplied at a good price compared to others. The result reveals that 47.9% of the respondents had contact with extension agents while 52.10% of the respondents had no contact with extension agents. This is an indication that many of the respondents are laggard. The implication is that majority (52.10%) of the broiler farmers have not adopt new innovations which increases production. Majority 59.50% of the respondents depended on their personal savings for broiler production. Only 26.30% of the respondents got loans from the Banks. Minority (3.80%) of the respondents obtained their capital from borrowed source, while 10.40% got theirs from relatives. Farmers with access to finance tend to be more productive due to enhanced ability to purchase inputs and hire labour. The findings agree with [12], who reported that one of the constraints faced by farmers in the production process was limited sources to funds.

**Table 1: Socio-economic Characteristics of the Respondents**

| Variables | Frequency | Percentage | Mean |
|---|---|---|---|
| **Sex** | | | |
| Male | 201 | 83.70 | |
| Female | 39 | 16.30 | |
| **Age** | | | |
| 21-30 | 14 | 5.80 | |
| 31-40 | 58 | 24.20 | |
| 41-50 | 139 | 57.90 | 43 |
| 51-60 | 29 | 12.10 | |
| **Marital Status** | | | |
| Married | 216 | 90.0 | |
| Single | 22 | 9.20 | |
| Widowed | 2 | 0.80 | |
| **Household Size** | | | |
| 1-3 | 39 | 16.30 | |
| 4-6 | 91 | 37.90 | 6 |
| 7-9 | 76 | 31.70 | |
| 10-12 | 26 | 10.80 | |
| 13-15 | 8 | 3.30 | |
| **Educational level** | | | |
| No formal education | 54 | 22.50 | |
| Primary education | 28 | 11.70 | |
| Secondary education | 80 | 33.30 | |
| Tertiary education | 78 | 32.50 | |
| **Rearing experience** | | | |

| | | | |
|---|---|---|---|
| 1-3 | 38 | 15.80 | |
| 4-6 | 74 | 30.80 | |
| 7-9 | 83 | 34.60 | 7 |
| 10-12 | 34 | 14.20 | |
| 13-15 | 11 | 4.60 | |
| **Sources of Chicks** | | | |
| Market | 97 | 40.40 | |
| Industry | 141 | 58.80 | |
| Other Producers | 2 | 0.80 | |
| **Extension Contact** | | | |
| No | 125 | 52.10 | |
| Yes | 115 | 47.90 | |
| **Sources of Capital** | | | |
| Personal Saving | 143 | 59.50 | |
| Loan | 63 | 26.30 | |
| Borrowed | 9 | 3.80 | |
| Relatives | 25 | 10.40 | |
| **Total** | **240** | **100** | |

Source: Field Survey, 2024

**Broiler Production Period of the Respondents**

The distribution of respondents by broiler production period (weeks) is presented in Table 2. The result revealed that 35.80% of the respondents produce their broiler within six weeks. Also 26.70% of the respondents produce one batch of broiler in seven weeks and majority (37.50%) of the respondents produce their broiler in eight weeks. This result agrees with the findings of [13], who reported that broiler producers in an urban and peri-urban area of Zimbabwe, sold their broilers at 5–8 weeks and at a live weight of 1.8–2.5 kg/bird.

**Table 2: Broiler Production Period (Weeks) of the Respondents**

| Production Period (Weeks) | Frequency | Percentage |
|---|---|---|
| 6 | 86 | 35.80 |
| 7 | 64 | 26.70 |
| 8 | 90 | 37.50 |
| Total | 240 | 100 |

**Source:** Field survey, 2024

**Costs and returns of broiler production in the study area**

The result in Table 3. depicts the average costs and returns associated with broiler production per bird in the study area. The result indicated that cost of feed accounted for the largest percent share in total variable cost followed by the cost of day-old chicks. This implies that large amount of money was spent in the purchase of feed and day-old chicks, which are the basic inputs in broiler production. This study is in conformity with [11], who reported that the cost of feeds alone accounted for the largest proportion (59.92%) of the total cost of broiler production, followed by the cost of day-old chicks (29.48%). The total cost of production is ₦5,204.08. The main product that is broiler output is 83,361 birds. The average selling price per bird is ₦7,999.2 and for the by-product that is droppings is 4,015 bags was obtained and the average price per bag is ₦1,846.96. The average gross income per broiler was ₦3,253.88. The Total revenue from broiler rearing comprise of receipts from sale of broilers and droppings (manure) is ₦8,088 per broiler., the net farm income per bird is ₦2,890.04. The return per naira invested was found to be ₦0.60s. This means that 60 kobo is generated on each naira invested on capital in broiler production in the study area. This implies that broiler production in the study area was profitable. This is in conformity with the findings of [14], who reported that broiler production was a profitable enterprise in Ghana broiler chicken industry.

**Table 3: Average Costs and Returns per bird in the Study Area**

| Items | Cost (₦) | Percentage of Total Cost |
|---|---|---|
| **A. Variable Cost** | | |
| Day-Old Chicks | 1,031.12 | 19.84 |
| Feeds | 3,157 | 60.72 |
| Water | 23.88 | 0.46 |
| Medication | 149.4 | 2.87 |
| Litter Material | 92.32 | 1.78 |
| Lightning | 28.88 | 0.56 |
| Hired Labour | 152.36 | 2.93 |
| Family Labour | 16.48 | 0.32 |
| Transportation | 182.8 | 3.52 |
| **B. Total Variable Cost** | **4,840.24** | |
| **C. Fixed Cost** | | |

| | | |
|---|---|---|
| Housing/Building | 141.44 | 2.72 |
| Feeders | 84.68 | 1.63 |
| Drinkers | 120.24 | 2.31 |
| Rake | 1.12 | 0.02 |
| Shovel | 1.68 | 0.03 |
| Wheelbarrow | 7.64 | 0.15 |
| Broom | 7.04 | 0.14 |
| **D. Total Fixed Cost** | **363.84** | **100** |
| Total Cost of Production/Bird | 5,204.08 | |
| Total Revenue (TR)/Bird | 8,088 | |
| Gross Income (GI)/Bird | 3,253.88 | |
| Net Farm Income (NFI)/Bird | 2,890.04 | |
| Return on Naira Invested | 0.60 | |

**Source:** Field survey, 2024

**Stochastic Frontier Analysis**

**Estimate of the Parameters of the Stochastic Frontier Production Function**

The estimates of the parameters of the stochastic frontier production function of the respondents are presented in Table 4.

**Table 4: Maximum Likelihood Estimates of the Stochastic Frontier Production Function**

| Variables | Parameters | Coefficients | Standard-error | t-ratio |
|---|---|---|---|---|
| Production Factors | | | | |
| Constant | $\beta_0$ | 3.6215*** | 0.2792 | 12.9705 |
| Stock size ($X_1$) | $\beta_1$ | 0.0978*** | 0.0067 | 14.4760 |
| Feeds ($X_2$) | $\beta_2$ | 0.2649** | 0.0946 | 2.8008 |
| Water ($X_3$) | $\beta_3$ | -0.1065 NS | 0.0988 | -1.0789 |
| Family labour ($X_4$) | $\beta_4$ | 0.0105*** | 0.0011 | 9.5454 |
| Hired labour ($X_5$) | $\beta_5$ | -0.0183 NS | 0.0750 | -0.2448 |
| **Inefficiency model** | | | | |
| Constant | $\delta_0$ | 0.3669 NS | 0.3886 | 0.9440 |
| Age of farmer | $\delta_1$ | 0.1160*** | 0.0250 | 4.6338 |
| Sex | $\delta_2$ | 0.0915 NS | 0.1035 | 0.8839 |
| Educational level | $\delta_3$ | -0.0130 NS | 0.0171 | -0.7589 |
| Household size | $\delta_4$ | -0.0560*** | 0.0037 | -15.1351 |
| Extension contact | $\delta_5$ | 0.0233 NS | 0.0219 | 1.0660 |
| Sigma squared | $\sigma^2$ | 0.0670*** | 0.0068 | 9.8547 |
| Gamma | $\gamma$ | 0.7999*** | 0.00002 | 39,995 |
| Log Likelihood Function | | 0.9813 | | |

**Source**: Field survey 2024.

***Significant at 1%, ** Significant at 5%, NS Not Significant

The maximum likelihood estimates of the parameters were adopted for this research work because it assumes the presence of inefficiency effects and the study is interested in determining the sources of inefficiency in broiler production. The coefficient for stock size ($X_1$) was 0.0978 which was statistically significant at 1%. This implies that a unit increase in stock size would raise broiler output by 0.09% the stock size affects adoption costs, human capital, and risk perception, significantly contributed to broiler production in Adamawa State, Nigeria. This is similar to the findings of [15], who reported that stock size had positive coefficient and statistically significant at 95% confidence level. The coefficient for quantity of feeds used ($X_2$) was found to be positive (0.2649) and statistically significant at 5%. This implies that a unit increase in feeds usage would raise broiler output by 0.26%. The coefficient of water ($X_3$) was -0.1065 and statistically not significant. This implies that this variable is negatively related to broiler output. The coefficient for family labour ($X_4$) was found to be positive (0.0105) and statistically significant at 1%. The positive coefficient for family labour implies that the amount of family labour used is important in broiler output. The coefficient for hired labour ($X_5$) was found to be negative (-0.0183) and statistically not significant. The negative coefficient for hired labour implies that hired labour was not in efficient used in broiler production. The result of the inefficiency model shows that the coefficient for age and household size are statistically significant at 1% level of probability. The variables of the inefficiency model are explained in the opposite way. The positive sign of age of the broiler farmers in the inefficiency model shows that age increases the technical inefficiency and therefore decreases technical efficiency of the broiler farmers. Which is in line with [15], that the coefficient of age of broiler farmer was negative and significant at 5%, so it's expected that optimism, mental and physical energy required in farming, decreases with age, hence affecting the output of the broiler farmer. On the other hand, the negative sign of household size implies that the variable increases technical efficiencies of the broiler farmers. The result in Table 4 further revealed that the estimate of sigma squared was 0.0670 and statistically significant at 1% level of probability. This

indicates a good fit of the model and the correctness of the specified distributional assumption of the composite error term. Furthermore, gamma value was 0.7999. This implies that 79% variation in broiler output is as a result of differences in technical efficiencies of the broiler farmers.

**Technical Efficiency Estimates of Broiler Production**

The result in Table 5. shows that the mean efficiency of the respondents was less than 100 % hence there is still window for improvement in broiler production. The minimum efficiency level was 0.29, while maximum efficiency was 0.99 with a mean efficiency of 0.58. This result indicates a huge variation in technical efficiencies of the producers. This could be attributed to different management practices adopted by the broiler farmers. The distribution of the technical efficiency for broiler production shows that majority (67.50 %) of them operated above efficiency of 0.50. This is in conformity with the findings of [9], who shows that technical efficiency level of the farmers in the study area ranges from 18.5% to 99.40% and, the mean technical efficiency is 80.70% which indicates that if efficiency of inputs usage is increased by 19.30% (100-80.70), the farmers will be operating on the production frontier. This also indicates that opportunity still exists for the farmers to increase their productivity and income through increased efficiency in the use of existing farm technology.

**Table 5: Distribution of Respondents Based on Technical Efficiency Estimates**

| Efficiency Indices | Frequency | Percentage |
|---|---|---|
| 0.20 – 0.40 | 20 | 8.33 |
| 0.41 – 0.60 | 116 | 48.33 |
| 0.61 – 0.80 | 86 | 35.83 |
| 0.81 – 1.00 | 18 | 7.51 |
| **Total** | **240** | **100** |
| Minimum efficiency | 0.29 | |
| Maximum efficiency | 0.99 | |
| Mean efficiency | 0.58 | |

**Source: Field Survey, 2024**

**Allocative Efficiency Estimates of Broiler Production**

The estimates of allocative efficiency are contained in Table 6. The mean allocative efficiency was 0.85 and the minimum and maximum efficiency were 0.71 and 0.99 respectively. This shows that broiler producers in the study area are allocative efficient. This implies that the sampled farmers were allocative in producing broiler at a given level of output using the cost minimizing input ratio to derive maximum output from inputs used in the production process. This result agrees with the finding of [16], who reported a high allocative efficiency estimate among producers in Delta State.

**Table 6: Distribution of Respondents Based on Allocative Efficiency Estimates**

| Efficiency score (%) | Frequency | Percentage |
|---|---|---|
| 0.70 – 0.75 | 19 | 7.92 |
| 0.76 – 0.80 | 39 | 16.25 |
| 0.81 – 0.85 | 68 | 28.33 |
| 0.86 – 0.90 | 71 | 29.58 |
| 0.91 – 0.95 | 26 | 10.83 |
| 0.96 – 1.00 | 17 | 7.09 |
| **Total** | **240** | **100** |
| Minimum efficiency | 0.71 | |
| Maximum efficiency | 0.99 | |
| Mean efficiency | 0.85 | |

**Source:** Field Survey, 2024

**Economic Efficiency Estimates of Broiler Production**

The estimate of economic efficiency of broiler production in the study area is presented in Table 7. The result showed that the estimate of economic efficiencies differs substantially among the farmers ranging between the values of 0.21 to 0.99 in the study area. The result also revealed that mean economic efficiency is 0.49. This implies that overall efficiency of the farmers can be raised by 0.51. Thus, the total efficiency of the farmers is still below the frontier output boundary.

**Table 7: Distribution of Respondents Based on Economic Efficiency Estimates**

| Efficiency indices | Frequency | Percentage |
|---|---|---|
| 0.20 – 0.40 | 74 | 30.83 |
| 0.41 – 0.60 | 102 | 42.50 |
| 0.61 – 0.80 | 51 | 21.25 |

| | | | |
|---|---|---|---|
| 0.81 – 1.00 | | 13 | 5.42 |
| **Total** | | **240** | **100** |
| Minimum efficiency | 0.21 | | |
| Maximum efficiency | 0.99 | | |
| Mean efficiency | 0.49 | | |

**Source:** Field Survey, 2024

**Estimate of the Parameters of the Stochastic Frontier Cost Function**

The result in Table 8 revealed that the coefficient for the cost of day-old chicks ($P_1$) was 0.0562. and statistically significant at 5% This implies that a 1% increase in the cost of day-old chicks would increase the total cost of production by approximately 0.06%. The result further revealed that the estimated coefficient for cost of feeds ($P_2$) is 0.05 and statistically significant at 5%. This means that the cost of feeds is an important determinant of total cost of production. This corroborates the findings of [16] observed that high cost of feed is the most important limiting factor in the expansion of the poultry industry in Nigeria. Therefore, the cost of feed accounts for 70-80 percent of the total production cost. The coefficient for the cost of medication ($P_3$) was found to be positive (0.0681) and statistically significant. This contradicts the findings of [17]. The coefficient of the cost of housing ($P_4$) is 0.1365 and statistically significant at 5%. Cost of water ($P_5$) and cost of family labour ($P_6$) are statistically not significant with a coefficient of 0.0278 and 0.0130 respectively, while the cost of hired labour ($P_7$) is statistically significant. This means that these factors are important determinants of total cost associated with broiler production in the study area. A 5% increase in cost of hired labour will increase total production cost by 0.01%. The coefficients of age of the farmer is not significant (-0.4468). The coefficients of sex (-0.0243) is statistically significant at 1% and positively related to cost efficiency among the respondents because a negative coefficient implies positive effect on cost efficiency and vice versa. The coefficient of education variable was estimated to be positive and statistically significant at 1% level for the respondents. This means that farmer's cost inefficiency will be increased when his educational status improves. The coefficient of household size is not significant. The coefficient of extension variable was also estimated to be positive and statistically significant at 1% level, indicating that increased extension services to farmers tend to increase cost inefficiency in broiler production. The result in Table 8 also shows that the estimate of sigma squared was 0.0694 and it is significant at 1% level of probability. This indicates a good fit of the model and the correctness of the specified distributional assumption of the composite error term. Likewise, gamma value was 0.8335. This implies that 83.35% variation in total cost of production in the study area is as a result of differences in cost efficiencies of the farmers.

**Table 8: Maximum Likelihood Estimates of the Stochastic Frontier Cost Function**

| Variables | Parameters | Coefficients | Standard-error | t-ratio |
|---|---|---|---|---|
| Constant | $\beta_0$ | 4.0399*** | 0.4045 | 9.9868 |
| Cost of day-old chicks ($P_1$) | $\beta_1$ | 0.0562** | 0.0178 | 3.1652 |
| Cost of feeds ($P_2$) | $\beta_2$ | 0.0503** | 0.0181 | 2.7704 |
| Cost of medication ($P_3$) | $\beta_3$ | 0.0681 NS | 0.0824 | 0.8278 |
| Cost of housing ($P_4$) | $\beta_4$ | 0.1365** | 0.0486 | 2.8124 |
| Cost of water ($P_5$) | $\beta_5$ | 0.0278 NS | 0.0765 | 0.3627 |
| Cost of family labour ($P_6$) | $\beta_6$ | 0.0130 NS | 0.0399 | 0.3262 |
| Cost of hired labour ($P_7$) | $\beta_7$ | 0.0110** | 0.0039 | 2.8166 |
| **Inefficiency model** | | | | |
| Constant | $\delta_0$ | 1.0984* | 0.5080 | 2.1622 |
| Age | $\delta_1$ | -0.4468 NS | 0.3274 | -1.3648 |
| Sex | $\delta_2$ | -0.0243*** | 0.0114 | -21.1325 |
| Educational level | $\delta_3$ | 0.0148*** | 0.0017 | 8.6946 |
| Household size | $\delta_4$ | 0.0807 NS | 0.0411 | 1.9627 |
| Extension contact | $\delta_5$ | 0.0385*** | 0.0022 | 17.5 |
| Sigma squared | $\sigma^2$ | 0.0694*** | 0.0115 | 6.0465 |
| Gamma | $\gamma$ | 0.8335*** | 0.0639 | 13.0502 |
| Log Likelihood Function | | 0.1757 | | |

**Source:** Field survey 2024,

***Significant at 1%, ** Significant at 5%, *Significant at 10%, NS Not Significant

**Management System of Broiler Production**

The result in Table 9. revealed that, all (100%) the respondents adopt the method of deep litter as method of their broiler production. In the intensive production system, the birds are confined to the house entirely with no access to outside confinement and it is usually adopted where land is limited and expensive. In the study area, the broiler farmers use the deep litter methods, because it's easy to construct and manage as it consists of a fixed house, presence of litter on the floor, water absorbent, provide good insulation against heat stress, light in weight, dry rapidly, absorbs minimum of atmospheric water and less expensive. The litter materials include wood shaving, maize cobs, chopped

straws and groundnut hulls. This is in line with [14] reported that, in poultry production, the intensive production system is the most commonly used in the developing countries.

**Table 9: Distribution of Respondents according to System of Management**

| System of Management | Frequency | Percentage |
|---|---|---|
| Deep Litter System | 240 | 100 |
| Battery Cage System | 0 | 0.00 |
| **Total** | **240** | **100** |

**Source:** Field survey, 2024

### Problems to Broiler Production in the Study Area

The resultt revealed that majority of the broiler farmers, 91.67%, 77.08%, 70%, 37.50% and 32.50% indicated that they experienced great problems due to inadequate and high cost of feeds, inadequate capital, inadequate extension services, inadequate veterinary services and high cost of day-old chicks. Similarly, the study is also agreeing with [11], who observed that the problems of high feed cost, high cost of day-old chicks, high labour cost, high cost of medicine, mortality, diseases, miscellaneous charges, inadequate veterinary services, ranked 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, and 8th respectively.

**Table 10: Distribution of the Respondents According to Problems to Broiler Production**

| | Problems | Great Problems (%) | Slight Problems (%) | No Problems (%) | Ranking |
|---|---|---|---|---|---|
| 1. | Inadequate and high cost of feeds | 220 (91.67) | 15 (6.25) | 5 (2.08) | 1st |
| 2. | Pest and disease incidence | 21 (8.75) | 71 (29.58) | 148 (61.67) | 14th |
| 3. | Inadequate capital | 185 (77.08) | 37 (15.42) | 18 (7.50) | 2nd |
| 4. | Poor pricing of broiler | 35 (14.58) | 100 (41.67) | 105 (43.75) | 12th |
| 5. | High cost of vaccines/medication | 72 (30) | 99 (41.25) | 69 (28.75) | 7th |
| 6. | High cost of day-old chicks | 78 (32.50) | 54 (22.50) | 108 (45) | 5th |
| 7. | Inadequate extension services | 168 (70) | 5 (2.08) | 67 (27.92) | 3rd |
| 8. | High cost of transportation | 39 (16.25) | 94 (39.17) | 107 (44.58) | 11th |
| 9. | High cost of paid labour | 67 (27.92) | 22 (9.16) | 151 (62.92) | 8th |
| 10. | Government attitude | 50 (20.83) | 109 (45.42) | 81 (33.75) | 10th |
| 11. | Inadequate Veterinary services | 90 (37.50) | 73 (30.42) | 77 (32.08) | 4th |
| 12. | High cost of litter materials | 73 (30.42) | 96 (40) | 71 (29.58) | 6th |
| 13. | Inadequate or unstable market | 61 (25.42) | 96 (40) | 83 (34.58) | 9th |
| 14. | Poor quality of Day-old chicks | 30 (12.50) | 59 (24.58) | 151 (62.92) | 13th |
| 15. | High mortality rate | 20 (8.33) | 57 (23.75) | 163 (67.92) | 15th |

**Source**: Field survey, 2024

Figures in parentheses are in percentage

## CONCLUSION

Based on the findings of this research, the study revealed that broiler farmers were small scale farmers, both male and female engage in the production of broilers, they had one form of education or the other, Broiler farming is profitable in the study area with the farmers operating at a higher level of profitability. It was also found that the farmers were technically and allocative efficient, although, the maximum technical efficiency was not achieved by farmers. The best farmer produced at 0.99, just 0.01 below the frontier. The mean technical efficiency was 0.58. This means that there is opportunity for increasing the output of the broiler farmers in the study area by increasing the efficiency with which resources are used at the farm level. The deep litter method of the intensive system was the management system practiced in the study area. Furthermore, among the problems identified by the broiler farmers in the study area were inadequate and high cost of feeds, inadequate capital, inadequate extension services, inadequate veterinary services and high cost of day-old chicks. Other factors identified include high cost of litter materials, high cost of medication, high cost of paid labour, inadequate or unstable market and government attitude. The study recommends that, Provision of agricultural extension support services and technology transfer which will increase output. There is also the need for farmers to acquire more knowledge since education positively influences efficiency. Government Policy should tackle the issue of lack of finance by assisting and encouraging broiler farmers. Private sector should develop and implement programme which will aimed at subsidizing cost of production inputs. Government should ensure that the marketing system is improved upon by providing infrastructural facilities such as good road, good water supply, electricity for production and marketing of broiler meat for domestic consumption.

## Acknowledgement

I wish to express my gratitude to the management of Federal Polytechnic Mubi for giving me the opportunity to benefit from the Institutional Base Research funded by Tertiary Education Trust Fund (TETFUND). Also, my appreciation goes to the Tertiary Education Trust Fund (TETFUND) for the privilege to conduct the research. To

my co-researchers and research assistants, I say thank you so much for the support and coordination. May almighty Allah (SWA) reward you abundantly. Amen

## REFERENCES


1. Card, L. E. (1961). Poultry Production. Retrieved from (http://www.cabdirect.org/abstracts/19610102428.html). Lea and Febiger. ISBN978-0-8121-1241-2.
2. Storey, A. A., Athens, J. S., Bryant, D., Carson, M. & Emery, K. (2012)."Investigating the global dispersal of chickens in prehistory using ancient mitochondrial DNA signatures" Retrieved from (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3405094).
3. World Bank. (2017). Livestock productivity and resilience support project (P160865); 2017. [Cited 2019 Dec 15]. Available from: worldbank.org/curated/en/386621567697691142/pdf/Nigeria-AFRICA-P160865
4. Davis, C.G., A. Muhammad, D. Karemera, & D. Harvey. (2014). The impact of exchange rate volatility on world broiler trade. *Agribusiness*, *30*(1), 46-55.
5. Food and Agriculture Organisation (2013). Poultry and human heath"Retrieved From (http://www.fao.org/ag/againfo/themes/en/poultry/human_health.html).
6. Yamane, T. (1967). Elementary sampling theory. New Jersey, USA: Prentice Hall Englewood Cliffs.
7. Olukosi, S.O. & Erhabor, P.O. (1988). *Introduction to Farm Management Economics: Principles and Applications.* Agitab publishers Limited, Zaria-Nigeria. 114p.
8. Battese G.E. & Coelli T.J. (1995). A model for technical inefficiency effects in a stochastic frontier production for panel data. *Empirical Economics*, 20:325-332.
9. Essay S. (2019). *Poultry Industry in Nigeria.* Retrieved from: <https://www.essaysauce.com/economics-essays/poultry-industry-in nigeria/>[Accessed 13-07-20]
10. Alabi, O.O. and Ibraheem, A (2018). Economics of Maize (Zea mays) Production in Igabi Local Government of Kaduna State, Nigeria. Journal of Agricultural Faculty of Gaziosmanpasa University (JAFAG) .35 (3): 248-257.
11. Buba, S., Maurice, D. C. & Umaru, A. T. (2016). Analysis of broiler production in Mayo-Belwa Agricultural Zone, Adamawa State, Nigeria. *Adamawa State University Journal of Agricultural Sciences. 4*(2), 128 – 133.
12. Kolawole, O. & Ojo, S. O. (2007). Economic Efficiency of Small Scale Food Crop Production in Nigeria: A Stochastic Frontier Approach. *Journal of Social Science*, 14(2): 123-130
13. Gororo, E. & Kashangura, M.T. (2016). Broiler production in an urban and Peri-urban Area of Zimbabwe, Development Southern Africa, 33 (1) 99-112.
14. Olabisi, A. E. (2018) Profitability, Farmer and Farm Characteristics: The Case of Ghana broiler Industry. Unpublished Master of Science Thesis. Department of Agricultural Economics, College of Agriculture. Kansas State University. Manhattan, Kansas
15. Ume I., Jiwuba, C., Obi, I. & Elisha, D, (2016). Economics of broiler production among rural women in Ahiazu Mbaise L.G.A of Imo State, Nigeria. *Asian Research Journal of Agriculture*,1(2):1-8. DOI: 10.9734/ARJA/2016/27428.
16. Anwasia, A. I. (2015). Production efficiency of small scale broiler farmers in Delta state, Nigeria. Unpublished M.Sc. Dessertation in Agricultural Economics, Department of Agricultural Economics, Faculty of Agriculture, University of Nigeria, Nsukka.
17. Omolayo Joshua Olorunwa (2018). Economic Analysis of Broiler Production in Lagos State Poultry Estate, Nigeria. *Journal of Investment and Management.*7 (1) 35-44.


**CITE AS: Buba Saidu and Offar Gwandi (2025). Analysis of Economic Efficiency of Broiler Production in Adamawa State, Nigeria. IDOSR JOURNAL OF SCIENCE AND TECHNOLOGY 11(2):21-30. https://doi.org/10.59298/IDOSR/JST/25/112.213000**