International Journal of Research in Agricultural Sciences
Volume 9, Issue 5, ISSN (Online): 2348 – 3997

Comparative Profitability Analysis of Broiler Production Systems in Ekiti State, Nigeria

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Date of publication (dd/mm/yyyy): 07/09/2022

Abstract **– The study analyzed profitability of broiler production systems in Ekiti State, Nigeria. A multi- stage sampling technique was employed to select the respondents. Data were collected from 90 broiler farmers through well-structured questionnaires. Descriptive statistics such as frequency counts, mean and percentages were employed to describe the socio-economic characteristics of the respondents, ascertain the different production systems engaged in by broiler farmers and ascertain the constraints to broiler production in the study area. Logit model was used to determine the factors influencing the choice of various production systems in the study area. Budgetary analysis was employed for comparing the profitability of various systems of broiler farmers. From the results of socio-economic characteristics of respondents, it was revealed that the mean was 44.34 years old and 68.9% of the broiler farmers were married while 65.5% had tertiary education. It was revealed from the result that the mean value of the family size was 5 persons. Also, 48.9% of the respondents reported 5 years and below as their years of farming experience. The result from different production systems engaged in by broiler farmers revealed that 65.6% of the respondents engaged in deep litter production system, while 24.4% of the respondents participated in battery cage system and 10% of the broiler farmers also involved in both systems. The determining factors influencing the choice of various production systems in the study area revealed that age, primary occupation, stock size, household size and capital were statistically significant, implying that they were the important variables found to greatly influence the choice of various broiler production systems in Ekiti State. Result from budgetary analysis revealed total revenue of ₦1,100,450 gross margin analysis (GM) of ₦375,450 and a net farm income (NFI) of ₦157,450 for battery cage system while the deep litter system had a total revenue of ₦1,200,850 gross margin (GM) of ₦369,350 and net farm income (NFI) of ₦287,350. The profitability ratios showed the rate of returns on Investment (RRI) of 16.7%, returns on labour (RL) of ₦95.7, returns on feed (RF) of ₦4.3 and returns per Naira invested (RNI) of ₦0.39 kobo for battery cage system as against RRI of 35%, RL of ₦88.9, RF of ₦4.1 and RNI of ₦0.35 kobo for deep litter system. This shows that both systems were profitable and viable but battery cage system was more profitable. The result on the constraints to broiler production in the study area as shown by descriptive statistics also gathered that 74.4% of the respondents indicated high cost of feed, 72.2% of the respondents faced the challenge of insufficient funds, 65.6% of the farmers in the study area encountered pest and diseases outbreak,47.8% faced veterinary problem. It was further revealed that 43.3%, 40.0%, 24.4% and 13.3% of the respondents in the study area encountered the issues of market channel problem, high mortality rate, inadequate feed supply and pilfering respectively. It was therefore recommend--ded broiler farmers should undergo necessary trainings focusing on how to compound feeds in order to reduce cost incurred on feed.**

Keywords **– Profitability, Broiler, Production Systems, Budgetary Analysis.**

I. INTRODUCTION

Food production is of high importance for sustainable livelihood, economic productivity and food security of the developing countries (Obike *et al.*, 2016). Food security involves access by all people at all times to enough food quality diet for active and healthy living. The report of FAO (2013) showed that Nigeria has an energy intake of 1730Kcal capita per day far below the 2500-3400Kcal minimum recommended daily intake. The

present animal protein consumption in Nigeria about 15g per person per day which is relatively below the recommended 35g per person per day (Olarinde*et al*., 2010). This further aggravates the current wide spread hunger, malnutrition and stunted growth as well as increased spread of nutrition-related diseases in most parts of the country. Hence, there is need for increased production and consumption of animal-based birds for healthy living. Protein of animal sources includes fish, milk, beacon, pork, mutton, beef and poultry products such as eggs and poultry meat among others.

Poultry is an important sub-sector of the Nigerian livestock industry as it provides significant proportion of the needed animal protein to the populace as well as creating employment for a considerable percentage of the population (Bamiro *et al*., 2009). FAO (2010) reported that the poultry sub-sector comes fourth among sources of animal proteins for human consumption in Nigeria and contributes about 27% of the national meat production. Intensification derived from prolific animals like poultry birds is relevant to meet animal protein requirements from domestic sources. Yusuf *et al*, (2016) stated that poultry products such as meat and egg offer considerable potential for bridging the nutritional gap in view of the fact that high yielding exotic poultry are easily adaptable to our environment and the technology of production is relatively simple with returns on investment appreciably high.

Apart from the nutritional significance of poultry products, the economic importance of poultry industry cannot be overestimated. The contribution of poultry production (meat and eggs) to total livestock output increased from 26% in 1995 to 27% in 1999 and it is presently put at about 42% (Bukunmi and Yusuf, 2015). This is because, relative to other groups of livestock such as rabbit, cattle, sheep and goat, poultry has the fastest rate of economic returns. In addition, poultry production can be carried out in a small area of land since the issue of land is a major problem of agriculture in most part of Nigeria (FAO, 2013). Commercial poultry production in Nigeria was estimated at about 800 million USD as at 2010 (NBS, 2012). FAO (2010) reported that poultry sub-sector contributed about 25% of the agricultural domestic products of the Nigerian economy. Socially, poultry meat and eggs are the most consumed animal proteins due to lack of religious or cultural discrimination against the products unlike pig, dog and some other livestock. Therefore, if the poultry industry is properly harnessed, it is capable of serving as a major source of foreign earnings to complement the present over-dependence on crude oil. Despite the acknowledged nutritional and socio-economic importance of poultry products, poultry production is grossly challenged with notable farming risk. In Nigeria, the production of food has not increased at the rate which can meet the demand from an increasing population. The apparent differences between the rate of food production and demand for food in Nigeria has led to increasing resort to food importation and high rate of increase in food prices. Nigeria is presently unable to meet the actual nutritional requirements. The poultry industry has emerged as the fastest expanding segment in animal husbandry sector. Management is therefore a key factor determining the success or failure of a business enterprises; it may be a firm or a farm. Therefore, poultry production like any other agricultural business activity requires a farmer has a wealth of experience in the management of the enterprise. The farmers are out there to make profit in order to actualize this; he should be able to produce at a level that will make him recoup his cost at the least.

II. METHODOLOGY

2.1. *The Study Area*

This study was carried out in Ekiti state, Nigeria. The State which lies entirely within the tropics located between longitude 40°51` to 50°45` East of the Greenwich Meridian and latitude 70°151` to 80°51` North of the equator. The State has a total land area of 6,353kmsquare. In Ekiti State, there are 16 Local Government Areas (LGAs) and the population is estimated to be around 3,270,798 million according to the 2006 census done by National Population Commission.

Ekiti State lies south of Kwara and Kogi States while it is bounded by Osun State on the west. It is also bounded in the south and in the east by Ondo State. The State enjoys a typical tropical climate with two distinct seasons, i.e. rainy season which last from April to October and the dry season that spans for the remaining moths (November to march). Temperature ranges between 21 degrees Celsius and 28 degrees Celsius with high humidity. Tropical forest exists in the southern part of the State while the guinea savannah occupies the Northern area of the State. The farmers in the State mainly engage in agricultural activities, with arable crop production as the major source of their livelihood, generating raw materials for their livestock production, as livestock production and artisanship remain secondary occupation among the farmers.

2.2. *Sampling Technique and Sampling Size*

A multi–stage sampling technique was used to select the respondents for the study. The first stages involved the selection of three LGAs. They are Ado, Ikere, and Ido/osi LGAs which were purposively selected due to the dominance of registered broiler farmers with poultry association of Nigeria for the study. In second stage, a simple random selection procedure was used to select three communities each from the selected LGAs making a total of nine (9) communities. The third stage involved selection of ten (10) broiler farmers from each of the communities. A total of 90 respondents were selected and interviewed for the study.

2.3. *Data Collection*

In carrying out this study, primary data were used. The primary data was collected with the aid of a well-structured interview schedule through questionnaires to compare the profitability of the broiler poultry production in the study area. Data were collected on their socio-economic characteristics, different production systems engaged in, factors influencing the choice of various production systems, profitability of various production systems, and the constraints to broiler production in the study area.

2.4. *Method of Data Analysis*

The data collected were analyzed using descriptive statistics, budgetary analysis and Logit model analysis.

2.4.1. *Descriptive Statistics*

Descriptive statistics was used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. They were also used to present quantitative descriptions in a manageable form. The tools of descriptive statistics include means, frequency count, and percentage.

2.4.2. *Budgetary Analysis*

The budgetary analysis was used to measure and evaluate the cost component and their returns. The three profitability/ viability indicators, Gross Margin (GM), Net Farm Income (NFI) and returns per naira investment (RNI) were estimated for the different production systems.

2.4.2.1. *Gross Margin Analysis (GM)*

According to Odii (1998); Olukosi and Erhabor (2005), this measures the difference between the gross output or revenue and the variable cost of each enterprise in the farming system. The Gross margin is given as:

GM = TR – TVC (1)

Where:

GM = Gross Margin (₦).

TR = Total Revenue (₦).

TVC = Total Variable Costs (₦).

Net Farm Income (NFI):

The net income or revenue of the farmers was computed as:

NI = TR – TC (2)

Where:

NI = Net Income (₦).

TR = Total Revenue (₦).

TC =Total Cost.

TC = TVC + TFC.

Where:

TVC = Total variable cost.

TFC = Total fixed cost.

Where:

TR = PyY,

Py =Price of the matured broiler,

Y = Total number of broilers sold.

TC was computed as follows;

$TC = r_1 x_1 + r_2 x_2 + b$;

$r_1 r_2$ = Prices of inputs (measured in Naira).

X_1 ……...Xn = variable inputs (measured in Naira).

b = cost of any fixed input (measured in Naira).

Therefore;

NI = TR - TC Profitability Ratios:

These profitability ratios are financial indices which show the performance of a business. The ratios as stated by Ayinde and Aromolaran (1998); Emokaro and Eigbirhemolen (2012) are as follows:

$$Rate\ of\ returns = \frac{Net\ farm\ income}{Total\ cost}\ X\ 100 \quad (3)$$

$$Returns\ on\ labour = \frac{Total\ revenue}{Labour\ in\ man\ /day} \quad (4)$$

$$Returns\ on\ feed = \frac{Total\ revenue}{Quantity\ of\ feed\ (kg)} \quad (5)$$

2.4.3. *Logit Model Analysis*

To determine factors influencing the choice of various systems by broiler farmers, Logit model was used. Logit model are used to model a relationship between a dependent variable Y and one or more independent variable X. The dependent variable Y, is a discrete variable that represents a choice or category, from a set of mutually exclusive choices or categories. The logit model is expressed as follows:

$$Yi = \beta0+\beta1\ X1+\beta2\ X2+\beta3\ X3+\beta4\ X4+.....\beta nXn+\varepsilon i \quad (6)$$

Where:

Yi = Production system (0=deep litter, 1=battery cage (dependent variables).

β0 = Constant

β1- βn = Estimated coefficients of the explanatory variables (independent variables).

X_1-Xn = independent variable.

X^1 = Age (years).

X_2 = Sex (male = 1, otherwise = 0).

X_3 = Household size (number of person)

X_4 = Level of education (years).

X_5 = Stock size (total number of birds).

X_6 = Capital input (₦).

X_7 = Farming experience (₦).

X_8 = Vaccination cost (₦).

εi = Error term.

The link function for the logit model to the probability that the dependent variable equals1:

$$Y = \frac{\ln Pr(Yi = 1)}{1-Pr\ (Yi = 1)} \quad (7)$$

and the inverse of the link function that rearranges the terms from the link function,

To isolate the probability that the dependent variable equals1: $Pr(Yi = 1) = \frac{e^r}{1+e^r}$.

Where;

Pr(Yi = 1) = the probability that Yi equals1.

e_i = the exponential function, which serves as the base for the natural log.

ln = the natural log.

III. Results and Discussion

Socio-Economic Characteristics of the Respondents

The results in table 1 revealed the socio-economic characteristics of the respondents where the mean age of the broiler farmers was reported to be 44.34 years. This implies that the respondents were still in there active and productive age. Majority of the farmers (67.8%) were male while 32.2% were female, indicating that broiler production in the study area was dominated by male farmers. It is further revealed that (68.9%) of the respondents were married, 25.5% were single and 5.6% were widow, implying that majority of the respondents were married. The result also presented that 11.1% and 23.3% had primary and secondary education respectively while larger percentage, 65.6%, of the respondents acquired tertiary education. This is an indication that the farmers were literate which could aid access to relevant information on broiler production from diverse sources. This is in line with the finding of Odjugo (2010) that education is very important in farming. The result further showed that majority (66.7%) of the farmers had family size of 4-6 persons while the mean farming experience of the respondents in the study area was 6 years. This means that the respondents had spent some good time in the poultry enterprise and the more experienced the farmers are, the better they are informed about broiler production which may also encourage them to seek for agricultural information on how to improve on their production. The study presented that 20.0%, 36.7%, 3.3% of the respondents acquired land by inheritance, purchase and lease respectively while 4.4%, 11.2%, 24.4% acquired theirs as gift, using place of residence and rent for their production. This implies that majority of the respondents made use of purchased land. Majority (90%) of the farmers interviewed in the study area bought feeds milling factory or supplier while 10% of them acquired it through milling by self. Also, the result shows that 36.7% and 47.7% fed their birds twice and 3 times per day while 12.3% and 3.3% fed the birds 4 times and greater than 4 times per day in the study area. Majority (47.7%) of the respondents purchased the feed per bag at the rate of ₦4,500 - ₦5,400 and the mean cost of feed was ₦4,677.8 per bag. The result further revealed that 37.8% of the respondents made cooperative society as their source of financial capital, 27.8% of the farmers made bank loan as theirs, while 24.4%, 8.9% and 1.1% sourced theirs through personal savings, money lender and gift from relatives respectively. The study also revealed that majority (44.5%) of the respondents engaged hired labour for the management activities on the farm; while 31.1% made use of family labour and 24.4% combined the two together. Also, the result showed that 20% of the respondents had no extension contact at all.

Table 1. Socio-economic characteristics of the respondents.

Variables	Frequency	Percentage	Mean
	Age		
≤30	4	4.4	
31-40	32	35.6	

Variables	Frequency	Percentage	Mean
41-50	35	38.9	44.34
51-60	19	21.1	
Sex			
Male	61	67.8	
Female	29	32.2	
Marital Status			
Married	62	68.9	
Single	23	25.5	
Widow	5	5.6	
Educational Level			
Primary	10	11.1	
Secondary	21	23.3	
Tertiary	59	65.6	
Family Size			
≤3	17	18.9	
4-6	60	66.7	5
7-9	13	14.4	
Farming Experience			
≤5	44	48.9	
5-8	29	32.2	6
9-12	11	12.2	
>12	6	6.7	
Land Acquisition			
Inheritance	18	20.0	
Purchase	33	36.7	
Lease	3	3.3	
Gift	4	4.4	
Place of residence	10	11.2	
Rent	22	24.4	
Land Rent Cost			
≤25,000	73	81.1	
26,000-50,000	10	11.1	
51,000-75,000	4	4.4	
76,000-100,000	1	1.1	

Variables	Frequency	Percentage	Mean
>100,000	2	2.2	
	Feed Acquisition		
Milled by self	9	10	
Bought	81	90	
	Cost of Feed Per Bag		
≤ 3,400	9	10	
3,500-4,400	23	25.6	
4,500-5,400	43	47.7	
>5,400	15	16.7	
	Sources of Financial Capital		
Personal savings	22	24.4	
Cooperative society	34	37.8	
Money lender	8	8.9	
Bank loan	25	27.8	
Gift from relatives	1	1.1	
	Labour		
Family	28	31.1	
Hired	40	44.5	
Both	22	24.4	

Source: Field survey, 2021.

3.2. *Different Broiler Production Systems Being Practiced*

The results in table 2 revealed that 65.5% of the respondents involved in deep litter management system, and 24.4% engaged in battery cage system, while 10% of the respondents practiced both systems. This is an indication that majority of the broiler farmers practiced deep liter production systems. This might have been attributed to the fact that deep liter system of broiler production requires little capital outlay unlike battery cage system that is capital intensive.

Table 2. Different production systems engaged in.

Variables	Frequency	Percentage
Deep litter	59	65.6
Battery cage	22	244
Both	9	10
Total	90	100

Source: Field survey, 2021.

3.3. *Factors Influencing the Choice of Various Broiler Production Systems*

The table below presented the result of logit regression analysis of factors influencing the choice of various broiler production systems in the study area. The table revealed how selected socio-economic characteristics (age, household size, gender, educational level, primary occupation, stocking size, capital, farming experience and vaccination cost) influenced the choice of various production systems. From the result, it was shown that age, household, primary occupation, stock size, capital and vaccination cost, were all statistically significant at 1%. This implies that these variables greatly influenced or determined the choice of broiler production system in the study area.

The result indicates that the coefficient of the age of the respondents was positively correlated with the choice of broiler production system and statistically significant at 1% level, indicating that the older the farmers, the higher the likelihood to adopt deep litter broiler production system by the farmers. This might be attributed to the fact that the older broiler farmers did not have the financial capacity to acquire battery cage system of production. Also, it is observed that deep litter system of broiler production accommodates large stock size for those who are unable to acquire battery cage system. The coefficient of household size of the respondents was negatively related with the choice of broiler production system and statistically significant at1%. This is an indication that the larger the household size the lesser the choice to adopt deep liter system of production. This implies that family labour is not relevant in broiler production.

The result also shows that stock size had a positive relationship with the choice of broiler production, and it was statistically significant at 1%. This implies that increase in the number of birds stock in the farm will aid the choice for deep litter broiler production, considering the cost of constructing battery cage to house the birds. The coefficient of capital was negative (0.000) which was significant at 1%, implying the lesser the initial capital outlay, the more the urge to choose deep litter system of production because it is not as capital intensive as that of battery cage system. The result concerning capital is consistent with a priori expectation. According to Onwumere *et al.* (2017), a limited increase in the stock of fixed capital goods hampers the production capacity of the farm families as the latter remains constant over time. The result further revealed that vaccination cost was negatively correlated but statistically significant at 1%. This is an indication that high cost of vaccination greatly affects the farmers' desire to acquire battery cage for their production.

Table 3. Result of Logit regression showing the factors influencing choice of various broiler production systems.

Variable	Coefficient	Standard Error	P Value
Age	0.0134***	0.0054	0.0160
Gender	0.0214	0.0908	0.8140
Household size	-0.0697***	0.0284	0.0160
Educational level	0.0074	0.0560	0.8960
Stock size	0.0002***	0.0000	0.0000
Capital	-0.0000***	0.0000	0.0020
Farming experience	-0.0195	0.0131	0.1390
Vaccination cost	-0.0000***	0.0000	0.0160

Variable	Coefficient	Standard Error	P Value
R- squared	93.93%	Adjusted R- squared	93.25%

Source: Field Survey, 2021.

Note: *** indicates statistically significant at 1% level of significance.

3.4. *Profitability Analysis of Different Broiler Production Systems*

Table 4 shows the profitability analysis of different broiler production systems in the study area. The variables cost under this study were costs of stocking birds, vaccination and drugs, feed, sawdust and labour while variables considered as the fixed costs were land, drinkers, feeders and battery cage. From the result, the total variable cost for deep litter and battery cage systems of production were reported to be ₦831,500 and ₦725,000 respectively. This is an indication more variable cost was incurred in deep litter system of broiler production. This arises from frequent replacement of litter (sawdust) which usually requires additional labour with cost attached. Also, the total fixed cost for deep litter and battery cage were ₦82,000 and ₦218,000 respectively, indicating that battery cage system of broiler production attracted more cost. This could be attributed to the huge amount of money expended in constructing battery cage.

The mean value Gross Margin analysis for deep litter management system was reported as ₦369,350 while ₦375,450 was recorded for battery cage. Also, ₦287,350 and ₦157,450 were reported as Net Farm Income for deep litter and battery cage management systems respectively. The result further revealed 31.5% and 39.8% as the Rate of Returns on Investment. These low values of RRI on both management systems could be attributed to a sudden increase in the cost of feed, making most of the farmers to reduce their stock size. On the same vein, ₦88.9 and ₦95.7 were reported as Returns on labour while ₦4.1 and ₦4.3 were recorded as Returns on feed deep litter and battery cage management systems respectively. This implies less cost was incurred on labour in battery cage management system, and higher feed conversion rate was noticeable in battery cage system of broiler production.

Table 4. Gross margin analysis and profitability ratio of both systems.

Items	Deep Litter Mean (₦)	Battery Cage Mean (₦)
(A) Total Revenue	1,200,850	1,100,450
(B) Variable Cost		
Stocking of bird	357,000	320,000
Vaccination and drugs	25,000	20,000
Feeds	295,000	258,000
Labour	135,000	115,000
Sawdust	19,500	12,000
Total variable cost	831,500	725,000

Items	Deep Litter Mean (₦)	Battery Cage Mean (₦)
(C) Fixed Cost		
Land rent	52,500	38,000
Depreciated cost of feeders	16,000	0
Depreciated cost of drinkers	13,500	0
Depreciated cost of battery cage	0	24,100
Total Fixed Cost	82,000	62,100
Total cost	913,500	787,100
(D) Gross Margin	369,350	375,450
(E) Net Farm Income	287,350	313,350
(F) Rate of Return on Investment	31.5	39.8
(G) Returns on Labour	88.9	95.7
(H) Returns on Feed	4.1	4.3

Source: Field survey, 2021.

3.5. *Constraints to Broiler Production*

This result in Table 5 revealed the distribution of multiple responses as regards the problems militating against the attainment of full potential in broiler production in the study area. From the result, it was revealed that 74.4% of the respondents lamented on the high cost of feed as the most challenge militating against broiler production and that is the reason why majority of these farmers could not increase their stock size, and this could discourage the intending broiler producers from embarking on the business. The result further reported that 72.2% of respondents complained in sufficient fund as another challenge faced by broiler production in the study area and that is why majority of them only operated on small scale. This suggests that, with availability and accessibility of capital, a good number of people would increase their scale of operation and perform effectively, being a profitable venture.

It was also reported that 65.6% respondents in the study area faced with the problem of pests and diseases outbreak which includes, rodent, soldier ant, New Castle diseases, coccidiosis, fowl pox and so on. This constraint drastically reduces the profit of broiler production in the study area. In the same vein, 47.8% of the respondents complained of insufficient veterinary services as the problem militating against broiler production which can cause high spread of the diseases if veterinary services are not readily available when needed.

Among other problems being encountered by the broiler farmers in the study area as reported are; market channel problem (43.3%), high mortality rate (40.0%), inadequate feed supply (24.4%) and pilfering (13.3%). This is an indication that broiler farmers in the study are facing diverse problems in broiler production which usually prevented them from maximizing profit.

Table 5. Constraints to broiler production.

S/N	Constraints	Frequency	Percentage
1	Pilfering	12	13.3
2	Pests and diseases outbreak	59	65.6
3	High cost of feeds	67	74.4
4	Insufficient fund	65	72.2
5	High mortality rate	36	40.0
6	Inadequate feed supply	22	24.4
7	Market channel problem	39	43.3
8	Insufficient veterinary services	43	47.8

Source: Field survey, 2021.

Multiple responses.

IV. Conclusion and Recommendations

From the study, it is concluded that broiler producing farmers in the study were relatively young, fairly educated, males and virtually married. The study inferred that majority of the respondents interviewed engaged in deep liter broiler production system. Age, primary occupation, household size, stock size and capital were variables considered to greatly influence the choice of production system in the study area. From gross margin and profitability analysis, it was concluded that battery cage system of production was more profitable than the deep liter system. It is therefore recommended that poultry farmers should be encouraged to participate in poultry association for up-to-date information as regards poultry production; soft loans should be made available to the various farmers as this would go a long way to increase their scale of production. Feed has a significant contribution to broiler production in both systems, in order to make feed available to poultry broiler farmers, commercial feed millers should collaborate with relevant institutes and other applied agricultural research centers to work out alternative substitutes to the current cereals in feed formulation, and in order to reduce cost incurred on feed, broiler farmers should undergo necessary trainings focusing on how to compound feeds.

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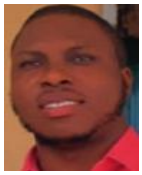
AUTHOR'S PROFILE



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