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DRIVERS OF PROFITABILITY OF COMMERCIAL BROILER PRODUCTION: EMPIRICAL EVIDENCE FROM NIGERIA

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Abstracts

Broilers are fast-growing birds and serve as a means of white meat highly rich in protein with low cholesterol compared with other livestock. Despite this, there is a dearth of information on its profitability in Nigeria. This study, therefore, investigated the profitability of commercial broiler production enterprise and its determinants in Osun state Nigeria. Data were collected from 200 commercial broiler farmers under the Poultry Association of Nigeria and analysed using descriptive statistics, gross margin and multiple regression. The results revealed that the broiler production enterprise had a gross margin of ₦692,961.83 (USD 1,680.15), a net income of ₦568,036.14 (USD 1,377.26), a benefit-cost ratio of 2.53, an operating cost of 0.26 and 1.53 return on capital invested. These show that the broiler production enterprise was profitable. Cost of feed and disease outbreaks were factors that inhibit the profitability of broiler production venture while years of broiler farming experience, flock size, annual income, access to agricultural extension and access to credit were enhancing factors for the profitability of broiler production enterprise. The extremely severe constraints faced in broiler production were disease outbreaks, inadequate capital and the high cost of feeds. These findings call for government and policy intervention to enhance broiler production profitability. This could be achieved through subsidising the cost of feed, provision of vaccines and drugs to prevent and control disease outbreaks and provision of financial support in the form of credit.

Keywords: broiler enterprise, commercial farming, cost of feeds, disease outbreak, net profit

INTRODUCTION

The livestock industry is an important aspect of the agricultural sector globally. The livestock industry in Nigeria employed above 25 million people out of which the poultry industry accounted for the highest share (National Bureau of Statistics, 2018). Livestock industries contributed between six to eight per cent to the national gross domestic product (Africa Sustainable Livestock, 2018). In Africa, poultry meat production skyrocketed at a faster rate than other livestock meat production. This could be because poultry has a relatively high feed conversion ratio and net returns on investment compared with other livestock which makes it has high priority in Nigeria (Olayemi and Robert, 1979; Maikasuwa and Jabo, 2011).

Poultry farming involves the rearing of domesticated birds such as chicken, geese, quail, duck and turkey for the production of eggs and meat for human consumption. Poultry production is an important area of livestock farming in most developing countries. The poultry sector supplies food and raw material to industries, serves as the basis for research and provide employment. Poultry and their product are generally acceptable in all cultures in Nigeria, unlike other livestock such as pigs. In Nigeria, poultry production or farming is among the important agricultural activities which are highly profitable and occupied a crucial position in the economy (Kaine and Chukwuma, 2017). It plays a significant role in Nigeria's economy as it serves as means of livelihood to millions of

people and contributed to the national economy (Akanbi *et al.*, 2020). It is the most commercialized agricultural sector in Nigeria and its production has expanded by 25 per cent (Padilla *et al.*, 2019; Suleiman *et al.*, 2017). Poultry contributed significantly to animal protein consumption in Nigeria. The average poultry product consumption in Nigeria was 1.3 kg per head per year and its share in total annual protein consumption in Nigeria was about 15 per cent (Ologbon and Ambali, 2012).

The poultry industry has become the fastest-expanding and the most dynamic segment in the livestock sector (Emokaro and Eweka, 2015). After Nigeria independent in 1960, poultry production has grown from rearing a few birds in the backyard for family consumption to a thriving industry (Jongur *et al.*, 2009). Poultry has been merely kept to obtain some money, also as a means of knowing when daytime is near and in some communities; it has been kept for the game of Cockfighting. Gradually poultry keeping has developed into a commercial enterprise which has split into several operations such as hatcheries, pullet farms for egg production, broiler farms for meat production, and feed production.

Production of broiler chicken for meat production is increasing globally to meet the huge demand for protein. The broiler production industry is considered the largest animal protein source due to the rapid increase in its productivity day by day than other livestock industries (Ohimain and Ofongo, 2012; Hossain *et al.*, 2020). Chickens are fast-growing animals compared to other livestock. The broiler can produce a market size of (2 kg) in between five to eight weeks depending on the managerial practises. Broiler farming offers employment opportunities for the fairly large population of attendants both skilled and unskilled hence it is a source of income for many households. It has become increasingly more profitable in recent years to employ capital in the broiler business as a result of widespread use of the technology device, mainly bulk feed tanks, mechanical feeding and watering systems, mechanical grading and improved breed. One of the things that have contributed positively to the poultry industry in Nigeria is the easy adaptation of poultry to various environments. Poultry production enterprise can be practised in any part of Nigeria as opposed to some other livestock enterprises such as beef production which is affected by pests such as the tsetse fly in some parts of the country. Poultry products have no religious bias against them as compared to pork production. Therefore, they are expected to have higher demand than either pork or beef.

The global population keeps increasing every day which required an increase in food production from both plant and animal sources. An increase in population and low supply of food led to widespread of malnutrition and hunger in the country and other sub-Saharan African countries. The growing population coupled with malnutrition in developing countries, Nigeria inclusive, requires an increase in protein sources to meet up with the protein requirements. Most developing countries, especially sub-Saharan Africa, suffer from malnutrition, especially protein deficiency. The effect of protein deficiency in Nigerian children resulted in kwashiorkor (Omololu, 1999 in Ayinde *et al.*, 2012). It has been realised that malnutrition in children may defer their brain development and attain full genetic potential (Burton and Cooper, 2007; Osei, 2008).

Poultry production can play a significant role in solving the problem of nutrient deficiency in developing countries as they produce eggs and meat within a short period compared to other livestock. Reducing nutrient deficiency and food insecurity can be achieved through poultry farming. Poultry products (meat and eggs) supply several required nutrients such as protein, vitamins, minerals and fats and oils for a healthy life. It can also be used as a tool targeted at reducing or alleviating poverty in developing nations due to its easy management, small area of land requirement compares to other agricultural practises and can even be practised in the backyard. Thus, the need to meet up with cheap protein requirements for healthy life motivates this research.

Most previous studies on poultry enterprises in Nigeria concentrated on egg production enterprises (e.g., Akanbi *et al.*, 2020; Amos, 2006; Emokaro and Erhabor, 2014; Johnson *et al.*, 2020; Ojo, 2003). This study, therefore, investigated the profitability of broiler production in Nigeria. The factors responsible for the profitability of broiler production and the constraints faced in its production were also identified. In addition, an economic analysis of the effect of disease outbreaks on the profitability of broiler production enterprises was incorporated into the model used in this study. This is to provide the policy that will enhance the profitability of broiler production which will, in turn, increase participation in the business and make broiler meat readily available for human consumption. This would solve the problem of malnutrition and food insecurity.

MATERIALS AND METHODS

Study Area

This study was conducted in Osun State, Nigeria. Osun state has a land area of approximately 14,875 square kilometres with a population of 3,416,959 (National Population Commission, 2006). Its neighbouring states include Kwara state in the North, Oyo State in the West, Ondo and Ekiti states in the east and Ogun State in the south. Osun State lies between longitude 6º51' N and 8º10' N on the North-South Pole, and longitude 4º05' E and 5º02' E

on the East-West Pole. The people of the state engaged in agriculture and allied activities such as rearing poultry, livestock and growing crops. Poultry production is largely small-scale in the state.

Sampling Technique and Data Collection

A multistage simple random and purposive sampling technique was used to select the respondents for this study. In the first stage, five local government areas (Ife East, Ife North, Ife South, Ife West and Ede North) were purposively selected due to the high concentration of poultry farmers than other local government areas. The poultry farmers in the various local Governments were accessed to administer the questionnaire under the umbrella of the Poultry Farmers Association of Nigeria. The second stage involved a random selection of four communities from each local government which gave a total of twenty communities. The third stage involved the random selection of ten broiler farmers from each community. This gave a total sample size of 200 commercial broiler farmers.

The data for this study were collected through the aid of a structured questionnaire and interviewed schedule at the individual level from time to time from the poultry farmers under the Poultry Association of Nigeria between August and September 2019. The questionnaires were constructed in English Language and were translated into Yoruba (which is the local language in the study area) for a few of the poultry farmers who did not understand English. The questionnaire contains some of the following information: gender, marital status, family size, years of broiler production experience, income level, age, and level of education. Information on cost and returns such as cost of labour, feeding cost, cost of day-old chicks, cost of equipment, cost of controlling disease, housing cost, electricity cost, litre cost, and mortality recorded were also included in the questionnaire. The average values of the cost and returns were used for the profitability analysis. The average flock size among the respondent was 198 birds indicating they are small-scale farmers.

Methods of Data Analysis

The data were analysed using both descriptive and inferential statistics. The data collected were subjected to descriptive statistical analysis which includes the use of tables, frequency distributions and percentages which was the measure of central tendency and dispersion used in this study. This shows the distribution of respondents, an average conversion unit, socio-economic background and the cost of each item in relation to other total costs. The profitability of the enterprise was examined using several methods including gross margin analysis, net profit, a benefit-cost ratio, an operating ratio and a return on capital invested. Multiple regression was used to examine the driving factors for profitability of broiler production.

Gross margin is an analytical technique used to estimate the economic profitability of a venture. It is calculated by taking the difference between the gross revenue from a broiler production venture and the total variable cost incurred in the production. The total revenue figures were arrived at by multiplication of the selling price with the quantities sold. The variable costs considered were the cost of day-old chicks, cost of feeds, drugs and labour.

Since gross margin analysis did not put the fixed cost into its estimation, the study further estimated the net profit of the broiler production venture. This was done by estimating the fixed cost used in broiler production. To obtain the worth of each of the fixed-cost items, the straight-line method of depreciation was used. The fixed costs were depreciated into annual costs to spread the original amount of fixed costs. The fixed costs include rent payment, borehole or well, and the purchase of feeders, drinkers, shovels, cages and lamps. After the estimation of annual depreciation, the fixed cost incurred in broiler production was calculated which was used to calculate the net profit. The net profit was estimated by taking the difference between gross margin and total fixed cost.

The benefit-cost ratio was further estimated to show the ratio of benefit realised to the total cost in the broiler production enterprise. It was estimated by dividing total revenue by total costs.

The operating ratio was used to measure the proportion of the gross income used for operating expenses. It was estimated by dividing total variable cost by total revenue.

Return on capital invested was used to assess the gain per unit of investment, that is, the profit made per currency (₦1 or USD 1) invested. It was estimated by dividing the net profit by the total costs.

Model Specification for Multiple Regression

A multiple regression model is a statistical technique that uses several independent or explanatory variables to predict the outcome of a dependent or response variable. It models the linear relationship between a dependent variable and several explanatory variables. A multiple regression model was used in this study to investigate the factors contributing to the profitability of broiler production enterprises. It is expressed as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \\ + \beta_8 X_8 + \beta_9 X_9 + \epsilon, \quad (1)$$

where Y means dependent variable – Net profit (in Naira), X_1 is cost of feed (Naira), X_2 is years of education (How long it took to acquire the level of education), X_3 is annual income (Naira), X_4 is disease outbreak (measured in the cost of mortality recorded and treatment due to disease outbreak), X_5 is years of experience (How long the farmer has

been in the broiler production business), X_6 is access to credit (1 = Yes or No = 0), X_7 is flock size, X_8 is member of association, X_9 is access to agriculture extension services, β_0 is constant term, β_i are regresion coefficients and ϵ stays for error term.

Description of Explanatory Variables and Apriori Expectations

Cost of feed: This is the amount spent on purchasing feeds in the broiler enterprise. It is expected to have a negative effect on the profitability of broiler production enterprises. A high cost of feed will reduce the profitability of the enterprise while a low cost of feed will increase the profitability of the broiler enterprise.

Education level (years of education): High educational level is expected to have a positive effect on broiler production profitability due to the ability to adopt innovation and technology by the farmers. Education also influences production efficiency positively (Coelli and Battese, 1996) and paves the way for farm economic sustainability and marketing and production information (Mukaila *et al.*, 2023a). Therefore, a high level of education is expected to aid farmers' farming efficiency positively as compared to those with little or no formal education. Likewise, a farmer with a primary level of education is expected to be less efficient than those with a secondary level.

Annual income: This is the sum of revenue accrued by broiler farmers within a year. The annual income is expected to have a positive influence on broiler profitability. This is because annual income in a previous farming season would determine the level of capital available by most farmers to invest in the next farming season. Thus, high annual income would increase the level of investment which will, in turn, increase the productivity of the farmers and their profitability, *ceteris paribus*.

Years of experience: Farming experience may have a mixed-effects; it could have a negative or positive effect on the profitability of the farmer. A farmer with a high level of experience is expected to be skilled and knowledgeable about the best production and management practices in broiler enterprises, thus will have a high profit. Whereas, farmers with little or no experience may have little knowledge about broiler farming which may influence broiler profitability negatively.

Disease outbreaks: The amount a broiler farmer loses due to mortality as a result of a disease outbreak or the amount spent on treating the disease will have a negative effect on its level of profitability. A high mortality rate will cause a decrease in the gross margin in other words decreases its profitability. A high cost of treating the disease will also reduce the profitability of the ventures.

Access to credit: Broiler production is relatively capital intensive and may require the accessibility of external funding, especially to operate on a large scale. Thus, farmers who can access credit would have the required fund to invest largely in the production activities of broiler enterprises. This would increase their productivity and profitability.

Flock size: This is the total number of broiler birds on the farm. A larger flock size will increase the profitability of the enterprise, *ceteris paribus*. Thus, farmers who have larger flock sizes will have higher profitability than their counterparts who have small flock sizes.

Member of association: Farmers' membership of associations such as farming associations and cooperatives will have a positive effect on the profitability of the farm. Thus, farmers who belong to the association will have a higher profit than their counterparts who did not. This could be due to the benefits of being a member of an association such as access to marketing information, and financial assistance, among others.

Access to agriculture extension services: This is farmers' access to relevant information and supports from the agricultural extensionists. Agricultural extension serves as a link between researchers or institutions and farmers to pass information about innovation (Akanbi *et al.*, 2022). Thus, access to agricultural extension is expected to have a positive influence on the profitability of broiler farms.

A Mean Score Rating Scale for Constraints Faced in Broiler Production

A mean score was used to examine the constraint encountered in broiler production. Four points Likert scale was used to identify the constraints faced in broiler production. A list of some problems was itemized; the farmers indicate the level of severity of the problems. The scale ranges from not serious (1), moderately serious (2), very serious (3) and extremely serious (4). A mean score (of the four-point Likert scale) of 2.5 was used as a cut point for severe constraints. The study further used an interval of 0.5 to classify the constraints as not serious, moderately serious, very serious and extremely serious. Any constraint with a mean score less than 2.5 was considered not severe constraint to broiler production, a mean score of 2.5 to 3.0 was considered moderately severe constraint, Likert mean score from 3.01 to 3.5 was considered very severe and a Likert mean score of above 3.5 was considered extremely severe constraint.

RESULTS AND DISCUSSION

Socio-economic Characteristics of Broiler Farmers

The socioeconomic characteristics of broiler farmers were presented in Tab. I. The results revealed that males constituted 63 per cent of

the total broiler farmers while the females were 37 per cent. This indicates that broiler farming was dominated by the male in Nigeria. This is because poultry enterprise is a strenuous and labour-demanding activity that women avoid most of the time. Akanbi *et al.* (2020) also reported that the poultry business was dominated by males. The distribution of the farmers by age revealed that the majority (64.5%) were within the age group of 31–50. They had an average age of 45 years. Due to the drudgery nature of peasant farming, age is an important influencer of labour quality and availability on the farm (Mukaila *et al.*, 2020). Thus, age is an important factor in determining the productivity of a farmer and the effective performance of management functions on the farm and possibly their marketing efficiency. It also affects farmers' ability to take risks. Thus, the broiler farmers were within their economic active age where they can effectively manage their broiler farming activities and take rational risks for effective productivity and marketing. The majority (76.5%) were married while only a few were single (16%), widowed (6%) and divorced (1.5%). This implies that the broiler farmers will have some dependants in their households. The majority (60.5%) had between four to seven household sizes with an average of six persons in a household. This implies that the poultry farmers had a relatively large household size which could serve as family labour in their broiler production business which is labour-intensive. The probability of getting additional helping hands increases as the household size increases; hence, the possibility of business proliferation (Obetta *et al.*, 2020).

The majority of the broiler farmers had formal education. This could be as a result of their youthful age. The high level of education among

I: *Distribution of respondents by their socioeconomic characteristics*

Variables	Categories	Frequency	Percentage	Mean
Gender	Male	126	63.0	
	Female	74	37.0	
Age	Less than 30	44	22.0	45
	31 to 50	129	64.5	
	Above 50	27	13.5	
Marital status	Married	153	76.5	
	Single	32	16.0	
	Divorced	3	1.5	
	Widowed	12	6.0	
Household size	Less than 4	57	28.5	6
	4 to 7	121	60.5	
	Above 7	22	11.0	
Educational level	Primary	12	6.0	
	Secondary	49	24.5	
	Tertiary	139	69.5	
Poultry farming	Major	114	57.0	
	Minor	86	43.0	
Farming experience	Less than 10	25	12.5	
	11–20	128	64.0	
	Above 20	47	23.5	
Access to credit	Yes	69	34.5	
	No	131	65.5	
Annual income (₦)	≤ 500,000	6	3.0	₦891,020.5
	500,001 to 800,000	43	21.5	
	800,001 to 1,100,000	122	61.0	
	≥ 1,200,001	19	14.5	

Source: Field survey, 2019

the majority could enhance their productivity, access to relevant information and decision-making process (Akanbi *et al.*, 2020; Mukaila *et al.*, 2023). Formal education is an important factor in the adoption of new technologies by farmers. This is because the more enlightened a farmer is, the higher his ability to weigh the advantages and disadvantages of new techniques for effective production. Fifty-seven per cent of the respondents practice broiler farming as a major occupation while about 43% of them practice broiler farming as a minor occupation. This implies that a higher percentage of the respondents took broiler farming as their major source of livelihood and income. Thus, putting all their very best effort into it. The majority (64%) of the broiler farmers had between 11 and 20 years of broiler farming experience. The time spent in a business enterprise determines the knowledge and skills gained about the business (Egwue *et al.*, 2020; Mukaila *et al.*, 2023a). Thus, the broiler farmers can be described as well experience farmers who had good knowledge about broiler production enterprise. Only 34.5 per cent of the broiler farmers can access credit. This implies low access to credit by the broiler farmers which could affect their level of production as personal funds are not always enough in the poultry business due to its capital intensive. Regarding broiler farmers' annual income, a higher percentage (61%) had between ₦800,000 (USD 1,939.86) to ₦1,100,000 (USD 2,667.31) per annum. They had an average annual income of ₦891,020.50 (USD 2,160.57). This suggests that broiler production gave a relatively high income to the farmers.

Profitability of Broiler Production

Tab. II presents the profitability of broiler production. It is worth noting that the variable costs had the highest share of the total production cost in the broiler production enterprise. This is in line with the findings of Olorunwa (2020) in Nigeria, Rana *et al.* (2012) in Bangladesh and Singh (2010) in India, that variable cost accounted for the largest share of the total cost of broiler production. The cost of feeding the broiler accounted for the highest share (53%) of the variable cost followed by the cost of day-old chicks (20.7%). This is in tandem with the findings of Akanbi *et al.* (2020), Chibanda *et al.* (2022), Kamruzzaman *et al.* (2021) and Omondi (2019) that the cost of feeds accounted for the largest share of variable cost in the poultry production enterprise in Nigeria, Senegal, Bangladesh and Kenya, respectively. The results revealed that with total revenue of ₦938,926.09 (USD 2,276.74) and a total cost of ₦370,889.95 (USD 899.26) for the broiler production enterprise, the benefit-cost ratio for the broiler farmers was 2.53. This is relatively high and implies that broiler production is highly profitable and the farmers were efficient in their production. Furthermore, the gross margin and net income of broiler production enterprises were ₦692,961.83 (USD 1,680.15) and ₦568,036.14 (USD 1,377.26), respectively. These also imply that the venture is profitable. The operating ratio of broiler production was 0.26 which implies that 26 per cent of the gross revenue was used as operational running cost in the broiler production enterprise. The return on capital invested was 1.53 which implies that for every ₦1 or USD 1 invested in broiler production, ₦1.53 or USD 1 was returned as profit in the business, respectively. This further shows that the broiler production enterprise was a highly profitable venture and will give the investors high returns on their investments. This is in line with previous studies that broiler production was a profitable enterprise in Nigeria (Olorunwa, 2018), Bangladesh (Rana *et al.* 2012; Kamruzzaman *et al.*, 2021), India (Singh, 2010), Malaysia (Abdurofi *et al.*, 2017), the Netherlands (Horne, 2020) and Senegal (Chibanda *et al.*, 2022).

II: *Gross margin analysis results for broiler production*

Items	Value (₦)	
Revenue (A)	938,926.09	
Variable cost		
Feed cost		130,304.83
Cost of drug		24,334
Cost of day-old chick		50,853.73
Labour cost		21,156
Transportation cost		12,576.36
Litre cost		6,739.34
Total variable cost (B)		245,964.26
Gross margin	692,961.83	
Fixed cost		
Housing or cage		43,913.04
Feeders		13,684.34
Drinkers		13,041.74
Shovel		1,036.52
Lamp		731.74
Heat and power		32,733.87
Borehole or well		19,784.44
Total fixed cost		124,925.69
Total cost (C)	370,889.95	
Net profit (D)	568,036.14	
Benefit-cost ratio (A/C)	2.53	
Operating ratio (B/A)	0.26	
Return on capital invested (D/C)	1.53	

Source: Field survey, 2019

Drivers of Broiler Production Profitability

The result of the multiple regression of the linear functional form revealed that the coefficient of multiple determination (R^2) was 0.6313 implying that the cost of feed, years spent in school, annual income, disease outbreaks, years of broiler production experience, access to credit, flock size, membership of association and access to agricultural extension jointly explained 63.13% of the variation in broiler production profitability. It can therefore be concluded that the explanatory variables significantly affect broiler production profitability. The F-ratio value (37.29) was however significant at a 1% level of significance. This suggests that the model has a good fit. Furthermore, the model passed the Breusch-Pagan-Godfrey heteroskedasticity test with $p = 0.585$. The results of the multiple regression analysis indicate that cost of feed ($t = -9.58$; $p < 0.000$), annual income ($t = 18.10$; $p < 0.000$), disease outbreak ($t = -2.75$; $p < 0.006$), years of broiler farming experience ($t = 2.68$; $p < 0.008$), access to credit ($t = 2.63$; $p < 0.009$), flock size ($t = 1.77$; $p < 0.077$), and access to agricultural extension ($t = 2.11$; $p < 0.036$) had a significant relationship with the profitability of broiler production enterprise.

The coefficient of cost of feed had a negative and significant effect in relation to broiler enterprise profitability. This suggests that as the cost of feeding the broiler increases the profitability of the venture reduces. Thus, the high cost of feeding was an inhibiting factor to broiler production profitability. This is because the high cost of feeding increases the variable cost incurred during the rearing of the birds which, in turn, reduced the gross margin and net profit of the broiler production venture. This is against the findings of Rana in Bangladesh that an increase in the cost of feeding increased the revenue from broiler production. However, it is in line with the findings of Mukaila (2023), that cost of feeding significantly decreased the profitability of the farm in Nigeria.

The coefficient of annual income of farmers was positive and significant in relation to broiler enterprise profitability. This implies that annual income was an enhancing factor in the profitability of broiler production. This is because previous annual income in the form of retained earnings serves as capital for investment in the current production season. Thus, farmers who had a higher annual income will make a higher profit as they would have money to invest in the agribusiness enterprise. Whereas, farmers who have low annual income will make a lower profit from the business, *ceteris paribus*.

The coefficient of disease outbreak was negative and significant in relation to broiler enterprise profitability. This implies that disease outbreaks reduced the profitability of broiler production. Disease outbreak is a critical menace in livestock farming and causes severe economic losses (Mukaila, 2023; Mukaila *et al.*, 2023b). Disease outbreaks led to spending much on controlling the diseases and death of the broilers. This resulted in a loss in the broiler production enterprise and reduced the profitability of the ventures. Farmers who experienced disease outbreaks on their farms recorded a lower profit compared with those who experience no or little disease outbreaks on their farms. Disease outbreak has also been reported to negatively influenced livestock production profitability in Nigeria (Mukaila, 2023; Mukaila *et al.*, 2023b).

The coefficient of years of farming experience was positive and significant in relation to broiler enterprise profitability. This implies that years of farming experience is an enhancing factor in the profitability of broiler production. This could be because the years spent in broiler farming increases farmers' skills in broiler farming which will, in turn, increase their efficiency and consequently their profitability. Also, how long a farmer has been in the poultry business has given such a farmer an edge over others in terms of his marketing efficiency. Such farmer knows when and how to carry out certain precautions to reduce cost in terms of disease eradication or prevention, feeding, marketing of the products and the type of marketing channel to engage in. This result is in line with the finding of Suleiman *et al.* (2017) who reported that farming experience had a positive influence on poultry enterprise profitability.

The coefficient of access to credit was positive and significant in relation to broiler enterprise profitability. This implies that broiler farmers who can access credit had a higher profit than those that could not access credit. This is because access to credit increases farmers' capital to be invested in the farming enterprise as personal funds are not always enough (Falola *et al.*, 2022a), especially in poultry production which is capital intensive. Suleiman *et al.* (2017) reported a similar result that access to credit increased the profitability of poultry enterprises.

The coefficient of flock size was positive and significant in relation to broiler enterprise profitability. This implies that flock size enhanced the profitability of the enterprise. This is because flock size determines the output of the farm (Falola *et al.*, 2022b) and a larger flock size will increase the revenue from the broiler production and consequently the profitability of the enterprise, *ceteris paribus*. Thus, farmers who had a larger flock size had higher profitability than their counterparts who had a small flock size. This is in consonant with the findings of Mukaila (2023), who reported that stock size increased the profitability of the farm.

The coefficient of membership of the association was positive and significant in relation to broiler enterprise profitability. This implies that being a member of an association such as a cooperative society or farmers' association increased the profitability of the enterprise. This is because an association (cooperative society) has several

benefits such as access to marketing information, enjoyment of economies of scale, and financial assistance, among others. Thus, farmers who belong to the association had a higher profit than their counterparts who did not. This is in tandem with Mukaila (2023), who recently found that membership in the association enhanced the profitability of the farm.

The coefficient of access to agricultural extension was positive and significant in relation to broiler enterprise profitability. This implies that farmers' access to agricultural extension enhanced the profitability of the enterprise. Agricultural extension plays a crucial role in agriculture as they provide relevant farming information, training and solution to farmers' problem such as disease management, and serves as a link between researchers or institutions and farmers to pass information about innovation. Thus, farmers who had access to agricultural extension will have a higher profit than their counterparts due to the mentioned benefits.

Perceived Constraints to Broiler Production

The constraints faced in broiler production were presented in Tab. IV. The most severe constraint to broiler production was disease outbreak which was ranked first. A similar result was reported by Maikasuwa and Jabo (2011) and Rana *et al.* (2011) that disease outbreak was the major constraint to poultry production in Nigeria and Bangladesh, respectively. This was followed by inadequate capital to manage and run day-to-day activities. This implies poor financing affected the broiler production enterprise. This could limit their level of production to small-scale as personal funds might not be enough to effectively operate on a large scale. The high cost of feeds was also considered an extremely severe constraint as perceived by the farmers and was ranked third among the constraints. The high cost of feeds increases the variable cost incurred in broiler production which may, in turn, lower the profitability of the business. Price fluctuation of both market size broiler and day-old chick was a very severe constraint and ranked fourth. Olorunwa (2020), Rana *et al.* (2012), and Taru *et al.* (2010) reported similar findings that inadequate capital, high cost of feeding and poor pricing were severe constraints to broiler production in Nigeria, Bangladesh and Cameroon, respectively. Thus, it can be inferred that inadequate capital, poor pricing and high cost of feeding are affecting poultry enterprises in developing countries. High cost of transportation and poor marketing were considered moderately severe and ranked fifth and sixth, respectively. Pilfering or insecurity was not a severe constraint as most farmers employed security guards on their farms.

III: *Drivers of broilers' profitability*

Variables	Coefficient	Std. Err.	t	P > t
Cost of feed	-.0677329***	.0070702	-9.58	< 0.001
Annual income	9.477126***	.5236999	18.10	< 0.001
Disease outbreak	-134.568***	48.72727	-2.75	0.006
Years of Experience	2095.86***	781.6102	2.68	0.008
Access to credit	55976.52***	21296.83	2.63	0.009
Flock size	14192.16*	7997.361	1.77	0.077
Access to extension	8597.484**	4074.637	2.11	0.036
Constant	262896.1***	56462.02	4.66	< 0.001

Note: * significance at 0.1 levels, ** significance at 0.05 levels, and *** significance at 0.01 levels
Source: Field survey, 2019

IV: *Perceived constraints to broiler production*

Constraints	Likert mean	Decision	Rank
Disease outbreak	3.85	Extremely severe	1st
Inadequate capital to manage and run day-to-day activities	3.65	Extremely severe	2nd
High cost of feeds	3.51	Extremely severe	3rd
Fluctuation of broiler price	3.34	Very severe	4th
High cost of transportation	2.83	Moderately severe	5th
Poor marketing	2.57	Moderately severe	6th
Pilfering or insecurity	2.41	Not severe	7th

Source: Field survey, 2019

CONCLUSION

This study investigated the profitability of broiler production enterprises and the factors responsible for it. The study revealed that the broiler production enterprise was profitable with a gross margin of USD 1,680.15 and a net income of USD 1,377.26. Furthermore, the enterprise has a low operational running cost as only 26 per cent of the gross revenue was used as operational running cost. It also has a high return on investment; for every USD 1 invested in broiler production, USD 1.53 was returned as profit in the business. This study further revealed that the cost of feed and disease outbreaks were factors reducing the profitability of broiler production ventures while years of broiler farming experience, annual income, flock size, access to agricultural extension and access to credit were enhancing factors for the profitability of broiler production enterprise. Thus, farmers who are well experienced, had access to credit and agricultural extension, had large flock sizes, had high incomes and experience no or little disease outbreaks had a higher profit in the broiler production enterprise. The severe constraints faced in broiler production were disease outbreaks, inadequate capital to manage and run day-to-day activities, high cost of feeds, price fluctuation of both market size broiler and day-old chick, high cost of transportation and poor marketing.

To increase the profitability of the broiler production enterprise, this study recommends subsidising the cost of feed used in the production by the government. This would not only increase the profitability of the broiler production but also makes the broiler affordable to the citizens which could boost protein consumption in the country. The provision of vaccines and drugs by the government at no or cheaper cost to broiler farmers to prevent and control disease outbreaks on the farm would go a long way to enhance their profit. Provision of financial support in the form of credit or grants by the government, non-governmental agencies and financial institutions to broiler farmers would also go a long way to boost broiler production profitability as farmers would increase their production level due to the financial support.

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