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Analysis of Small Scale Broiler Production on Farmers' Food Security in Southern Taraba, Taraba State, Nigeria

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Abstract

This study analyzed Small scale broiler production on farmers' food security in Southern Taraba, Taraba State, Nigeria**.** A multistage sampling technique was employed to collect primary data from 138 small-scale broiler farmers using well structure questionnaires. Data collected were analyzed using food security index, tobit regression model and the enterprise budgeting techniques such as gross margin, net farm income, net return on investment, gross ratio and profitability index. The findings revealed that 76.8% of the respondents were food secure. Cost and return showed average total revenue of ₦629,850.7 and ₦266,756.8 as total cost of production with a gross margin of ₦380,182.6. Net farm income of ₦363,093.9, net return on investment of ₦1.4, gross ratio of 0.4 and profitability index (PI) of 0.6 which signifies for every naira earned as revenue 60 kobo was return as net income**.** Effect of broiler production on farmers food security status showed that; cost of day old chicks, cost of drugs and income of farmers were significant at 1% while cost of transportation and cooperative membership were significant at 5% and cost of labour was significant at 10% and they influence food security either positively or negatively. It was concluded that broiler production is a profitable enterprise that aid broiler farmers to be food secured. It was recommended that efforts should be made for production input to be affordable and easily accessible by

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the farmers, agricultural cooperatives should be promoted and strengthened by providing members with the necessary input.

Keywords: Analysis, Small Scale, Broiler Production and Food Security

INTRODUCTION

Millions of small-scale farmers throughout the world depend heavily on the small-scale broiler production sector, which is a vital part of the global poultry business (Etuah *et al.,* 2020). The demand for chicken meat is rising due to its affordability and nutritional value, making the poultry industry one of the agricultural subsectors with the quickest rate of growth in the world (Erdaw and Beyene, 2022). Small-scale farmers in developing regions, especially in Africa, rely on small-scale broiler production as a reliable source of income, employment, and food security for their rural economies (Bamidele and Amole, 2021). Small-scale enterprises provide a significant amount of Nigeria's chicken output, making poultry farming one of the nation's most prominent agricultural industries (Girei, 2020). The Nigerian chicken Association states that local markets receive a large portion of their chicken meat supply from small-scale broiler producers (Adeyonu *et al.,* 2021). Taraba State, which is situated in northeastern Nigeria, is not an exception. There are a lot of small-scale broiler farmers in the state that raise chickens for their families' food and means of subsistence (Audu and Audu, 2023).

Small-scale broiler farming has an importance that goes beyond just producing meat. It provides rural households with work possibilities, a means of generating income diversification, and a way out of poverty, making it a vital livelihood strategy (Adam, 2021). Due to its minimal entry hurdles, small-scale broiler farming is frequently available to farmers with little resources (Alo, 2020). Furthermore, as noted by Nkukwana (2018) it supports the rural economy by promoting associated industries including feed manufacturing, veterinary services, and the sale of poultry equipment.

A key worldwide challenge is food security, which is defined as the availability, accessibility, usage, and stability of food (García-Díez *et al.,* 2021). Because small-scale broiler production increases the availability of reasonably priced protein sources, improves dietary diversity, and generates cash that can be used to buy other food products, it directly helps

to food security (Daniels, 2021). Small-scale broiler production raises household incomes enough for farmers to pay for improved healthcare, education, and other necessities, which enhances general well-being and increases food security (Wong *et al.,* 2017). In the world, there are still over 820 million hungry people (FAO, 2020), making food security a critical concern (Aryal *et al.,* 2022). Due to elements including population increase, climate change, and unstable economies, the problem is especially severe in Africa (Waha *et al.,* 2017). According to the National Bureau of Statistics (2019), food insecurity is pervasive in Nigeria, where a sizable fraction of the populace lives below the poverty line and frequently lacks access to wholesome food (Onoja *et al.,* 2024). Similar issues confront Taraba State, where poor agricultural production and economic prospects make rural communities more susceptible to food insecurity (Ladan and Badaru, 2021).

Improving food security for rural households is mostly dependent on small-scale broiler production (Wong *et al.,* 2017). According to Akinola *et al.* (2023), farmers might enhance their nutritious consumption by procuring a variety of food products, made possible by a dependable revenue stream. Moreover, eating chicken meat from domestic broilers increases protein intake, which is necessary for development and general well-being (Te Pas *et al.,* 2020). The broad objective of the study was analysis of small scale broiler production on farmers' food security in Southern Taraba, Taraba State, Nigeria.

The specific objectives were to:

i. estimate the food security status of small scale broiler farmers in the study area;
ii. estimate the cost and returns of Broiler production in the study area;
iii. analyze the effects of broiler production on food security status of small scale broiler farmers in the study area and

MATERIALS AND METHODS

The Study Area

The Study was conducted in Southern Taraba, Taraba State, Nigeria. The study area is made up of five local government areas (Wukari, Takum, Donga, Ussa and Ibbi) and one special Development Area (Yangtu). It lies between latitudes $8^{0}30^{0}$N and $9^{0}3^{0}$E of the Equator and between longitudes $8^{0}30^{0}$N and $10^{0}30^{0}$E of the Greenwich Meridian (Danladi *et al.*, 2024). It covers an area 14,099Km^{2} land mass with a population of about 687,077 people as at 2006 (NPC 2006). The National Population Commission had projected an

annual growth rate of 3.5% which brought the population figure to 1,233,080.294 people as at 2023 (Danladi *et al.*, 2024). The area shares boundaries with Gassol, Bali, Kurmi, Gashaka and Karim-lamido Local Government areas in the North, Nasarawa State and Plateau State to the North -West, Benue State in the South-West and Republic of Cameroun in the South-East. It has tropical wet and dry seasons, well drained alluvial soil and characterized by both savannah and rain forest vegetation. Its dry season lasts for a minimum of four months (December to March) while the wet season spans early March and late November in the South. The area has mean annual rainfall of 1800mm (Rukwe *et al.,* 2020).

Majority of the population consists of peasants farmers cultivating food and cash crop such as sorghum, yam, maize, cassava, sesame, rice etc. at a small-scale level, fresh water fishing and forestry. Livestock keeping is a minor occupation of the population of the area dealing on goats, sheep, poultry, rabbit and fish farming. Other activities include trading and civil service. The people lived mostly in an organized settlements, town and villages. The indigenous ethnic group found in the area is Jukun (Ichen, Wapan, Kuteb, Wanu, kpanzun, Yukuben, Tigum, Ndola and Chamba) and others are Tiv, Igbo Yoruba and Hausa.

Sources of Data /Data Collection

Primary data was used for this research work. The primary data was collected using a well-structured questionnaire which was administered to the respondents in the study area.

Sampling Techniques:

A multi-stage sampling technique was used to select 138 small-scale broiler farmers in the study area using well-structured questionnaires. Stage one, Southern Taraba was purposively selected based on the availability of small-scale broiler farmers. Stage two, all the five (5) local government areas that made up southern Taraba were selected. They include; Donga, Takum, Ussa, Wukari and Ibi. Stage three, three (3) wards were purposively selected from each of the local government areas based on the presence of small-scale broiler farmers, which are: Asibiti, Akate, Mararraba, Dutse, Rogo, Manya, Lissam I, Lissam II, Kwesati, Puje, Hospital, Rafin kada, Rimi uku I, Rimi uku II and Nwonyo I. The last stage, 138 small-scale broiler farmers were sampled using snow balling sampling to select small-scale broiler farmers from the selected wards.

Analytical Techniques

Data for the research were analyzed using Food Security Index (FSI) to achieved Objective i, the food security line used was based on the daily recommended level of calories which is 2260Kcal. Enterprise budgeting techniques such as Gross margin, Net-farm income, Net return on investment, Gross ratio and profitability index was used to determine objective ii and tobit regression model was used to analyze Objective iii.

Model Specification:

Food Security Index (FSI)

The food security line used in this study was based on the daily recommended level of calorie, which is 2260 Kcal (Ojeleye, 2015).

In order to generate food security indices, the nutrient content of the food items consumed was used to derive calorie availability.

$$FSI = Zi = \frac{\text{Household per capita calorie availability}}{\text{Household's daily per capita calorie requirement}} \quad \ldots\ldots\ldots\

the number of kg contain in one mudu, bag, tiya or basket as the case may be for each food consumed. After converting the quantity of food consumed to kilogram, it was further converted to Kcal/Kg by multiplying each quantity of food consumed in kilogram by the recommended nutrient composition of commonly eaten foods in Nigeria. The quantity of food consumed in Kcal/kg was divided by seven to get the household daily per capital calorie availability. The household daily per capita calorie availability was further divided into the number of household members to get the individual per capita calorie availability, which is further divided by Household's daily per capita calorie requirement to get the food security index.

Tobit Regression Model

Tobit regression model was expressed as;

$$Y_i = X_i\beta + \varepsilon_i \quad \ldots\ldots\ldots\

The Enterprise budgeting techniques; Gross margin, Net-farm income, Net return on investment, Gross ratio and profitability index

The method was mathematically given as:

i. **Gross Margin** = Total Revenue – Total Variable Cost ……(4)

ii. **Net Farm Income** = Total Revenue – Total Cost ……..(5)

Where:

Total Cost (₦) = Total Variable Cost + Total Fixed Cost

iii. Net Return investment

$$\frac{\text{Net Farm Income}}{\text{Total Cost}} \quad \text{…….....(6)}$$

iv. Gross Ratio

$$\frac{\text{Total Cost}}{\text{Total Revenue}} \quad \text{……..…(7)}$$

v. Profitability index (PI)

$$\frac{\text{Net Farm Income}}{\text{Total Revenue}}$$

…….……(8)

Calculation of depreciation

Depreciation on capital items (machines, equipment and buildings) was obtained from the initial costs and useful lives of such fixed items. Straight-line method of depreciation was use and the method was given as

$$AD = \frac{CF-SV}{ULS} \quad \text{……...……..(9)}$$

Where

AD= Annual depreciation (₦)

CF=Cost of fixed Assets (₦)

SV= Salvage value (₦)

ULS= Useful lifespan (years)

RESULTS AND DISCUSSION

Food security status of Small-scale broiler farmers

The results for small-scale broiler farmers as shown in table 1, the food security indices for food-secure and food-insecure households were estimated to be 2.7 and 0.7, respectively. An index value of 2.7 for food-secure households indicates a surplus index of 1.7, signifying that these households consumed more calories than the recommended level of 2260 Kcal. An index value of 0.7 for food insecure household indicate a shortfall index of 0.3, signifying that those household consumed less calories than the recommended level of 2260Kcal.The shortfall/surplus index measures the extent of deviation from the food security line, further reflecting the nutritional sufficiency of food-secure households and nutritional insufficiency for food insecure households.

The average daily calorie consumption for food-secure households was 6108.40 Kcal, demonstrating an excess of 3848.40 Kcal above the recommended dietary allowance. This finding aligns with their higher average total output of broilers (40.19) and significantly higher income (₦684,041.51). Such households exhibit higher technical and economic efficiency in broiler production, contributing to their improved food security status. On the other hand, food-insecure households, with a food security index of 0.7, revealed a shortage index of 0.3, indicating that these households need to increase their calorie intake by 30% to meet the recommended level. The average daily calorie consumption for food-insecure households was 1664.51 Kcal, reflecting a calorie deficit of 595.50 Kcal. These households also recorded lower average broiler output (24.75) and income (₦450,343.75), which may have constrained their ability to achieve food security status. The percentage distribution further highlights the disparity in food security among broiler-producing households, with 76.8% being food secure and 23.2% food insecure. This result is consistent with the findings of Keku (2017), who reported that 66.0% of sampled farm households in Kaduna State were food secure, emphasizing the role of efficient agricultural production in ensuring household food security.

Table 1: Summary of broiler households' food security status

Variable in Average	
Food secured households	**106**
Food security index	2.7
Surplus index	1.7
Average household daily calorie consumption for food secured households	6108.40
Average calorie consumption in excess of recommended (2260Kcal)	3848.40
Average total output for food secured households (Number of broilers)	40.19
Average total income of food secured households (₦)	684041.5094
Percentage of food secured household	76.8%
Food insecure households	**32**
Food insecurity index	0.7
Shortage index	0.3
Average household daily calorie consumption (Kcal) for food insecure households	1664.51
Average calorie consumption in shortage of recommended (2260Kcal)	595.50
Average total output for food insecure households (Number of broilers)	24.75
Average total income of food insecure household	450343.75
Percentage of food insecure household	23.2%

Source: Author's Compilation from Field Survey, 2024.

Cost and return analysis of small-scale broilers production

The profitability of small-scale broiler production as presented in Table 2. The cost and return analysis indicates that the total revenue of ₦629,850.7 was realized by an average small scale broiler farmer for one production cycle of three months. This revenue includes income generated from the sale of birds (₦578,937.7, accounting for 92% of total revenue**)** and the sale of droppings (₦50,913.04, accounting for 8% of total revenue). The analysis also shows that the average total cost of production for one cycle was N266,756.8, which comprises both variable costs and fixed costs. The total variable costs (TVC) of N249,668.1 accounted for 97% of the total cost. Key components of the TVC include the cost of feeding (N118,926.1, 46% of total cost), stocking (₦111,647.8, 43% of total cost), and labour (₦9,672.464, 4% of total cost). Feeding, has the largest expenses, aligns with the findings of Chiekezie *et al.* (2022) and that of Baruwa and Fabode (2019), who identified

feed cost as the most significant cost in poultry production. Other variable costs such as water, medication, transportation, and utility expenses contributed smaller shares to the total cost.

The total fixed costs (TFC) of ₦8,544.348, which accounted for only 3% of the total cost, were attributed to the depreciation of assets such as buildings/cages, feeders, drinkers, and other equipment. This low percentage highlights the minor contribution of fixed costs relative to variable costs in small-scale broiler production. The gross margin (GM) for the production cycle was ₦380,182.6, while the net farm income (NFI) was ₦363,093.9, indicating a profitable enterprise. The net return on investment (NRI) shows that for every naira invested in broiler production, farmers earned ₦1.4 as income. This high return demonstrates the economic viability of broiler farming in the study area. Additionally, the gross ratio of 0.4 implies that only 40% of the total revenue was used to cover all production costs, leaving a substantial margin for profit. The profitability index (PI) of 0.6 signifies that for every naira earned as revenue, 60 kobo was returned as net income. These findings align with those of Chiekezie *et al.* (2022) and Baruwa and Fabode (2019), who observed the profitability of broiler production.

Table 2: Cost and return of small-scale broiler production

S/N	Description	Broilers Production Cost	Percentage
1	**Stocks**		
	Average Opening Stocks (36.9 birds per production cycle of 3 months)		
	Average Closing Stocks (35.8 birds per production cycle of 3 months)		
2	**Revenue**	**Value (₦)**	
a.	Sales of Birds	578937.7	91.92
b.	Sales of droppings	50913.04	8.08
	Total Revenue (TR)	**629850.7**	
3	**Variable Cost:**		
	Stocking	111647.8	43.2
	Feeding	118926.1	46.1
	Labour	9672.464	3.7
	Water	2088.406	0.8

	Medication/Vaccination/Additives	1807.246	0.7
	Warming + lighting and fuel	1500.145	0.6
	Litter Material	783.1884	0.3
	Transportation	2762.319	1.1
	Other Utility expenses	480.4348	0.2
	Total Variable Cost (TVC)	**249668.1**	**96.7**
4	**Fixed Cost:**		
	Depreciation on:		
	Buildings / cages	2226.087	0.9
	Feeders	1345.652	0.5
	Drinkers	1300.725	0.5
	Stove	822.029	0.3
	Jerry-can, Bucket and Basins	1047.681	0.4
	Spades and Shovel	977.5362	0.4
	Wheel Barrows	824.6377	0.3
	Total Fixed Cost (TFC)	**8544.348**	**3.3**
	Total Cost (TC)	**266756.8**	
	Gross Margin (GM)	**380182.6**	
	Net Farm Income (NFI)	**363093.9**	
	Net Return On Investment (NFI / TC)	**1.4**	
	Gross Ratio	**0.4**	
	Profitability Index (PI)	**0.6**	

Source: Author's Compilation from Field Survey, 2024.

Effect of broiler production on farmers' food security status

The result presented in table 3 showed the result of the tobit regression estimates of the effects of broiler production on farmers' food security status. Log-Likelihood Ratio Chi-square (LR Chi^2) value of 56.89 with $p<0.01$ indicates that the model's explanatory variables collectively have a statistically significant effect on food security. Prob > Chi^2: The probability value (0.0000) confirms the overall significance of the model. A pseudo R^2 value of 0.1034 suggests the model explains approximately 10.34% of the variation in food security outcomes.

From the result, out of the nine independent variables used in the model, six variables were statistically significant in affecting the food security status of the farmers. The cost of day-old chicks was negative and significant at 1% level of probability. This implies that cost

incurred in costs of day-old chicks adversely affect farmers' level of food security. The result suggests that an increase in cost of inputs reduces the disposable income available for household food consumption, thereby worsening food security. This finding aligns with the studies by *Isiaka et al. (2023)* who observed that increased in the cost of day old chicks would increase the total cost of production and reduce the revenue. The cost of labour was positive and significant at 10% levels of probability. This implies that every one-unit increase in labour will lead to an increase in food security status of the farmer. This suggests that employing more labour, potentially indicating larger-scale of operations that are more intensive, positively affects food security. This aligns with findings by Okusaga (2013) who reported that labour cost have significant impact on quail meat production.

The cost of drugs was positive and significant at 1% levels of probability. Which implies that every one-unit increase in cost of drugs or veterinary care will lead to increase in food security status of the broiler farmers. This indicates that spending on veterinary care and disease prevention improves broiler production efficiency, leading to better food security outcomes. Proper health management reduces mortality and increases the profitability of broiler farming, which agrees with the findings of Okusaga (2013) who states that cost of drugs have significant impact on quail meat production. The cost of transportation was positive and significant at 5% levels of probability. This implies that every one-unit increase in transportation cost will lead to an increase in food security. This suggests that better access to markets, facilitated by transportation, enhances farmers' ability to sell their produce at competitive prices, thereby improving household food security. The findings disagreed with that of *Isiaka et al. (2023)* whose findings showed that transportation cost does not affect food security status of the small-scale broiler farmers.

The Income from broiler production was positive and significant at 1% level of probability. Which implies that food security status of the farmers will increase with increase in the level of income from broiler production. This indicates that higher revenues from sales of broiler translate directly into improved household food availability and access. This is in agreement with the study by Omotayo *et a*l. (2020) and Ojo *et a*l. (2021) that broiler chicken farming is a profitable enterprise. Cooperative membership was positive and significant at 5% levels of probability influencing the food security status of broiler farmers. This implies that farmers who belong to one cooperative or the other will increase their household food security status. Cooperatives often provide members with access to inputs, credit, and training, which enhance production efficiency and market access. This is in agreement with

Iheke and Onyendi (2017) who found out that membership of cooperatives are sources of organized marketing of good quality inputs, labour, credit, information and farm products for farmers and this will lead to increased food security.

Table 3: Effect of broiler production on farmers' food security status

Variables	Coefficient	Std. error	T	P>/t/
Cost of day old chicks (X_1)	-0.0000246***	7.34e-06	-3.35	0.001
Cost of feed (X_2)	-7.77e-07	2.94e-06	-0.26	0.792
Cost of labour (X_3)	8.84e-06*	4.61e-06	1.92	0.057
Cost of Drugs (X_4)	0.0005337***	0.0001195	4.47	0.000
Cost of Transportation (X_5)	0.0001023**	0.0000514	1.99	0.049
Income from broiler (X_6)	4.53e-06***	1.58e-06	2.88	0.005
Primary occupation (X_7)	-0.2710151	0.3715108	-0.73	0.467
Access to credit (X_8)	6.94e-06	4.94e-06	1.40	0.162
Cooperative membership (X_9)	0.9769512**	0.4083054	2.39	0.018
Constant	-0.4301115	1.15633	-0.37	0.711
Sigma	1.459115	0.0888569		
LR chi2(9)	56.89			
Prob>chi2	0.0000			
Pseudo R^2	0.1034			
Number of observations	138			

Source: Author's Compilation from Field Survey, 2024. *** = 1%, ** = 5% and * = 10%

CONCLUSION

This study provides valuable insights into food security status, and profitability of small-scale broiler production and effect of small-scale broiler production to farmers' food security status in Southern Taraba, Taraba State, Nigeria. The findings reveal that majority of the farmers in the area are food secure, with higher incomes from broiler production contributing to better food access and nutritional sufficiency. The cost and return analysis indicate that small-scale broiler production is economically viable, offering a substantial return on investment. Therefore, it can be concluded that broiler production is a profitable

enterprise, which aid broiler farmers in the study area to be food secure. Based on the findings from this research the following recommendations were drawn:

i. Cooperative membership and income from broiler were found to be significant. Hence, agricultural cooperatives should be promoted and strengthened by providing members with the necessary input and the ability to purchase inputs collectively which will lower production cost there by increasing the farmers' income and enhance farmer's capacity to achieve food security.
ii. Cost of transportation was found to be significant. Hence, Authorities should invest in rural infrastructure, particularly transportation networks, to ensure farmers can transport their produce to urban markets and sell at competitive prices, ultimately improving their income and food security.
iii. Cost of day old chicks, cost of labour and cost of drugs, which are production inputs, were found to significantly influence food security status of small-scale broiler farmers. Thus, efforts should be made for production input to be affordable and easily accessible by the farmers.

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