



ASSESSMENT OF THE CONTRIBUTIONS OF SMALL-SCALE BROILER PRODUCTION TO FARMERS' FOOD SECURITY IN KADUNA STATE, NIGERIA

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ABSTRACT

The challenges of food insecurity and hunger in Nigeria have continued to receive attention from experts and the government. To increase both protein intake and food security, the government called for urgent need to increase broiler production at both household and commercial holdings. Primary data obtained in year 2020, from 205 randomly selected broiler farmers was analyzed using descriptive statistics and Tobit regression model. This study assessed small-scale broiler production's contribution to farmers' food security in Kaduna state, Nigeria. The result showed that mean age was 40 years and majority of the farmers (89.4%) had household size ranged from 1 – 10 persons. In addition, about 73.8% were members of a cooperative society, about 40.5% of the farmers did not have access to extension service while about 78 % of the farmers have access to credit. About 75.10 percent of broiler farming households were found to be food secure. Of the food insecure households, 6.70 % were marginally food insecure, 4.20 % moderately food insecure and 14.00 % severely food insecure. The regression results showed that coefficients of level of education (0.872), access to credit (0.113), membership of association (0.068), cost of day-old chicks (0.363), cost of feed (0.812), cost of labour (-2.211), cost of drugs (-0.263) and income from broiler (0.161) were found to be significant contributing to the food security status of the broiler farming households. Finally, broiler farmers attested to the fact that; lack of constant market (95.8%), high cost of feed (92.7%), high cost of input (88%), and price fluctuations (86.9%) are most severe constraints militating the chances of increasing broiler production. Built on the findings of the study it can be concluded that the proportion of food secure broiler farmers are more than the food insecure broiler farmers in the study area. Education, cost of feed and income from broiler production are variables that significantly influences broiler farmers' food security status. Therefore, farmers should adopt self-feed formulation using locally available resources that will reduce the cost of feeding and increase their profit margin and thereby their food security status.

Keywords: Broiler, Food security, Household income, Cooperative membership, Hunger.

INTRODUCTION

Nigeria's livestock industry is growing at 12.7% annually as a result of increase in consumer demand orchestrated by growing populations, a shift toward urban living, and increasing incomes which translate to food security (FAO, 2019a). The livestock subsector plays a significant role in sustaining the livelihood of both rural farm households and urban households. Apart from cushioning protein shortage experienced by the households, it also settles domestic obligations in terms of buying inputs needed for farming operations, and as a means of bridging the animal protein demand-supply gap among Nigerians (Oladimeji *et al.*, 2017). Although, only about 29% of farmers rear other livestock whilst poultry is kept by about



14% of farmers as a source of income (NAERLS, 2021). The poultry enterprise with about 180 million birds is the most dynamic and fastest growing of the livestock sub-sector in Nigeria (FAOSTAT, 2017). In SSA, poultry especially the broiler component is growing rapidly across SSA and offers a multitude of potential economic and health benefits to these economies and their populations (Shaw *et al.*, 2019). Its growth is expected to rebound by 2.3 percent in 2021, 3.1 percent in 2022 from 2.0 percent contraction in 2020 (World Bank, 2021) due to increase in demand.

Thus, broiler production involves the keeping of chickens breed for the purpose of getting good quality meat products usually sold live or processed from five weeks of age (Saliu *et al.*, 2015). It is carried out in all parts of the country with no religious, social or cultural inhibitions associated with their consumption. Specifically, investment in broiler enterprises is attractive because the production cost per unit is low relative to other types of poultry, with an average production cost per kg of ₦193.28-210.51 for broiler chickens (Salihu *et al.*, 2020) as compared to rabbits with ₦302.81 (Saleh *et al.*, 2015). In addition, broiler meat is very tender and with short production cycles (Oladimeji *et al.*, 2017).

Poultry production has been recognized as one of the quickest ways of rapid increase in protein supply in the short run according to Poultry Association of Nigeria PAN (2017). From a health and nutritional viewpoint, broiler meat consumption has been associated with many positive aspects (Bernstein *et al.*, 2010; Millen *et al.*, 2013). However, the supply of poultry products is grossly inadequate and far from meeting the domestic demand. A sure means of substantially solving the demand-supply gap is by embarking on widespread homestead/small scale broiler production activities as it will boost the economic stability, income and the food security status of the producers. Nigerians consume an average of about 1.9 kg per capita of poultry meat, compared to 49.3 kg for the USA, 32.98 kg for South Africa and 7.67 kg for Ghana as against the FAO minimum level of 35 kg per caput (Tijjani *et al.*, 2012; FAO, 2018; FMFA, 2020). Hence, there is need to meet animal protein requirement from domestic sources which demands intensification of production of meat and eggs, derived from prolific animals like poultry birds (Oyinbo *et al.*, 2015).

Achieving food security in its totality has been seen to be a major challenge not only to developing nations but also to the developed world. According to FAO (2018), an estimated 821 million people worldwide are still undernourished and almost 20.4% of people in Africa are chronically undernourished, and in Nigeria, the situation is not different. Kumolu (2010) and Nkeme *et al.* (2017) reported that about 40 million people in Nigeria are believed to be hungry and a large percentage of the population lack access to adequate food component most especially protein.

The challenges of food insecurity and hunger worldwide and particularly in developing countries like Nigeria have continued to receive attention from experts and Governments (FAO, 2003; Nkomoki *et al.*, 2019). Consequently, several conferences and World Food Summits on human nutrition have brought to fore for debate the issue of eradicating extreme poverty and food insecurity. To increase protein intake in Nigeria the NBS report of 2020 called for urgent need to increase broiler production at both household and commercial holdings (NBS, 2020). Therefore, assessing the food security status of broiler farmers in terms of access to balanced diets and improved livelihood becomes necessary. Hence, this study was aimed at examining the contribution of broiler production on farmers' food security in Kaduna State. Specifically, the study analysed the food security status of broiler farmers; estimate the effects of broiler production on food security status of the farmers; and describe the constraints faced by broiler farmers in the study areas.



MATERIALS AND METHODS

The Study Area

Kaduna State is situated in the Northwest zone of Nigeria. The State lies between latitudes 9° N and 11° N of the equator and between longitudes 6° E and 8° E of the prime meridian (Okusaga, 2016). The average annual rainfall and humidity are 1,272.5 mm and 56.64%; respectively while the average daily minimum and maximum temperatures are 15.1 °C and 35.18 °C. The mean annual rainfall shows a marked decrease from South to North (1,524 mm to 635 mm) (KADA, 2020). The estimated projected population of the state at 3.2% growth rate per annum in 2022 is 9,647,645 (NPC, 2006).

Agriculture is the major occupation of the people in the area. Farming is mainly traditional in nature and small-scale farmers constitute most of the labour force who undertake bulk of the agricultural production in the area. Livestock kept in the area include: cattle, sheep, goat and poultry (KADA, 2020). Poultry farming in the area is mainly traditional and the birds are generally local breeds kept on free range. There are however, a number of commercial poultry: small, medium and large-scale farms in the area that keep exotic breeds of broilers as well as layers mostly on deep litter system, it is also known for pottery and arts work, and several cottage industries which can be found throughout the State (Oyinbo *et al.*, 2015, Salihu *et al.*, 2015).

Sampling Procedure and Data Collection

A multistage sampling procedure was used for this study. In the first stage, two agricultural zones were purposively selected because of their relative peace. The second stage involved the purposive selection of two LGAs namely, Igabi and Sabon-Gari based on the predominance of poultry producers, mostly broiler farmers. The third stage involved the random selection four (4) villages using a simple ballot system from each of the selected LGAs to make a total eight (8) villages selected for this study. The final stage involved a proportionate random sampling to select 49% from a sample frame of 420 broiler farmers giving a sample size of 205 for the poultry farmers in the study area. The 49% represent the minimum sample size from Slovin formula based on the assumption of five (5) percent expected margin of error, 95% confidence interval and applying the finite population correction factor. Thus,

$$SZ = \frac{N}{1+N(e)^2} \quad \dots(1)$$

where; N = Sample frame; e = level of significant; 1 = constant and Sz = sample size

$$Sz = \frac{420}{1+420(0.05^2)} = Sz = \frac{420}{2.05} = Sz = 204.5 \approx 205 \quad \dots(2)$$

$$Sz = \frac{205}{420} \times 100 = 48.8\% \text{ approximately } 49\% \quad \dots(3)$$

Method of Data Collection

Primary data were used for the study. The data were obtained through the use of structured questionnaires in 2020 production season.

ANALYTICAL TECHNIQUES

To achieve the objectives of the study, data collected were analysed using descriptive statistics, Tobit regression model and food security index (FSI). The food security line used in this study was based on the daily recommended level of calories and protein, which are 2260 Kcal and 65g respectively (Ojeleye, 2015). In order to generate food security indices, the nutrient content of the food items consumed were used to derive calorie availability.

$$FSI = Z_i = \frac{\text{Household per capita calorie availability}}{\text{Household's daily per capita calorie requirement}} \quad \dots(4)$$



For a household to be food secured, Z_i must be greater than or equal to 1 ($Z_i > 1$). If Z_i is less than 1 ($Z_i < 1$), the household is food insecure. The quantity of broilers consumed and other food items, purchased and received as gifts were converted to kilogram and further to calorie consumed per day per household and then compared with the standard (2260 kcal). The nutrient composition of commonly eaten foods in Nigeria adopted by Babatude *et al.* (2007) was used to estimate the calorie intake of household. On the other hand, the equivalent male adult scale to determine adjusted household size computed by Falusi (1985), and adopted by Ojeleye (2015) was used. The quantity of broilers produced and other food items purchased for consumption was converted to kilogram and then to calorie and then divided by the adult equivalent household size, using FAO adult equivalent scale. To estimate the calorie consumed per day per household, the result was further divided by 365 days and then compared with the FAO standard (2260 Kcal), for food secured individual. The households whose daily per capita calorie was up to 2260 Kcal were regarded as food secure, while those below the food security line of 2260 Kcal were regarded as food insecure.

Tobit regression model was used to estimate the effects of broiler production and socio-economic characteristics on food security status of the farmers. Hence,

$$Y_i = X_i\beta + \varepsilon_i \quad \dots(5)$$

where; Y_i = Food security index for i th farming household, X_i = independent variables which were the production inputs, β = vector of the parameter estimates, ε_i = the error term

The Tobit model is stated explicitly as:

$$Y_i = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + U_i$$

where; Y_i = Food security index for i th farming household, X_1 = level of education (years of schooling), X_2 = access to credit (amount borrowed in ₦), X_3 = cooperative membership (years of participation), X_4 = primary occupation (poultry farmer = 1, non-poultry farmer = 0), X_5 = dependence ratio, X_6 = cost of day old chick (₦), X_7 = cost of feed (₦), X_8 = cost of labour (₦), X_9 = cost of drugs (₦), X_{10} = cost of transportation (₦), X_{11} = income from broiler (₦).

RESULTS AND DISCUSSION

Summary Statistics of Socio-economic Variables

The result in Table 1 showed that majority of the farmers (71.7%) were within 30-49 years with mean age was 40 years implying that they are within their economically active age which corresponds to the reports of Ojo *et al.* (2021), who stated that mean age of poultry farmers was 43.3 years. About 64.4% of the poultry broilers had at least secondary education and this may encourage them to adopt innovations and technologies that are vital for enhancing broiler productivity. This finding is in agreement with Ojo *et al.* (2021), that opined that most of the farmers were literate and this probably increased their perception and adoption of innovations as it enables farmers make accurate decisions in the management of farms, thus leading to higher productivity and subsequently food security of the households. About 89.4% had 1-10 family size and this has direct implications on labour supply to the farm because of the potential contributions of family labour available for broiler production. Higher household size provides enough persons for farm labour and therefore less money will be needed to pay for hired labour. However, the implication of household size for food security is that small households are less prone to food insecurity than large household sizes because large household sizes have low per capita. The result agrees with Okusaga (2016) who reported higher household size which may provide the needed labour on the farm thus, increasing their productivity and food security status. The result indicated high cooperative membership as



73.2% belong to cooperative society, which implies that farmers may have had access to credit and 62.5% accessed credit of less than ₦300,000 which will improve their production practices and food security status.

Table 1: Summary of socio-economic variables

Variable	Dominance characteristics of respondents	Mean	Std. dev.
Age	71.7% were between 30-49 years	39.6	5.03
Education	64.4% had at least secondary education	Na	Na
Household size	89.4% had 1-10 family size	8.0	4.24
Cooperative	73.2% belong to cooperative society	10.3	2.29
Credit	62.5% access credit of less than ₦300,000	₦262,500	₦602.43
Experience	74.6% had poultry experience of 6-15 years	11.4	4.44
Occupation	55.1% engaged in poultry as primary occupation	Na	Na

Food Security Status of Broiler Farmers

The result presented in Table 2 showed that 75.10% of the sampled households were food secure while 24.90% were not food secure. The larger proportion of the food secured household could mean that the level of production was high and this could afford them the ability to purchase enough food items for their household. It may also be that the food secured households engaged in secondary activities which enabled them to generate additional income to supplement revenue from broiler production. This is in agreement with the report of Ameh (2021) who stated that off-farm work is a proxy to wealth and an additional income that increases household's probability of being food secured.

Table 2: Summary of broiler households' food security status

Variable in Average	Value
Food secured households	154
Food security index	1.91
Surplus index	0.91
Average household daily calorie consumption for food secured households	4317.12
Average calorie consumption in excess of recommended (2260Kcal)	2057.12
Average total output for food secured households (kg)	451.92
Average total income of food secured household (₦)	587500
Percentage of food secured household	75.10
Food insecure households	51
Food insecurity index	0.45
Shortage index	0.55
Average household daily calorie consumption for food insecure households	1013.08
Average calorie consumption in excess of recommended (2260Kcal)	1246.92
Average total output for food insecure households(kg)	173.08
Average total income of food insecure household (₦)	225000
Percentage of food insecure household	24.90

Following results of Table 2, the average food security indices for the food secure and insecure households were estimated to be 1.91 and 0.45, respectively. An index value of 1.91 for the food secure household indicated a surplus index of 0.91 among the food secured households. The shortfall/surplus index measures the extent of deviation from the food security line. The average output of 451.92 Kg for the food secure household suggests that these households are more technically efficient in broiler production for them to attain a FSI of 1.91.



The average daily calorie consumption for the food secure household was 4,317.12 Kcal, and this suggests an excess in calorie consumption of the recommended by 2,057.12 Kcal. On the other hand, the food insecure household with FSI of 0.45 revealed that these households have shortage index of 0.55 for them to be food secured. The average daily calorie consumption of 1,013.08 Kcal shows a shortage in calorie consumption of the FAO recommended by 1,246.92 Kcal. The result is in tandem with the findings of Keku (2017) where he found majority (66.00 %) of sample farm households in Kaduna State to be food secure.

Level of Food Security among Broiler Farmers

The result presented in Table 3 showed the different categories of food security status among broiler farmers. The calorie intake shortfalls are estimated based on the nutritional food security line of 2,260 Kcal. According to Devereux (2006) and Meseret (2012), the level of food insecurity measures the calorie consumption according to the degree of severity of food insecurity. The result showed that majority (75.10%), of the broiler farmers were food secured suggesting that these households show zero evidence of food insecurity, whereas the others were found to be food insecure with different severity levels. In addition, about 6.7% were marginally food insecure, while 4.20% were moderately food insecure implying that these households could adjust their food consumption despite the inadequacy in supply and 14.00% were severely food insecure implying that the food consumption of the household were reduced to a level that they witnessed severe hunger. The proportion of severe food insecure house in this study (14%) is lower than 6.1% reported by Abdulrahman *et al.* (2017) for severe food insecurity. The result of this findings corresponds to that of Ojeleye (2015), and Ameh (2021), who reported that larger proportion of 66.40 % and 62.40%, respectively, of the sampled households was found to be food secured.

Table 3: Distribution of broiler farmers based on level of food security

Food security levels	Calories consumption per person per day (Kcals)	Frequency	Percentage
Food secure	Above 2260	100	75.10
Marginally food insecure	1800-2260	26	6.70
Moderately food insecure	1500-1800	43	4.20
Severely food insecure	Below 1500	36	14.00
Total		205	100.0

Effect of Broiler Production and Socio-economic Characteristics on Farmers Food Security Status

The result presented in Table 4 showed the marginal effects of the Tobit regression estimates of the effects of broiler production on farmers' food security status. The estimated F-value (86.113), and Prob. > F (0.000), rejects the null hypothesis that the explanatory variables do not have significant effect on broiler farmers' food security. From the result, out of the eleven independent variables used in the model, seven variables were found to be statistically significant in affecting the food security status of the farmers.

The marginal effects of level of education were positive (0.872), and found to have significant ($p < 0.01$), effect on the level of household food security of broiler farming households. This implies that household food security increases as level of education of the respondents' increases. Increase in level of education of the farmers' leads to higher rate of adoption of improved technology and production techniques which aids in increased information and understanding of new practices leading to improved economic efficiency and



food security. This agrees with earlier findings and the findings of Akpan and Nsa (2009), Abdulrahman *et al.* (2015), who stated that education is a very important policy tool that can be employed to enhance the economic efficiency of agricultural production.

The marginal effect of access to credit on food security status of broiler farming households was also found to be positive (0.113), and statistically significant at $p < 0.05$. This implies that food security status of the farmers will increase with increase in access to credit and the amount of credit obtained. This agrees with the findings of Asogwa *et al.* (2014), whom found that access to credit was significant in their study.

The marginal effects of membership of an association were found to be positive (0.068), and statistically significant at $p < 0.05$ influencing the food security status of the broiler production households. This means that farmers who belong to one association or the other will increase their household food security status. This finding agrees with Iheke and Onyendi (2017) whom found that membership of cooperatives are sources of good quality inputs, labour, credit, information and organized marketing of products for farmers and this will lead to increased food security.

The marginal effects of cost of day-old chicks (DOC), was positive (0.363), and statistically significant at $p < 0.01$ levels of probability. This implies that cost incurred in broiler production significantly influences level of food security status of the farmer. Increased in cost of DOC will increase the total cost of production and reduce the revenue. The result of this study agrees with the findings of Okusaga (2016) who reported cost of chicks among others as feed and drugs to have significant impact on quail meat production.

Table 4: Effect of broiler production on farmers' food security status

Variables	Marginal effect	Std. error	Z	P>Z
Level of education	0.872**	0.429	2.033	0.007
Access to credit	0.113*	0.085	1.329	0.052
Membership of association	0.068**	0.035	1.943	0.032
Primary Occupation	-0.086	0.065	-1.323	0.164
Number of dependents	-0.043	0.073	-0.589	0.798
Cost of DOC	0.363**	0.056	6.482	0.003
Cost of feed	0.182**	0.114	1.596	0.042
Cost of labour	-2.211***	0.805	-2.747	0.006
Cost of drugs	-0.263***	0.076	-3.461	0.008
Cost of transportation	0.932	2.122	0.439	0.661
Income from broiler	0.161***	0.064	2.516	0.012
F (63.621)	86.113***			
Prob > F	0.000			
Pseudo R ²	0.412			
Number of observations	205			

*** = 1%, ** = 5% and * = 10%.

Cost of feed was positive (0.182), and statistically significant at $p < 0.01$ level of probability. This implied that a unit increase in the cost of broiler feed will improve the food security status of the farmer. This may be due to increased productivity as a result of increased in feeding thereby ensuring higher revenue. This corresponds to the study conducted by Ojo *et al.* (2021), they reported that increase in the cost of feeding results into increased productivity. Similarly, the result of this study agrees with the findings of Okusaga (2016) who reported cost of feed to have significant impact on quail meat production.



The marginal effects of cost of drugs (-0.263), and labour (-2.211), were estimated to be negative and both statistically significant at $p < 0.01$ levels of probability. This implies that food security status of broiler farmers decreases as a result of a unit increase in the cost of drugs or medications and labour. This finding corresponds to the report of Okusaga (2016) who reported that cost of chicks, feed and drug have significant impact on quail meat production.

Farmers' income from broiler farming was also found to be positive (0.161), and significant at $p < 0.01$ implying that food security status of the farmers will increase with increase in their level of income procured from broiler farming. This implies that production of broiler enhances farmers' food security status, thereby improving their livelihood. This means that broiler farming is profitable to the farming households. This corresponds to the report of Omotayo *et al.* (2020) and Ojo *et al.* (2021) that broiler chicken farming is a profitable enterprise.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, it was concluded that the proportion of food secure broiler farmers are more than the food insecure broiler farmers in the study area. Further, calorie consumption of the food secured farmers was in excess of the daily recommended intake, while that of the food insecure was low. The result also revealed that level of education, access to credit, membership of association, cost of day-old chicks, cost of feed cost of drugs and income from broiler production are variables that significantly influences broiler farmers' food security status. Finally, broiler farmers attested to the fact that; lack of constant market (95.8%), high cost of feed (92.7%), high cost of input (88%), and price fluctuations (86.9%) are most severe constrains militating the chances of increasing broiler production. In light of the findings of this study, the following recommendations were made:

- i. Broiler farmers should be provided with informal education through extension services on nutritional awareness and improved broiler production practices.
- ii. Farmers should adopt self-feed formulation using locally available resources that will reduce the cost of feeding and increase their profit margin and thereby enhancing their food security status.
- iii. Broiler production is a viable business and increases food security of the farmers. Therefore, agricultural policies that promote both public and government that encourage poultry production to increase local production should be endorsed, so as to bridge the gap between broiler demand and supply in the country.

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