



# Profit Efficiency of Broiler Production among Public Servant Household Heads in Kwara State, Nigeria: A Coping Strategy

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## Authors' contributions

*This work was carried out in collaboration between all authors. Author YUO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors ZA and AMA managed the literature searches, analyses of the study in conjunction with author YUO. Authors SA and ROA participated in study design, data collection and data analysis/interpretation, the findings, conclusion and recommendations. All authors read and approved the final manuscript.*

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## ABSTRACT

The aims of the study were to describe socio-economic characteristics of urban and peri-urban broiler farmers, profitability of broiler production and determine its profit efficiency in Kwara State, Nigeria. Both primary and secondary data were collected from 120 respondents selected using simple random sampling techniques. Data were collected through field survey with the aid of structured questionnaire and production records between March and August, 2014. Data collected were analyzed using net farm income, multiple regression and stochastic frontier profit function. The results of socioeconomic characteristics revealed that the bulk of the respondents (72%) were

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within the active age of 25-50 years and about 92% had formal education. Broiler production is profitable with mean profit of ₦912 per bird and an average return of ₦1.98 for every ₦1 invested in the study area. The coefficients of drugs ( $p < 0.01$ ), day old chicks ( $p < 0.01$ ), feed ( $p < 0.01$ ) and education ( $p < 0.05$ ) of multiple regression analysis were significant determinants and the postulated explanatory variables explained about 58% in the variations of net income of broiler farmers. Results of profit frontier indicated that cost of family labour, feed, capital items and investment were significant ( $p < 0.01$  and  $P < 0.1$ ). The mean profit efficiency is 74% while the range is 30-98%. Also, age, household size and cooperative membership were the socio-economic variable responsible for the variation in profit efficiency of the broiler producers. It recommended that broiler farmers should form a formidable group to enjoy economic of scale to purchase broiler inputs and should be given adequate training through their cooperative by inviting resource personnel.

*Keywords: Broilers feed; profit; stochastic production frontier; Kwara State.*

## 1. INTRODUCTION

Poultry refers to all birds of economic value to man as source of meat and eggs. It serves as an important source of animal protein and has certain advantages as a means of bridging the protein demand-supply gap amongst Nigerians. Apart from poultry, other sources of animal protein in Nigeria are ruminants, fishes, pigs, snails and rabbits. Hence, livestock industry of which poultry is a part provides protein for the populace [1,2] However, ruminants are poor candidates for rapid short-term increases in number. This is due to their low fecundity, long gestation and long generation interval [2]. It is known that swine and poultry multiply rapidly within a short-time with gestation and incubation period of 114 and 21 days respectively. Unlike pork that has no national spread due to religious beliefs, there are virtually no taboos that hinder the consumption of poultry meat or eggs [2]. Hence, poultry production has long been recognized as one of the quickest ways of rapid increase in protein supply in the short-run. The need to meet animal protein requirements from domestic sources demands intensification of production of meat and eggs, derived from prolific animals like poultry birds [2].

It suffices to note that Nigeria hosts more than 45% of the poultry in the West Africa sub region [3] and its poultry population is estimated at 140-160 million comprising of 72.4 million chicken, 11.8 million ducks, 4.7 million guinea fowl, 15.2 million pigeon and 0.2 million turkeys [4]. In Nigeria, livestock resources consists of 13, 885, 815 cattle, 34, 453, 742 goats; 22, 096, 602 sheep; 3, 406, 381 pigs and poultry ranged from 140-160 million [5]. From this figure, poultry accounted for about 58.2% of the total livestock production. This indicates the important place of poultry sub-sector in the livestock sector.

However, [5] stated that Nigerian poultry industry is dominated by small-holding farmers who on the aggregate raise bulk of the birds for egg production and meat, but individually rear less than 1000 birds using different production strategies in consonance with little resources available to them.

### 1.1 Problem Statement

Weekly wages and monthly income is the most essential component of public servant households' income. However, of recent this income exhibits a high irregularity and outcomes are thus uncertain, because of drastic reduction in allocation from Federal Government and global economic recession. Thus, many government establishments at the three tiers are indebted to their employees running to months. Consequently, many of these civil servants partly allocate their leisure time, off days and vacations to activities which provide a supplementary income so as to cope with adverse shocks. Livelihood diversification activities have become an important income-generating strategy for both urban and rural small farm households throughout the developing world including Nigeria. Diversification refers to the expansion of the range of activities outside their primary or main occupation [6] and is seen as a dynamic adaptation process created through pressures and opportunities [7]. Diversification may occur as a deliberate household strategy or as an involuntary response to crisis; and can be used both as a safety net for the poor or as a means of accumulation for the rich [8]. Evidence from literature [9,10,6] revealed that there has been an increasing livelihood diversification to agriculture among urban and peri-urban people including public servants.

According to [7], participation in multiple activities by urban and farm (rural) families is not new or

only confined to the rural sectors of developing countries. Most rural and urban families have truly multiple income sources which may indeed include off-farm wage work in agriculture and wage from non-farm activities, rural non-farm self-employment, trading and remittances from urban areas and from abroad [11]. Lately, many urban and rural households including public servants play a significant role in the service sector mostly casual labour in industries, craft, artisan work and, public and private institutions located near their villages during the off-days, vacations, off-farm season to get work for sustaining their livelihood such as cushion food shortage experienced by the households or settle domestic obligation and buy back some inputs needed for farming operations [6]. It is obvious that involvement of public servants in agricultural production has multiplier effects on both micro and macroeconomic in Nigeria. For instance, such engagement could increase household income and consumption of such produce which improves access to better nutrition, increase self-sufficiency and promote overall agricultural development and production.

Considering the growing importance of the broiler production as supplementary occupation among wage earners in Nigeria, the study therefore, intends to:

- (i) Describe the socio-economic characteristics of the public servant poultry farmers,
- (ii) Examine profitability of broiler production and its determinants,
- (iii) Estimate the gross margins of broiler farmers and
- (iv) Determine the profit efficiency of broiler production among public servant households.

## 2. MATERIALS AND METHODS

### 2.1 The Study Area and Data Collection

The study was conducted among public servants poultry owners in Kwara State, Nigeria. Ilorin is the capital of Kwara State situated in North Central Nigeria. The State lies between latitude 8° 10' and 19° 50'N and between longitudes 3° 10' and 6° 05'E. The area falls within the Guinea savannah zone of Nigeria with mean annual rainfall and temperature ranges from 800 mm to 1500 mm and 31.5°C - 35°C respectively [12]. For ease of data collection however, this study was meant to collect information from public

servant broiler producers. Both primary and secondary data were collected for the study. The primary data were collected through interview method using structured questionnaire while secondary data were collected from the production records of the poultry farmers.

### 2.2 Sampling Procedure, Sampling Size and Analytical Techniques

A total of 600 public servants poultry owners' specifically broiler production was generated and random sampling resulted in a sample totaling 120 respondents in the study area. The tools used for analyzing the data collected for this study includes; descriptive statistics, net farm income analysis, multiple regression and stochastic frontier profit function models. Therefore,

$$NFI = GR - TVC - TFC \quad (1)$$

Where: NFI = Net farm income (₦); GR = Gross receipt (₦); TVC = Total variable cost (₦); TFC = Total fixed cost (₦).

Variable cost include cost of chick stock, cost of hired labour, cost of drugs and vaccine, cost of electricity and cost of feed while fixed cost consist of depreciation cost of poultry shed and depreciation cost of other equipment.

The multiple regression model was specified as:

$$\pi = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e \quad (2)$$

Where:  $\pi$  = profit earned by farmers;  $X_1 - X_8$  were defined in the results and  $e$  = error term.

The stochastic frontier profit function was defined as:

$$\pi_i = f(X_i; \delta) + \varepsilon_i \quad (3)$$

Where  $\pi$  normalized profit of the  $i$ th farms is,  $X_i$  is a vector of inputs used by farm  $i$ , and  $\varepsilon_i$  is a "composed" error term.  $\delta$  is sigma The error term  $\varepsilon_i$  is equal to  $v_i - u_i$ . The term  $v_i$  is a two-sided ( $-\infty < v_i < \infty$ ) normally distributed random error ( $v \sim N[0, \sigma_v^2]$ ) that represents the stochastic effects outside the farmers' control. The term  $u_i$  is a one-sided ( $u_i \geq 0$ ) efficiency component that represents the technical inefficiency of farm. The distribution of the term  $u_i$  can be half-normal, exponential, or gamma and half-normal

distribution ( $u \sim N[0, \sigma_u^2]$ ) is used in this study. The two components  $v_i$  and  $u_i$  are also assumed to be independent of each other according to [13,14].

Empirical model specification for the determinants of profit efficiency was as follows;

$$\ln \pi_i = \beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + V_i - U_i \quad (4)$$

Where:  $\pi_i$  = Profit of the  $i$ th broiler farmers (₦);  $X_1$ –  $X_5$  were defined in the results, and subscript  $i$  refer to the observation of  $i$ th broiler farmers;  $\ln$  = Logarithm to base e. The inefficiency effects,  $V_i$  is a random error term assumed to be independently and identically distributed as  $N(0, \sigma_v^2)$ .

$U_i$  represents profit inefficiency and is identically and distributed as a truncated normal with truncations at zero of the normal distribution [15]. The  $U_i$  is defined as:

$$u_i = \omega_0 + \omega_1 Z_1 + \omega_2 Z_2 + \omega_3 Z_3 + \omega_4 Z_4 + \omega_5 Z_5 \quad (5)$$

Where:  $U_i$ = technical inefficiency of the  $i$ th poultry farmers;  $Z_1$ -  $Z_5$  were defined in the results.

### 3. RESULTS AND DISCUSSION

#### 3.1 Socio-economic Characteristics of Public Servant Broiler Producers

Summary statistics of the data reported in Table 1 revealed that poultry farming household heads in the study area are females dominated (69%); average age of 44 years and married (87%) with mean adjusted household size of 5. The estimated mean years of schooling of sampled poultry farmers were 11.9 years, largely skewed towards the formal education and above 2011 UNDP mean education index of 5 years for Nigeria. The study also revealed that 61% of the public servants farmers had at least 5 years' experience in poultry farming. The level of investment, number of day old chicks acquired by poultry farmers and average income from broiler production (a proxy for output) per cycle depict in Table 1 revealed that broiler production could sustain public servants livelihood diversification strategies rather than relying only on monthly salary as the only mean of livelihood. The study corroborates [11,8,6] who established that involvement in livelihood diversification exhibits higher potentials of reducing unemployment rate as well as increasing household income.

**Table 1. Dominance indicator of the broiler production data of public servant households in Kwara State, Nigeria**

Variables	Dominance indicators	Mean	Min.	Max.	Std d
Gender (sex)	69% were female	-	-	-	-
MMM Marital status	87% were married	-	-	-	-
Age (yrs)	72% below 50 years	44	23	58	2.5
Level of Educ. (yrs)	92% had sec. schooling	11.9	6	16	2.1
Poultry experience	61% had $\geq$ 10 years	5.8	1	19	2.8
Adj. h size (persons)	67% had 4-6 persons	5.4	3	11	1.9
Labour component	61% used family labour	72	21	98	6.2
Level of investment	59% invest > ₦200,000	200,500	54,000	970,550	21,900
Access to credit (₦)	76% had no access	176,900 *	50,000	1million	54,800
Types of mangt syst.	89% used deep litter	-	-	-	-
No of birds kept	65% kept 100/cycle	100	50	1200	9.7
Major occupation	100% public servants	-	-	-	-
Ancillary occupation	100% engage in poultry	-	-	-	-
Av. pub salary/month	76% earned < ₦40,000	39,800	18,000	139,000	290
Poultry income/cycle	59% earned > ₦50,000	81,000	19,000	600,000	23,400

Source: Field survey, 2014; Household size was adjusted using OECD Scale; labour component was measure in man-days; \* average of those who had access, Std dev denote standard deviation

### 3.2 Profitability Analysis of Broiler Production

The results of net farm income and profitability analysis are presented in Table 2. Majority of the respondents (81.5%) were interested in selling their outputs to raise additional income. The result revealed that the gross margin and net farm income per bird was about ₦1,057 and ₦912 as well as profit margin and return on investment (ROI) of 49% and 1.98 respectively. The net margin analysis has shown that poultry production among public servant in Ilorin is profitable. However, it is pertinent to show that both price of chick stock (27%) and cost of feed (34%) account for about 61% and 50% of total variable cost and total cost respectively. Furthermore, the variable costs gulped about

84% of total cost of broiler production. The results are comparable to studies by [16,17] that reported that broiler production are profitable in Pakistan and Ondo State, Nigeria respectively.

### 3.3 Estimated Factors Influencing Net Farm Income of Poultry Broiler Producers

Results showed that the postulated explanatory variables in equation 2 explained about 58% in the variations of net income of broiler producers in Table 3. The F-test with a value of 17.08 implies that the entire stimulus variables considered for the analysis jointly exerted significant influence on the profitability of the poultry production (1% significant level).

**Table 2. Average cost and returns of broiler production of 100 broilers**

Variables	Values (₦)	% TVC or FC	% TC
<b>A. Fixed costs</b>			
Depreciation cost of poultry shed	9100.90	62.97	9.79
Depreciation cost of other equipment	5350.75	37.03	5.76
<b>Total fixed cost</b>	<b>14,451.65</b>	<b>100.0</b>	<b>15.60</b>
<b>B. Variable costs</b>			
Cost of chicks stock	21,000.00	26.8	22.60
Cost of feed	26,780.08	34.1	28.82
Cost of labour	14,600.90	18.6	15.71
Cost of drugs & vaccines	9,550.00	12.2	10.28
Cost of electricity	1,900.00	2.4	2.044
Other costs (lime, litter, etc)	4,650.00	5.9	5.00
<b>Total variable cost</b>	<b>78,480.98</b>	<b>100.0</b>	<b>84.40</b>
<b>C. Total Cost (A + B)</b>	<b>92,932.63</b>		<b>100.0</b>
<b>Net Returns</b>			
Quantity sold (broilers)	93		
Unit price	1980.00		
<b>A. Total revenue</b>	<b>184,140.00</b>		
Gross Margin (C-A)	105,659.02		
<b>B. Net Farm Income (C-B)</b>	<b>91,207.37</b>		
Profit margin (D/C*100)	49.53		
<b>Ratio of input to output (ATR/ATC)</b>	<b>1:1.98</b>		

Source: Field Survey, 2014; production and financial records

**Table 3. Estimated factors influencing net income of broiler farmers**

Variables	Description	Coefficient	Std. error	t-value
Cost of hired labour (₦)	X <sub>1</sub>	0.0109	0.0056	1.95*
Cost of drugs and vaccines (₦)	X <sub>2</sub>	-0.7342	0.1971	-3.73***
Cost of day old chicks (₦)	X <sub>3</sub>	-0.3904	0.0210	-18.59***
Cost of feed (₦)	X <sub>5</sub>	-0.0720	0.0090	-8.00***
Depreciation of capital items (₦)	X <sub>6</sub>	-0.5008	0.2990	-1.68*
Level of education (years)	X <sub>7</sub>	0.4806	0.2201	2.18**
constant	β <sub>0</sub>	0.7823	0.2093	3.74***

Field survey/data analysis, 2014; R<sup>2</sup> = 0.579, F-value = 23.231 \*\*\*; \*\* & \* indicates significant at 1%, 5% & 10% respectively

The coefficients of costs of drug and vaccine (-0.7342), of day old chicks (-0.3904), of feed (-0.072), depreciation of fixed items (-0.5008) and level of education (0.4806) included in the factors affecting broiler producers income carried a priori signs which support the hypothesized theory that cost items are expected to bear a negative sign while level of education made positive contributions to the net income of households. Although, cost of hired labour variable was not in line with postulated economic theory, the variable was marginally significant at 10% which implies that more usage of hired labour may increase output. The result is comparable with findings of [5,17] that found these variables a determinant of income in Ondo State, Nigeria.

### 3.4 Profit Efficiency and Its Determinants among the Poultry Farmers

Table 4 showed the frequency distribution of the profit frontier model of broiler production in Kwara State. The result revealed that the estimated coefficient of the parameters of cost of feed (P<0.10), depreciation of capital items (P<0.05) and cost of investment (P<0.05) were positive while cost of family labour (P<0.01) was negative. This showed that a unit increase in

prices of the positive coefficient inputs will lead to increase in the net margin of broiler production and vice versa. The mean profit efficiency shows that farmers are able to obtain about 0.74 of potential output from a given one unit mix of production inputs. Therefore, the poultry farmers can expand their output further by a relatively high margin of 0.26 by adopting improved technique and technology available for best practices to attain the profit efficiency of one. Such farmers could also realize 0.26 (1-0.74/0.98) in order to achieve the profit efficient level of his most efficient counterpart. For the most inefficient farmer to maximize his profit, he has to achieve a cost saving of as high as 0.74 (1-0.28/0.98) to become the most efficient farmer.

The inefficiency sources in Table 4 showed that age, adjusted household size and cooperative membership were the significant factors affecting broiler production thus, as these variables increase, the profit inefficiency of the farmer decreases. The bulk of broiler farmers (about 70%) were concentrated in 0.61-0.98 distribution efficiency. Nevertheless, the results implied that a considerable amount of profit can be obtained by improving technical and allocative efficiencies. The results are comparable to studies by [16,17].

**Table 4. MLE results of frontier profit function of broiler production**

Variables	Parameters	Coefficients	Std. error	T-value
<b>Cost function</b>				
Constant	$\beta_0$	2.325	0.999	2.33***
Cost of hired labour ( $X_1$ )	$\beta_1$	0.374	0.879	0.43
Cost of family labour ( $X_2$ )	$\beta_2$	0.358	0.095	3.77***
Cost of feed ( $X_3$ )	$\beta_3$	0.367	0.189	1.94*
Depr. of capital items ( $X_4$ )	$\beta_4$	0.721	0.315	2.29**
Cost of vac. And drugs ( $X_5$ )	$\beta_5$	0.989	0.911	1.09
Cost of day old chicks ( $X_6$ )	$\beta_6$	0.989	0.911	1.09
Cost of investment ( $X_7$ )	$\beta_7$	0.913	0.393	2.32**
<b>Inefficiency variable</b>				
Constant		0.376	0.456	0.82
Age	$Z_1$	-0.431	0.189	-2.28**
Household size	$Z_2$	-0.221	0.089	-2.48**
Experience	$Z_3$	0.229	0.707	0.32
Cooperative	$Z_4$	-0.122	0.072	-1.69*
Credit	$Z_6$	0.983	0.753	1.31
Education	$Z_7$	0.424	0.945	0.45
<b>Diagnostic statistic</b>				
Sigma-square ( $\sigma^2$ )		0.186	0.065	2.86***
Gamma ( $\gamma$ )		0.653	0.129	5.04***
Log likelihood function $L/f$		81.862		
LR test		56.697		
Mean efficiency		0.74		

Asterisk indicate significance \*\*\*1%, \*\*5%, \*10%.

**Table 5. Distribution of profit efficiency estimates from the SFM**

Class	Frequency	Percentage
0.21-0.40	14	11.67
0.41-0.60	23	19.17
0.61-0.80	23	19.17
0.81-1.00	60	50.0
Total	120	100

Note: Minimum = 0.28; Maximum = 0.98; Mean = 0.74

### 3.5 Implications of the Livelihood Diversification Strategy

The result implies that broiler production is profitable among public servants in Kwara State attesting to the fact that Nigeria has a huge agricultural endowment of human, materials and natural resources. Despite this, the nation faces a lot of challenges including that of attaining food security and self-sufficiency in virtually all food commodities which they have production comparative advantages. Engaging in agricultural production by urban and peri-urban households enables households to have diversified incomes, enhance their food security, increase agricultural production and most importantly reduce shocks of unpaid salary and arrears. Thus, it is very important for adequate institutional framework to be put in place by all the three tiers of governments to encourage homestead agricultural production among public servants and urban households in general since such engagement could increase household income, consumption of such produce which improves access to better nutrition, increase self-sufficiency, create employment and promote overall agricultural development and productivity.

### 4. CONCLUSIONS AND RECOMMENDATIONS

The net margin analysis showed that poultry production among public servant in Kwara State is profitable. The study revealed that agricultural incomes are increasingly becoming important as a part-time, vacations or home based income supplement for urban households whose main activity is public service. It recommended that public servants should form a formidable group to enjoy economic of scale to purchase inputs and should be given adequate training through their cooperative by inviting resource personnel and staff of State ministry of agriculture. This will increase not only the profitability of the enterprise but also make efficient use of resources as a panacea to livelihood diversification and coping strategy thus, improving their wellbeing.

It could also be concluded that the profit efficiencies of the sampled respondents is far from the frontier. The demand-supply gap of poultry products could be bridged and sustainable increased output using the available inputs and existing technology may be achieved, if resources could be efficiently and optimally utilized as ample opportunity still exist to move closer to frontier as it was revealed in this study. The presence of inefficiency in poultry production system should also be addressed if poultry farmers intend to maximize their profit. Therefore poultry farmers' level of efficiencies could be increased if their specific factors particularly age, adjusted household size and membership of cooperative society found to be statistically significant factors influencing inefficiency, and in line with a priori expectations are adequately addressed.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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