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COMPARATIVE ANALYSIS OF THE PROFITABILITY OF PULLET AND EGG PRODUCTION IN ABIA STATE, NIGERIA

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Abstract

The study provided the comparative assessment of the profitability of pullet and egg production enterprises in Abia state, Nigeria during 2022 production season. Multistage sampling technique was used to select one hundred and sixty poultry farmers (80 pullet producers and 80egg producers). A structured questionnaire was used to obtain data from the farmers. Farm budgeting model and profit function model were used to estimate the profitability of the two enterprises. The result showed that the profitability indices for pullet farmer and egg farmer were 0.30 and 0.36 respectively, indicating that both enterprises were profitable but egg production enterprise was more profitable. The result also showed that household size, the price of labour, the price of feeds, the price of foundation stock, flock size and depreciated farm tools were the significant variables that influenced profit of the egg farmers. On the other hand, the price of output, the age of pullet farmer, household size, price of labour, price of feeds and flock size were the significant variables that influenced the profit of the pullet farmers. It was concluded that both enterprises were profitable and lucrative in the study area but egg enterprise was more profitable given the higher profitability index. The study recommends that farmers should therefore, form cooperative societies so as to enable them have access to productive inputs that will enable them expand their resource base and consequently their scale of operation.

Keywords: *Profitability, Cost, Revenue, Pullet Production, Egg Production.*

INTRODUCTION

Poultry farming is a significant contributor to the economy of Nigeria, playing a crucial role in food security, employment generation, and income creation for millions of households. Abia State, situated in southeastern Nigeria, boasts a burgeoning poultry industry characterized by both pullet production; sometimes referred to as pullet replacement which involves raising hens for laying purposes and table egg production ventures which involves the use of good layers stock for the purpose of table egg production for human use. Understanding the comparative profitability of these two aspects of poultry farming is essential for optimizing resource allocation, improving productivity, and enhancing profitability.

Profitability is a primary goal of every business venture. It is a measure of the efficiency of the business in using its resources to produce profit or net farm income.

Without profit, the entire business will close down due to inability of the producer to continue with the production. Profitability is measured in terms of revenue accrued from sale and expenses or cost incurred in the process of production, the differences between these variables provide profitability or net income to the producer (Hofstrand, 2013, Ronald et al., 2008)).

Profitability in poultry production does not differ from other business, because cost must be incurred in the process of poultry production. These costs consist of Day-Old Chicks (DOC) or pullet in the case of pullet and egg production respectively, feed, vaccine/drugs and labor which are considered as variable cost, while land, vehicle and other poultry production equipment are regarded as variable cost. (Umar and Ngambeki, 2020).

However, poultry business, like any other farming endeavor, is fraught with a lot of risks and uncertainties. To circumvent these, poultry farmers try out several production operations in a bid to irk out reasonable earnings. Some go the whole hog by raising their birds from day old chicks to spent layers, while others prefer to buy mature birds that are at the point of lay and concentrate only on table eggs production, eventually selling off the spent birds as old layers. The third category simply raise their birds from day old chicks to point of lay and sell them off to the second category. It is against this backdrop, that this work seek to estimate and compare the cost and return, hence profitability of the second category - pullet production and the third category - Table egg production in Abia State.

METHODOLOGY

Study Area

This study was carried out in Abia State of Nigeria. Abia State is a state in the South eastern part of Nigeria. The capital is Umuahia and the major commercial city is Aba, formerly a British colonial government outpost. The state was created in August 27th, 1991 from part of Imo State (https://en.m.wikipedia.org/wiki/Abia_State) and it is one of the nine constituents of the Niger Delta region. The name "Abia" is an abbreviation of four of the densely populated regions Aba, Bende, Isuikwuato and Afikpo (Abia State History, 2012). Abia state is one of the 36 states of the federal Republic of Nigeria. It is the 32nd largest in area and 27th most populous with an estimated population of over 3,727,347 as at 2016 (Owoh, 2023)

Abia state is made up of 17 Local government areas (L.G. As), which are grouped into three agricultural zones. The agricultural zones are Aba, Ohafia and Umuahia. The major occupation of Abians include: trading, manufacturing, farming, civil service etc. The major business hub of Abia state is Aba which is known for its ingenuity of the people in manufacturing of shoes, bags, clothes, paints and so many agribusiness firms are found in the zone (Oleka, 2014).

Sampling Procedure

A multi-- stage sampling technique was applied in selecting the respondents for the study. Out of the three Agricultural zones in Abia State, two were purposively selected due to their high livestock activities, the agricultural zones are Umuahia and Aba Agricultural zones. In the second stage, two local government areas were purposively selected from each of the two agricultural zones in the state representing the rural and urban areas. In the third stage, 20 pullet production farms and 20 table egg production farms were selected from each of the local government areas making it a total of 160 farms; 80 pullet production farms and 80 egg production farms.

Method of Data Collection

Primary data were used for the study. The Primary data was collected through a carefully designed researcher instrument of questionnaire in accordance with the specification of the research questions and hypotheses.

Analytical Techniques

Data analysis involved the use of farm budgeting model and profit function model.

1. Farm Budgeting Model

Farm budgeting is a process of estimating costs, returns and net profit of a farm or a particular enterprise. Farm budget techniques such as Gross Margin (GM) and Net farm income (NFI) were employed to estimate and compare the profitability of the pullet and egg producers. According to Olukosi and Sonaiya, (2003), farm budgeting is a detailed physical and financial plan for operation of a farm for a certain period. Gross Margin (GM) which is the difference between the total revenue and the total variable cost of production is expressed as:

GM= GR - TVC..... (1)

GM= Gross Margin

GR= Gross Revenue; given as:

GR= Price (P) × quantity sold (Q) ..... (2)

TVC= Total Variable Cost.

On the other hand, Net Farm Income (NFI) which is the difference between the total revenue and total cost of production is expressed as:

NFI= GM - TFC..... (3)

Where;

NFI= Net Farm Income.

GM= Gross Margin

TFC= Total Fixed Cost

According to Ronald et al. (2008), NFI should be considered more as a starting point for analyzing profitability than as a good measure of profitability itself. Because profitability is concerned with the size of the profit relative to the size of the business. Size is measured by the value of the resources used to produce the profit. A business can show a profit but have a poor profitability rating if this profit is small relative to the size of the farm business. Two farms with the same NFI, for example, are not equally profitable if one used twice as much land, labour and capital as the other to produce that profit. Therefore, profitability is a measure of the efficiency of the business in using its resources to produce profit or net farm income. So, in order to conclude on which enterprise is more profitable or not, there is need to compute their profitability index as follows;

Profitability Index (PI): This is the Net Farm Income (NFI) per unit of Gross Revenue (GR). It is however expressed as;

$PI = {}^{NFI}/_{GR}$. ..... (4)

Rate of Returns on Investment (%)

RRI = $^{NFI}/_{TC}$ × 100% …… (5)

2. Profit Function Model

Profit is the difference between the revenue and the costs. A profit function is a relationship that shows the difference produced by taking the cost function from the revenue function. It represents the profit that is generated by subtracting the cost for the revenue. The x-intercept of the profit function is the break-even point of the function. It shows the point at which the amount of money that is spent to produce a product is the same as the amount of money that is received for selling the good or service. A profit function has a domain for the set of all positive numbers but can have a range that includes negative numbers.

The profit function is written as P(x) = R(x) - C(x).

Where; profit = P(x),

Revenue = R(x)

Cost = C(x)

and x as the number of items sold.

It can be further represented as :

$\pi = pq - (F_n+wq)$

where:

π = profit

p = sales price

F_n = fixed costs

RESULTS AND DISCUSSION

Cost and Return Analysis of Pullet and Egg Production in Abia State

The costs and returns analysis associated with the production of the two enterprises in the study area is presented in the Table below:

Table 1: Cost and Return Analysis of Pullet and Egg Production in Abia State

	Pullet farmers			Layer (egg) farmers		
Description of items	**Unit cost/N**	**Qty**	**Value (N)**	**Unit cost**	**Qty**	**Value (N)**
A.VARIABLE COST (VC)						
Feed	8512.2	25bags	212805.00 (44.2%)	8500.00	30 bags	255000 (46.4%)
Foundation stock (Day old chick)	800	220	176000 (36.5%)	800	220 birds	176000 (32.0%)
Labour (family & hired)	1800	12 md	21600.0 (4.5%)	1800	18 md	32400.0 (5.8%)
Vaccines and medications			32780.0 (6.8%)			33660.0 (6.7%)
Utilities (Electricity and water)			3500.25 (0.7%)			3210.0 (0.6%)

Transportation			5550 .50 (1.2%)			6160.00 (1.1%)
Saw dust/litters			2092.8 (0.4%)			2592.8 (0.5%)
Debeaking			626.00 (0.1%)			828.00 (0.2%)
TOTAL VARIABLE COSTS (TVC)			**449404.1 (93.3%)**			**509850.8 (92.8%)**
B. FIXED COST (FC)						
Depreciation on fixed assets			32356.8 (6.7%)			35447.3 (6.5%)
TOTAL FIXED COST (TFC)			**32356.8 (6.7%) (6.4%)**			**35447.3 (6.5%)**
TOTAL COST (TC)			**481760.9 (100.0%)**			**549207.60 (100.0%)**
C. REVENUE COMPOSITION						
Culled birds(pullet)	3400	200	680000	3800	195	741000.00
Egg sales	-	-		2450.25	50 crates	122512.50
Droppings	500	25	12500	450	35	15750.00
TOTAL REVENUE			692500.0			879262.00
Gross Margin (GM)= TR-TVC			243095.90			369411.20
Net Farm Income (NFI) = TR-TC	0.94		210739.10			330054.40
Returns on Investment (NFI/TC)x100	43.7					60.1
Profitability Index(NFI/TR)	0.30					0.38

Source: *Field Survey Data, 2023*

The result shows that the variable costs constituted the highest share of costs of production (N449404.1) representing 93.3% of the total costs of pullet production while fixed cost was (N32356.8) representing only 6.7%. Variable cost also constituted the highest share (92.8%) of cost in layer (egg) production. Cost of feed accounted for the highest share (44.2%) of total cost for pullet production and 46.4% for layer (egg) production. This means that feed is the largest cost item in poultry production. This finding is in agreement with those of Okezie and Bime (2016), Mgbakor and Chinonso (2013), in their various studies also found that cost of feed constituted the highest share of total cost of pullet production in Cross River and Anambra States of Nigeria respectively. Cost of foundation stock accounted for the second largest variable cost constituting 36.5% and 32.0% of the total cost of pullet and layer (egg) productions respectively. The average gross income and net farm income were N692500.0 and N210739.10 respectively for a pullet farmer and N879262.00 and N330054.40 respectively for an average egg farmer.

Further cost and return analysis shows that the profitability indices for pullet farmer and egg farmer were 0.30 and 0.36 respectively.. The Profitability which means that for every naira earned as revenue, 30 kobo was returned to the pullet farmer as net income and 36 kobo was returned to the egg farmer as net income; as PI is the level of returns per

unit gross income. The decision rule is that for a farm to be profitable, the PI should be greater than zero. However, if the PI is negative it implies that the farm is running at a loss.

All in all however, the result in Table 4.6 showed that both enterprises were profitable and lucrative in the study area but egg enterprise was more profitable given the higher profitability index. The implication of the findings is that when efficiently, effectively and carefully managed, poultry production is capable of producing good output/yield as well as reasonable net return over time to any poultry farmer.

TEST OF DIFFERENCE IN THE PROFITABILITY OF PULLET AND EGG PRODUCERS

The result of the test of difference in profit is presented in Table below:

Table 2: Summary of z-test analysis of the significant difference between profitability of pullet and layer producers

Samples	Mean	Standard Deviation	Std. Error Mean	Df	z-cal	Prob	Decision
profit of egg farmers	330054.40	0.59822	0.30427	88	1.961	0.001	Significant (rejected)
profit pullet farmers	210739.10	0.22613	0.12581				
[a] Paired difference	119325.30						

The table observed significant level (P) of 0.001 which is less than (α) = 0.05. The z –calculated of 1.961 is greater than the z –critical of 0.840 at 88 degrees of freedom (df). Since the z-calculated is greater than z-tabulated, we reject the null hypothesis which states that there is no significant difference between profitability of pullet and egg production and accept the alternative that there is a statistically significant difference between the profitability of the two groups of poultry farmers.

PROFIT FUNCTIONS OF EGG AND PULLET FARMERS

Profit Functions of Egg Farmers

The result of the profits function of the egg and pullet farmers is presented in Table 4.8

Table 3: Estimated profit function for the egg farmers

Variables	Linear	Exponential +	Semi-log	Double-log
Constant	5.301 (1.745)*	612.311 (0.344)	589.919 (1.505)	14.844 (1.171)
Prices of output (P1)	-0.001 (-1.808)*	-0.919 (-0.516)	-1955.423 (-1.848)*	-0.605 (-0.478)
Age (P2)	-0.007 (-0.148)	-16.820 (-0.521)	-484.945 (-0.257)	-1.211 (-0.536)
Household size (P3)	0.227 (1.342)	351.208 (2.201)**	619.443 (0.117)	0.120 (0.171)
Farming experience (P4)	-0.057 (-0.989)	-17.027 (-1.275)	-7.015 (-0.940)	-0.430 (-0.434)
Level of education (P5)	-0.070 (-0.755)	-64.341 (-1.107)	-217.396 (-0.510)	-0.403 (-0.733)
Normalized price of labour (P6)	0.202 (1.346)	232.185 (2.147)**	623.017 (1.391)	0.619 (1.069)
Normalized price of feed (P7)	-0.483 (-1.442)	-486.898 (-2.017)**	-1078.417 (-1.527)	-0.224 (-0.278)

Normalized price of medication (P8)	-0.072 (-1.152)	-80.461 (-1.297)	-70.811 (-0.142)	0.099 (0.214)
Normalized price of foundation stock (P9)	-0.027 (-1.856)*	-38.637 (-3.688)***	-581.013 (-1.962)*	-0.174 (-0.582)
flock size (Z10)	0.610 (2.299)**	601.566 (3.146)***	616.010 (3.071)***	0.655 (2.866)**
Farm tools and equipment (Z11)	(1.741)*	(2.905)***	(-0.022)	(0.658)
R^2	0.616	0.724	0.543	0.641
R^{-2}	0.465	0.615	0.513	0.501
F-ratio	4.084***	6.410***	4.578***	4.533***

Source: *Field survey (2023)*
**** = Significant at 1%, ** = significant at 5%, * = Significant at 10%*

Based on the number of significant variables, the signs of the significant variables as they conform to *a priori* expectations and the magnitude of the coefficient of multiple determination (R^2), the exponential functional form was chosen as the lead equation. The R^2 shows that 72% of the variation in profit variable was explained by the independent variables included in the model. The household size, the price of labour, the price of feeds, the price of foundation stock, flock size and depreciated farm tools were the significant variables that influenced profit of the egg farmers.

The household size was positively related to profit implying a direct relationship between household size and profit. A large household size suggests access to more family labour which will reduce the quantity of hired labour required by the household and consequently the total labour cost. This will probably positively influence the profit of the farmers.

Flock size was positively related to the profit of the egg farmers. This also shows a direct relationship between flock size and profit. This means that, as flock size increases, profit will increase and vice versa. As more birds in the farmwill in turn increase profit level.

The price of labour for the egg farmers was positively related to profit. This direct relationship implies that as price of labour increased, the profit of the egg farmers increased and vice versa. As the price of labour increased, farmers may be forced to use less labour. The use of less labour will lead to a reduction in the total cost of labour which will in turn lead to a reduction in the total cost of production. As a result, profit will increase.

The price of foundation stock was negatively related to the profit. This is an indirect relationship which implies that as price of foundation stock increased, profit decreased and vice versa. A decrease in the price of foundation stock will predispose egg farmers to purchase and use more day old chicks (foundation stock). An increase in the quantity of foundation stock used will lead to an increase in output and as a result, profit will increase.

The price of feeds was negatively related to profit. This indirect relationship implies that as the price of feeds increased, the profit made by the egg producers decreased and vice versa. An increase in the price of feeds will probably force farmers to use less feeds. The use of less feeds will adversely affect output and consequently profit will decrease. Alternatively, an increase in the price of feeds will lead to an increase in the total cost of feeds assuming that the quantity of feeds used remained unchanged. An increase in the

total cost of feeds will lead to an increase in the total cost of production. Consequently, profit will decrease.

The depreciated value of farm tools was positively related to profit. This direct relationship implies that as depreciated value of farm tools increased, profit increased and vice versa. A higher depreciated value of farm tools and equipment implies that farm tools and equipment were intensively used. An intensive use of farm tools and equipment suggests the use of more of other inputs. The use of more of other inputs will lead to an increase in output. Consequently, profit will increase given that the price of output remains unchanged.

PROFIT FUNCTIONS OF PULLET PRODUCTION

The estimated profit function of pullet farmers is presented in Table 4

Table 4: Estimated profit function for the pullet farmers

Variables	Linear	Exponential	Semi-log+	Double-log
Constant	1.321 (1.735)*	612.391 (0.349)	12689.901 (1.485)	11.840 (1.162)
Prices of output (P1)	-0.201 (-1.718)*	-0.119 (-0.545)	-1905.444 (-1.798)*	-0.715 (-0.440)
Age (P2)	-0.005 (-0.188)	-18.881 (-0.514)	-420.931 (-2.307**)	-1.241 (-0.836)
Household size (P3)	0.229 (1.312)	142.234 (2.107)**	462.410 (2.287)**	0.164 (0.184)
Farming experience (P4)	-0.057 (-0.971)	-57.097 (-1.385)	-807.027 (-0.313)	-0.465 (-0.464)
Level of education (P5)	-0.170 (-0.355)	-74.331 (-1.107)	-242.304 (-0.523)	-0.474 (-0.743)
Normalized price of labour (P6)	0.2411 (1.286)	232.185 (2.147)**	624.090 (1.815)*	0.628 (1.999)
Normalized price of feeds (P7)	-0.383 (-1.412)	-486.898 (-2.017)**	-1154.622 (-7.107)***	-0.324 (-0.208)
Normalized price of medication (P8)	-0.172 (-1.182)	-89.461 (-1.997)*	-63.841 (-0.622)	0.933 (0.223)
Normalized price of foundation stock (P9)	-0.017 (-1.751)*	-38.637 (-3.688)***	-261.003 (-1.892)*	-0.169 (-0.502)
Flock size (Z10)	0.210 (1.209)	601.566 (3.146)***	200.017 (3.101)***	0.695 (2.806)**
Farm tools and equipment (Z11)	0.235 (0.741)*	287.394 (2.905)***	154.699 (-0.134)	0.025 (0.628)
R2	0.511	0.686	0.743	0.642
R-2	0.482	0.615	0.603	0.512
F-ratio	3.184***	5.475***	6.518***	4.523***

Source: *Field survey (2023)*

**** = Significant at 1%, ** = significant at 5%, * = Significant at 10% T - ratios are in parenthesis + = Lead equation*

Based on the number of significant variables, the signs of the coefficients of the significant variables as they conform to a priori expectation and the magnitude of the coefficient of multiple determination (R^2), the semi-log functional form was chosen as the lead equation. The R^2 shows that 72% of the variation in the pullet farmers' profit was explained by the independent variables included in the model. The F-ratio was significant at 1% level indicating a model of good fit. The price of output, the age of pullet farmer, household size, price of labour, price of feeds and flock size were the significant variables that influenced the profit of the pullet farmers.

The age of the farmer was negatively related to profit at 5% significant level. An increase in the age of the farmer will lead to a decrease in profit and vice versa. As the farmers age increased, the farmer becomes less energetic, more conservative and more risk averse. A less energetic, more conservative, more risk averse farmer will probably be more reluctant or unwilling to adopt new improved technologies and this will probably, adversely affect output. Given that the price of output remains unchanged, profit will fall and vice versa.

The coefficient of price of labour for the pullet farmers was negatively signed and significantly related to profit at 10% alpha level. This implies that as the price of labour increased, profit decreased and vice versa. An increase in the price of labour will lead to an increase in the total cost of labour assuming that quantity of labour remains unchanged. An increase in the total cost of labour will lead to an increase in the total cost of production. If the price and quantity of output remains unchanged, profit will fall and vice versa.

The price of feeds was negatively related to profit. This indirect relationship implies that as the price of feeds increased, the profit made by the pullet farmers decreased and vice versa. An increase in the price of feeds will probably force farmers to use less feeds. The use of less feeds will adversely affect pullet output and consequently profit will decrease. Alternatively, an increase in the price of feeds will lead to an increase in the total cost of feeds assuming that the quantity of feeds used remained unchanged. An increase in the total cost of feeds will lead to an increase in the total cost of production. Consequently, profit will decrease.

The household size was positively related to profit. This shows a direct relationship between household size and profit. A large household size suggests access to more family labour which will reduce the quantity of hired labour required by the household and consequently the total labour cost. This will probably positively influence the profit of the household.

Flock size was positively (directly) related to the profit of the pullet farmers. This implied that as flock size increases, profit will increase and vice versa. The larger the flock size, the more the yield and in turn profit will increase. The price of output was negatively related to profit. This implies that as the price of output decreased, profit increased and vice versa. This conforms to *apriori* expectation. When the price of a product decreases, the demand for the product will increase. An increase in demand will lead to an increase in total revenue and consequently an increase in profit. Alternatively as the price of output increases, profit decreases and vice versa. Following from the law of demand, as the price of output increases, the demand will fall. If the fall in demand is greater than the increase in price, total revenue will fall and profit will fall.

Just as in the case of egg production enterprise, profit increased as the depreciated value of farm tools increased in pullet production implying direct relationship.

Based on the profit function regression results, the significant variables which were earlier discussed are supported by the findings of Nmadu*et al*., (2014) in a study on Profitability and Resource Use Efficiency of Poultry Egg Production in Abuja, Nigeria who found out that feed, day old chick, family labour and household size influenced the profit of egg production in the study area.

CONCLUSION AND RECOMMENDATIONS

An important conclusion stemming from the analysis is that both enterprises were profitable and lucrative in the study area but egg enterprise was more profitable given the higher profitability index. However, the profitability of pullet and egg production in Abia State, Nigeria, varies based on factors such as investment costs, production efficiency, market dynamics, and risk management strategies. Both ventures offer opportunities for income generation and livelihood improvement, albeit with distinct challenges and trade-offs. Farmers should therefore, form cooperative societies so as to enable them have access to productive inputs that will enable them expand their resource base and consequently their scale of operation. Again, farmers, policymakers, and stakeholders must collaborate to address constraints, promote best practices, and create an enabling environment for sustainable poultry farming in Abia State and beyond. Further research is recommended to explore emerging trends, innovations, and market opportunities in the poultry industry.

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