Profit Analysis of Small-Scale Poultry Layers in Iwo Agricultural Development Programme (ADP) Zone of Osun State

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ABSTRACT
This study focused on the profit analysis of small-scale poultry layers in Iwo ADP Zone of Osun State. Data were collected from the poultry farmers using a well-structured questionnaire and multi-stage sampling procedure. A total sample size of one hundred and five (105) poultry farmers was selected. Data were analyzed using descriptive statistics budgetary analysis and inferential statistical tools (OLS). Results of the study revealed that majority (80%) of the farmers were below 50 years and the farmers' mean age was 49.5±7.7 years. The majority (95%) of the farmers had primary education and above. The mean year of experience was 11.0±3.4 years. The mean birds reared and profit was 405 birds and ₦84, 849.54 respectively. Return on investment during the period was ₦1.04 establishing positive returns. Household size, years of poultry farming experience and stock size were the factors significantly influencing the profit positively. Therefore, it is suggested that poultry farmers in the study area should try to increase their pen size, explore the use of family labour and endeavour to learn new methods of poultry management from farmers with more years of poultry-keeping experience to increase their level of profit.
Keywords: Egg, Poultry, Scale, Determinants, Profit

INTRODUCTION
The poultry industry in Nigeria currently has about 10% of the population, and is responsible for less than 15 to 18% of employment opportunities, since the industry is mainly subsistent (Alabi *et al.*, 2019). The contribution of (Nyoni *et al.*, 2019) asserted that annual per capita consumption in Nigeria has doubled to 3.6 kg of poultry meat and yearly egg consumption for an individual has increased almost three times to 10 kg per person per year. Also, FAO, 2018 concluded that aggregate consumption for poultry products in Nigeriais around 1.5 million tonnes of poultry meat and 4 million tonnes of egg per year.

Poultry birds in comparison with other livestock have a higher potential in feed efficiency ratio and conversion, reduced production cost per bird could be sold at different ages, served in different ceremonies, and complete production cycles in a shorter period (Ezeano *et al.*, 2017). The importance of poultry production cannot be overemphasized in providing employment and a mean of sustainability to the entire populace in Nigeria. The egg is a complete protein with excellent quality; one egg will give 6g of protein and egg-white protein has a biological value of 100, the highest biological value of any single protein (Bagheri *et al.*, 2020).

Poultry occupies a prime positionin any economy due to its vast potential for rapid economic growth (Nyoni *et al.*, 2019). The available data on the production of poultry in Nigeria revealed a billion tonnes of meat and 3.8 million eggs per year, with a population of about 180 million birds in which 80 million chickens are raised in extensive systems, 60 million in semi-intensive systems and the remaining 40 million in intensive systems (Binuyo and Abdulrahman, 2020). Costs of production are one of the determinants of poultry farmers' profit both in the short and long run poultry production. However, poultry production enterprises can be made more profitable with higher returns on investment cost of production can be closely monitored and controlled. Marked variations in cost components can be due to management practices, pen-carrying capacity, management, and feed efficiency (Etuah *et al.*, 2020). Egg production in Nigeria has been badly affected by a dangerous scenario in the economy which inhibits poultry farm expansion and new entrants find it hard to start poultry farms. The imminent problems confronting poultry production in Nigeria include the high cost of feed, outbreaks of diseases and marketing problems. These problems have forced many small-scale poultry farms to close down and those still managing to survive are producing at a very high cost with serious input limitations (Nmadu *et al.*, 2014). In line with this background information on poultry production in Nigeria, this study seeks to evaluate the costs and returns of small-scale poultry layers' farms, identify the production constraints to poultry layers' production and analyze the factors affecting the profit of poultry layers' farmers in the study area.

MATERIALS AND METHODS
Study area
The study area was Iwo Agricultural Development Programme (ADP) zone, OsunState. It is located in a warm tropic region of the rainforest of South Western Nigeria. The zone experiences an average monthly rainfall of 25 mm between May and July and 2.5 mm between December and January. The average annual rainfall is 52.35 inches (1,330

mm), though there are great deviations from this mean value from year to year. Usually, the rainy season lasts from April to October. The zone has a large number of poultry farms in comparison to other ADPs in Osun State as evidenced by the records of the Poultry Association of Nigeria (PAN) in Osun State.

Sampling Procedure and Sample Size
The study was carried out using a multi-stage sampling procedure. The first stage involved a purposive selection of Iwo ADP zone from 3 ADPs zones in Osun State which are Iwo, Ife-Ijesa and Osogbo. The second stage was a random sampling of 60 small-scale poultry farmers from the Iwo block and 45 from the Ola Oluwa block proportionate to their size of poultry farms using the Poultry Farmers Association's list of the Iwo ADP zones as the sampling frame. Small-scale poultry eggs are made from farms having less than 2000 birds (Mainali and Houston, 2017).

Method of Data Collection
Primary data were collected from the poultry farmers with the use of questionnaire administration and a well-structured interview schedule. The field survey of the study was conducted between February to April, 2021. Information on socio-economic characteristics of the poultry layers' farmers, quantity of production inputs, costs of the inputs, quantity of eggs produced and price of eggs was obtained from the poultry farmers. Information on various constraints to poultry production was also sourced from the farmers.

Data Analysis
The data obtained were analyzed using descriptive analysis and inferential statistics. The descriptive statistics that were used in the study included frequencies, percentages, mean standard deviation and budgetary analysis while the inferential statistical tool applied was the ordinary least square linear regression technique. All the analysis were conducted with Stata 14.2 Single – user 8 – core perpetual license; Serial number: 10699393; Licensed to: Andrey. The levels of significance of P-value are expressed as $P < 0.01$ (1% level), $P < 0.05$ (5% level) and $P < 0.1$ (10% level) (Rice, 1990). The basis of using three different levels of significance (0.1, 0.05, and 0.05) is to indicate the intensity of effect of the variables on dependent variables.

Budgetary Technique
The budgetary technique was used to estimate the cost of input, yield, and profit of poultry layers' production. This can be mathematically expressed as;
Gross Margin (GM) = Total Revenue (TR) – Total Variable Cost (TVC)
Net Farm Income (NFI) = Gross Margin (GM) – Total Fixed Cost (TFC)
NFI = GM – TFC

Return on Investment (ROI) $= \frac{GM}{TVC}$ …(1)
Where GM represents Gross Margin and TVC represents Total Variable Cost.
Egg production was appraised using the Benefit-Cost Ratio (BCR).
Benefit-Cost Ratio (BCR) $= \frac{TR}{TC}$ …… (2)
Where TR represents Total Revenue and TC represents Total Cost

Ordinary Least Square Regression Model
Ordinary least square (OLS) was used to determine the factors affecting the profit. The implicit form of the model was specified thus:
$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10} + e_i)$ … (3)
The explicit form of the model is specified as
$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 … + \beta_{10} X_{10} + ei$ …(4)
Where:
Y = Profit (Naira)
X_1 = Age (years)
X_2 = Gender (Dummy 1 = male; 0 = otherwise)
X_3 = Household size (number of persons in the household)
X_4 = Formal education (years)
X_5 = Years of layers keeping experience (years)
X_6 = Access to credit (Dummy 1 = access; 0 = otherwise)
X_7 = Stocksize (Number of birds)
X_8 = Cost of feed (Naira)
X_9 = Cost of medication (Naira)
X_{10} = Cost of hired labour (Naira)
e_i = Error term

RESULTS AND DISCUSSION
Socio-economic characteristics of the poultry farmers
Table 1 presents the socio-economic characteristics of the poultry farmers in the study area. The results in Table 1 show that the mean age of poultry farmers in the study area was 49.50 ± 7.7 years with the majority (80%) below 50 years. This indicates that most of these poultry farmers were in their active and productive years and can easily understand innovations that could enhance poultry production. This result agrees with the findings of (Olaniyi, 2013) who concluded that poultry farmers in Nigeria were active and energetic. Table 2 reveals that the majority (83.8%) was male while female constitutes 16.2%. This finding corroborates the findings of (Adeoti and Soyele, 2019) that discovered that males dominate poultry production in Osun State Nigeria. This implies that modern poultry farming is still predominantly a male occupation likely because of the high level of risk involved, labour intensity, and other husbandry processes which are not attractive to most women.

The results in Table 1 also reveal that the average household size of the poultry farmers in the study area was 5 persons which agrees with the similar findings of

(Akintunde *et al.*, 2020) that confirmed 5 persons as an average household size of poultry farmers in the Southwest, Nigeria. The results in Table 1 show that the majority (95%) of the poultry farmers were educated above the primary school level. This finding implies that poultry farmers will be enriched in knowledge to facilitate the decision-making process, managerial skills, and attitude towards the adoption of scientific techniques to improve their level of disease management. A similar finding was reported by Aboki *et al.* (2013) in which they asserted that the majority of the poultry farmers were educated above primary school in Kurmi Local Government Area of Taraba State, Nigeria.

The mean years of poultry experience were 11.0±3.4 years as shown in Table 1. These long years of poultry keeping experience are expected to manifest in a high level of disease management efficiency in production handling as the longer the years of layer rearing experience, the more exposed the farmer becomes and the more efficient the farmer is expected to be in disease management. This assertion was supported by (Liverpool-Tasie *et al.*, 2019) who observed that poultry farmers with more years of experience would be more efficient, have better knowledge of climatic conditions and market situations and are thus expected to run a more efficient and profitable poultry enterprise.

In Table 1, the majority (91.0%) of the poultry farmers have no access to credit. This finding agrees with (Adeyonu *et al.*, 2017) that observed that majority of small-scale poultry farmers had low credit accessibility. This inadequate credit accessibility implies that the business expansion of the small-scale poultry will be affected negatively due to limitations in borrowing money for business expansion.

Stock Size
Table 2 presents the number of birds stocked by the poultry farmers which shows 65% of the poultry farmers have a flock size range between 50 and 2,000,000. The average pen size was 405. This implies respondents are small-scale poultry farmers. (Ameer *et al.*, 2022) report that flock sizes of fewer than 2000 birds are considered a small-scale poultry farm.

Costs Analysis in Poultry Layers' Production in Iwo ADP Zone of Osun State
Table 3 presents the costs incurred by the poultry farmers in the study area. The cost of feed which is 62.0% constitute the highest in the total cost of poultry egg production for 405 birds followed by the cost of stocking birds which is 8.8% of the total cost and the cost of medication which is 8.7% of the total cost of production. This cost analysis implies that the cost of feed is on the higher side in poultry production in Nigeria which might be reducing the returns to the business and be a discouraging factor for the new entrant in the business. The cost analysis agrees with the earlier findings of Tijjani *et al.* (2012) that suggest that costs of feed constitute a larger proportion of the total cost of poultry egg production.

Profit Analysis in Poultry Layers Production for a Year in Iwo ADP Zone of Osun State
The analysis of profit level in poultry layers' production in the study area is presented in Table 4. On the average, the revenue derived from the entire farm production of 405 birds was from sales of egg with the value of ₦2,045,000.00 followed by revenue on culled layers valued at ₦220,000.00 and revenue on manure sales was ₦65,000. The total revenue was ₦2,330,000.00 and the total variable cost was ₦2,006,001.86 which gives the average gross margin in a year to be ₦323,998.14. Similarly, the total cost of production was ₦2,245,150.46 which amounts to a profit of ₦84,849.54 while the return on investment is ₦1.04. It implies that the poultry layers' business is profitable in the study area as the return on investment showed that every naira invested earned ₦1.04.

Factors influencing the level of profit in small-scale poultry layers' farms in Iwo ADP Zone of Osun State
Table 5 presents the multiple linear regressions of the factors affecting the level of profit of small-scale poultry layers' farms in the study area. The coefficient of multiple determination (R^2) shows that 76.4 % of the variation in the level of production is been determined by the included independent variables in the model. The coefficient of R^2 and F statistics which is significant at $p < 0.001$ shows that the exponential model is well fitted.

Table 1: Socio-economic characteristics of poultry farmers in Iwo ADP zone of Osun State

Characteristics	Frequency	Percentage (%)
Age		
≤ 29	14	13.3
30-39	17	16.2
40-49	53	50.5
≥ 50	21	20.0
Mean = 49.5	S.D = 7.7	
Sex		
Male	88	83.8
Female	17	16.2
Marital Status		
Single	20	19.0
Married	75	71.4
Divorced	5	4.8
Widow/ Widower	3	2.9
Separated	2	1.9
Household Size		
≤ 3	12	11.4
4 – 6	85	90.0
≥ 7	8	7.6
Mean = 5.0	S.D = 2.0	
Level of Education		
No formal education	5	4.7
Primary	22	21.0
Secondary	26	24.8
Tertiary	52	49.5
Poultry Keeping Experience		
≤ 5	10	9.5
6 – 10	24	22.9
11 – 15	59	56.2
≥ 16	12	11.4
Mean = 11.0	S.D = 3.4	
Access to extension services		
Yes	26	24.8
No	79	75.2
Access to credit		
Yes	14	13.3
No	91	86.7

Source: Field survey data, 2021.

Table 2: Distribution of flock size of poultry farmers in Iwo ADP zone of Osun State

Stock Size	Frequency	Percentage
<-2,000	65	61.9
2,001-4,000	30	28.6
> 4,000	10	9.5
Total	105	100

Source: Field survey, 2021; Average pen size = 405

Table 3: Cost analysis in poultry layers' production for a year in Iwo ADP zone of Osun State

Costs	₦	% TC
Stock (397)	198,500.00	8.8
Feed	1,393,086.00	62.0
Medication	195,287.50	8.7
Labour	145,706.70	6.5
Transportation	68,191.26	
Miscellaneous	5,230.40	
Total Variable Cost (TVC)	2,006,001.86	89.3
Depreciation	55,080.50	
Rent	138,987.50	
Interest on Capital	45,080.60	
Total Fixed Cost	239,148.60	10.7
Total Cost	2,245,150.46	

Source: Field survey, 2021; Average pen size = 405

The results presented in Table 5 show that household size, years of poultry keeping experience, stock size, and cost of feed were all the factors significantly influencing the profit of poultry layers' farmers. All of these variables had a positive influence with the profit except the cost of feeds. The coefficient of household size was 1.35 and statistically significant at a 5% level of significance which implies that an increase in the number of a household of poultry farmers will increase the profit of the poultry farmers by 1.4 units. This is expected as household members may be involved in the running of the poultry farm in general routine management and thereby reducing the cost of labour. The variable of the years of poultry farming experience had a positive coefficient of 1.391 and was statistically significant at a 1% level of significance. This result implies that a year increase in the year of poultry keeping will increase the profit by 1.4 units. It is believed that long years of experience in poultry keeping should translate to better management practices and production efficiency. This finding agrees with the work of (Ibitoye and Onimisi, 2013) on positive influence of training on farmers' productivity in poultry production in Kogi State, Nigeria.

The results as presented in Table 5 reveals that the coefficient of stock size was 2.02 and statistically significant at a 1% level which implies that a unit increase in stock size will increase the profit by 2 units. The economic implication of this finding is confirmation of economic scale in production as the poultry that operates on a large scale has the potential of generating more profit than the small scale. The variable of cost feed had a negative coefficient of 1.295 and was statistically significant at a 5% level which implies that a naira increase in the cost of feed tends to decrease the profit by 1.3 units. Feed is crucial in poultry production as one of the major determinants as revealed by the study. This finding agrees with the similar findings by (Nkukwana, 2018) who asserted that profit margins in poultry production are greatly affected by feed cost.

Table 4: Estimation of profit in poultry layers' production for a year in Iwo ADP zone of Osun State

Items	₦
Eggs value	2,045,000.00
Culled layer's value	220,000.00
Poultry manure	65,000.00
Total Revenue (TR)	2,330,000.00
Total Variable Cost (TVC)	2,006,001.86
Gross Margin (TR-TVC)	323,998.14
Total Cost (FC+TVC)	2,245,150.46
Profit (TR-TC)	84,849.54
Return on investment (TR/TC)	**1.04**

Source: Field survey, 2021; Average pen size = 405

Table 5: Multiple linear regressions analysis of factors influencing profit of poultry layers' farms in Iwo ADP zone of Osun State

Variables	Coefficient	Std. Error	t – value	p-value
(Constant)	1.821***	0.475	3.83	0. 000
Age (X_1)	-3.887	4.180	-0.93	0.132
Gender (X_2)	0.121	0.201	0.6	0.262
Household size (X_3)	1.350**	0.563	2.40	0.014
Years of Formal Education (X_4)	1.553	5.751	0.27	0.189
Years of Poultry Experience(X_5)	1.391***	0.515	2.70	0.003
Access to credit (X_6)	0.223	0.136	1.64	0.125
Stock size (X_7)	2.020***	0.751	2.69	0.007
Cost of feed (X_8)	-1.295**	0.558	-2.32	0.011
Cost of medication (X_9)	1.674	2.989	0.56	0.347
Hired Labour Cost (X_{10})	- 1.295	0.899	-1.44	0.256
F Statistics = 2.113				0.001
R^2 = 0.7641				
Adj. R-squared = 0.7595				

Source: Field survey data, 2021; *** Significant at 1%, ** Significant at 5%, * Significant at 10%

CONCLUSION

Based on the findings from the study, it can be concluded that poultry layers' production is profitable for small-scale farmers. The major factors affecting the profit of small-scale poultry layers' farmers positively in the study area include household size, years of poultry farming experience, and stock size. Given the research findings of this study, it is suggested that poultry farmers should be encouraged to increase their scale of production to increase their profit margin. The findings of the study established the inverse relationship between the profit and cost of feed. Therefore, research should focus on developing feed using local materials available in the country to make a feed available at a cheaper cost in order to increase the level of profit of the poultry farmers.

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