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Full Length Research Paper

Profitability and input-income determinants of broiler production systems in Edo State, Nigeria

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Abstract

The study looked out the profitability and the relationship between cost of input used and income realized of raising broilers under the battery cage and deep litter system of poultry production. The data used in the study were obtained from a cross-sectional survey of broiler farmers in EdoState from October–December, 2014. A multi-stage sampling process was used to select the respondents for this study. The data collected were analyzed using descriptive statistics, profitability ratios and ordinary least square (OLS) multiple regression model. The Gross Margin analysis gave a value of ₦2,422.24 and a Net Farm Income (NFI) of ₦2,412.40 per bird for battery cage system while the deep litter system had a gross margin of ₦1,601.77 and NFI of ₦1,593.80 per bird. The profitability ratios showed Rate of Return on Investment (RRI)of about 92%, Return on Labour(RL) of ₦18.03, Return on Feed (RF)of₦144.22 and Return Per Naira Invested (RNI) of₦0.91 for the battery cage system as against RRI (71%), RL (₦30.28), RF (₦117.95) and RNI (₦0.71) for the deep litter system. This shows that both systems were profitable and viable in the study area.Only three variables in the regression model were found to be statistically significant (P<0.05), these were feed cost, electricity, and purchase cost of day old chick for both the battery cage and deep litter systems. Feed cost was the major determinants of revenue accruing to the farmers. Accounting for about 53%.It was thereforeconcluded that farmers should be enlightened on the relative profitability/viability of broiler production in the study area, as a guide to future investment in the enterprise and are advised to compound their own feed as this will help to reduce the cost of feeds which account for over 70% of the total cost of raising broilers from day old chick to point of sale. Lastly the electricity service provider should charge customer according to their consumption.

Keywords: Battery cage, Cost, Deep litter, Net Farm Income, Profitability, feed cost, electricity.

INTRODUCTION

The livestock industry is an important sub-sector of the agricultural sector of Nigeria's economy. According to Sani,Tahir,and Kushwaha. (2000), the role of this sector cannot be over-emphasized, considering the importance of animal protein in the diet of the people and the contribution from this sector to the Gross Domestic Product (GDP). In Nigeria, the production of food has not increased at the rate that can meet the demand from an increasing population. While food production increases at the rate of 2.5%, food demand increases at a rate of more than 3.5% due to high rate of population growth of 2.83% (CBN, 2004). The apparent disparity between the

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Rate of food production and demand for food in Nigeria has led to increasing resort to food importation and high rate of increase in food prices.

The demand and supply gap for animal protein intake is quite high and the Food Agriculture Organization (FAO, 2003) recommends that the minimum intake of protein by an average person should be 65gm per day; of this, 36gm (i.e. 55.3%) should come from animal sources. Nigeria is presently unable to meet this requirement. The animal protein consumption in Nigeria is less than 8 gm per person per day, which is a far cry from the FAO minimum recommendation (Niang and Jubin, 2001). As a result of the above, widespread hunger and malnutrition are evident in the country. Poultry products offer considerable potential for bridging the nutritional gap in view of the fact that high yielding exotic poultry are easily adaptable to our environment and the technology of production is relatively simple with returns on investment appreciably high. Poultry farms are farms that raise chickens, ducks, turkeys, geese, guinea fowls and other related birds for meat or egg production. Poultry is the most commonly kept livestock and over 70% of those keeping poultry are reported to be keeping chickens (Arma and Maxwell, 2000). In Nigeria, the poultry population is estimated to be 140 million, (Ocholi, Oyetunde, Komibish, Odigbo and Tarma, 2006). The poultry industry has emerged as the most dynamic and fastest expanding segment in animal husbandry sector. Poultry eggs and meat contribution of the livestock share of the GDP increased from 26% in 1995 to 27% in 1999 (CBN, 1999). Despite these potentials the country still relies on imported frozen chicken to meet the domestic demand.

The industry is a huge success in augmenting the animal protein shortage occasioned by the fast declining cattle production that used to supply the required animal protein in human nutrition (Idachaba, 2004). Presently in Nigeria the industry is about 60% commercial and 40% subsistence. Just like any other enterprises the major reason a broiler farmer is in business is to make profit. In making profit cost component are involved.Cost is a monetary measurement of the amount of resources used for some purpose. One of the reasons why poultry farmers introduce costing system into their business is the hope that it will help them to know the cost of production and in fixing the selling prices. The cost of production is usually categorized into fixed and variable cost. The fixed cost of the farmer, are cost which cannot be used up during the course of production. These include poultry house, equipment for feeding and water, cages, wheelbarrow, spade etc. the variable cost, and include day old chicks, feeds, drugs, labour and electricity (utility). Any farmer/seller wants to charge a price that will cover the total production cost at given level of productions. The profitability of an investment is based on comparison of the returns and cost of the investment.

From past literature, it is clear that different models have been tried in the poultry industry. The commonest analytical model recently used in profitability/viability analysis in Nigeria along with regular econometric models include Return/Naira Invested (R/NI); Gross Margin (GM); Rate of Return on Investment (RRI); Rate of Return on Fixed Cost (RRFC); Rate of Return on Variable Cost (RRVC) etc. (Olukosi and Erhabor, 2005; Emokaro *et al.,* 2009); Adesina and Kehinde, 2008; Ayinde *et al.,* 2011).

Therefore, poultry production like any other agricultural business activity requires that a farmer has a wealth of experience in the management of the enterprise. The farmer is out to make profit and in order to actualize this; he should be able to produce at a level that will make him recoup his cost, at the least.Based on the above premise, this study was aimed at comparing the profitability of broiler production, under the common management system**s** (deep litter and battery cage) with a view to providing answers to pertinent questions on possible variations in cost and other profitability indices affecting broiler production under the two systems. Therefore, the broad objective of the study was to carry out a profitability analysis of broiler production systems in the urban areas of Edo State. The specific objectives were to evaluate the cost, returns and compare the profitability of the two systems of broiler production, to examine the relationship between cost of input used by respondents and income realized under the different production systems.

METHODOLOGY

Study Area

The study was conducted in Edo State of Nigeria. Edo State is located in the Southern rainforest region of the country. The State lies within the geographical coordinates of Latitudes 05^{o} 44' N and 07^{o} 34' N and Longitudes 06^{o} 04' E and 06^{o} 43' E. Two distinct seasons are noticed in the State – the rainy season (March – September) and the dry season (October – February). Relative humidity of the State is high; about 8l - 90% throughout the year. This climatic condition is favorable for poultry production.Edo State is made up of eighteen (18) Local Government Areas (LGAs) with a total landmass of 19,187sq km, and an estimated population of 3,926,587 million people using the projected annual growth rate of 2.7% (NPC, 2006). On the basis of Edo State Agricultural Development Programme (EADP) delineation, it is divided into three agro-ecological zones namely Edo South made up of seven LGAs, Edo Central made up of five LGAs and Edo North made up of six LGAs.

Sampling Technique and Sampling Size

A multi–stage sampling technique was used in the selection

of the respondents for the study in the State, two urban LGAswere purposively selected from each of the agro-ecological zones to give the study a State wide-focus and a total of six LGAs (Ikpoba-okha, Oredo, Esan North-east, Esan South-West, Etsako Central and Owan West) were selected. The second stage was a random selection of three communities each from the selected LGAs making a total of 18 communities. The last stage involved the selection of Fifteen (15) poultry farmers by snowballing from each of the communities to make a total of 270 respondents for the study.

Method of Data Collection

The primary data usedin this study weregathered from a cross-section of the respondents via the use of a well-structured questionnaire.

Method of Data Analysis

The data from the questionnaire were analyzed descriptively. **F**requency counts, means and percentages were used for the analysis.The cost and returns were estimated with the use of budgetary technique and profitability**/**viability analysis. Three profitability**/**viability indicators, Gross margin (GM), Net Farm Income (NFI) and return per naira invested were estimated for the different production systems.

Gross Margin Analysis (GM)

According to Odii (1998); Olukosi and Erhabor (2005), this measures the difference between the gross output or revenue and the variable cost of each enterprise in the farming system. It is given as:

GM= TR– TVC…… (1)

Where: GM = Gross Margin (₦), TR = Total Revenue (₦), TVC = Total Variable Costs (₦).

Net Farm Income (NFI)

The net income or revenue of the farmers was computed as:

NI= TR – TC……..…. (2)

Where: NI = Net Income (₦), TR = Total Revenue (₦),
TC = Total Cost (total variable cost + total fixed cost)
Where: TR = $P_y y$, P_y= Price of the matured broiler,
y = Total number of broilers sold

TC will be computed as follows

$TC = r_1 x_1 + r_2 x_2 + b$
$r_1 r_2$ = prices of inputs (measured in Naira)
$x_{1....}xn$ = variable inputs (labour,feeds,drugs,electricity and operational costs measured in Naira)
b = cost of any fixed input (measured in Naira)

Therefore NI = TR - TC

Profitability Ratios

These are financial indices which show the performance of a business
The ratios as stated by Ayinde and Aromolaran (1998); Emokaro and Eigbirhemolen (2012) are as follows:

(i). Rate of Return on investment (RRI)

$$\frac{NetIncome}{TC} x\ 100\% \quad \text{..... (4)}$$

(ii). Return on Labour(RL)

$$RL = \frac{TotalRevenue}{Labourinmandays} \quad \text{..... (5)}$$

(iii).Return on feed (RF)

$$RF = \frac{\text{Total revenue}}{\text{Quantity of feed (kg)}} \quad \text{.....(6)}$$

(d) The Ordinary Least Square (OLS) multiple regression model analysis was used to determine the relationship existing between output (which is measured by monetary value in naira) and the cost of inputs of the respondents of the management systems as practiced in the study area in line with Olukosi and Erhabor (2005); Adesina and Kehinde, (2008); Ayinde*et al.,* (2011) and Emokaro and Eigbirhemolen (2012).

The implicit form of the model is specified as follows:

$Y= F(X_1, X_2, X_3, X_4, X_5, X_6.U_i)$ .....(7)

While the explicit form is:
$Y=b_0+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+U_i$ ..... (8)

Where:
Y = Total revenue (Naira)
X_1= Labour (Naira)
X_2= Feeds (Naira)
X_3= Drugs (Naira)
X_4= Electricity consumption (Naira)
X_5= operational costs (disinfectant, fuel, transportation, litter materials (Naira)
X_6= Fixed cost (cages, boreholes, drinkers, feeders, poultry buildings, wheel barrows, etc) (Naira)
u = Error Term

Table 1. Gross Margin Analysis

	Battery cage(₦)	Deep litter(₦)
	Mean	**Mean**
A. Total revenue	414,646.67	715,164.90
B. Variable cost items		
Drugs	12,221.17	21,666.23
Electricity	12,306.67	13,619.87
Feed cost	149,400.00	315,245.03
Purchase cost	19,094.86	43,128.37
Labour cost	22,988.89	23,607.39
TVC	**216,011.59**	**417,266.89**
C. Fixed cost	818.00	1,584.44
Total cost	**216,829.59**	**418,851.33**
D. Gross Margin	198,635.08	297,898.01
E. Net Income	**197,817.08**	**296,313.57**

Table 2. Profitability Ratios

	Battery cage(₦)	Deep litter(₦)
Rate of Return on investment	91.69	70.74
Return onLabour	18.03	30.28
Return on Feed	144.22	117.95

Source: Field Data, 2014

The researcher experimented with linear, exponential, semi-log and double-log functions to ensure the selection of appropriate functional form. The general forms of the function are shown below.

Linear function:
$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + u_i \quad ....(9)$$

Exponential function:
$$Y = b_0 + e^{b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + u_i} \quad ....(10)$$

Semi-log function:
$$Y= b_0 + b_1Lnx_1 + b_2Lnx_2 + b_3Lnx_3 + b_4Lnx_4 + b_5Lnx_5 + b_6Lnx_6 + u_i \quad .... (11)$$

Double – log function:

$$Ln\ Y= b_0 + b_1Lnx_1 + b_2Lnx_2 + b_3Lnx_3 + b_4Lnx_4 + b_5Lnx_5 + b_6Lnx_6 + u_i \quad .... (12)$$

Where:

Y = total revenue in (Naira)
b_0 = constant term
b_1 to b_6 = regression coefficient to be estimated

The results were evaluated to select the lead equation based on economic, statistical, and econometric criteria. The final choice of the lead equation was based on:

(A) Higher value of adjusted R^2.
(B) Significance of regression coefficients
(C) F – value
(D) The correct signs of the coefficients

RESULTS AND DISCUSSION

Cost, Returns and Profitability Analysis of Broiler Production under the Two Systems

The mean estimates of cost and returns for broiler production under the two systems are presented in Tables 1 and 2.The total cost outlay of ₦216, 829.50,out of which ₦ 216,011.59 was incurred as total variable cost and ₦ 818.00 was estimated average depreciated fixed cost for an average of86 birds for farmers who practiced the battery cage system while a total cost outlay of ₦418,851.33,out of which ₦ 417,266.89 was incurred as total variable cost and ₦ 1,584.44 was estimated as average depreciated fixed cost for an average of 186 birds for operator**s** of the deep litter system of broiler production. The total revenue from the sales of matured broiler for the battery cage system was ₦ 414, 646.67 as compared to ₦ 715, 164.90 computed for operators of the deep litter system.

The Gross Margin**(**GM**)** analysis gave a valueof₦ 2, 422.24 and Net Farm Income (NFI) of ₦ 2, 412.40 per bird for battery cage system while the deep litter system had aGMof ₦ 1, 601.77 and NFI of ₦ 1, 593.80 per bird. The profitability ratios showedRate of Return on Investment of (RRI) of 91.69%, Return on Labourof ₦ 18.03 and Return on Feed of ₦ 144.22, for the battery cage system as compared toRRI of (70.74%),RL of ₦ 30.28 and RF of ₦ 117.95 for the deep litter system. Although both systems of broiler production wereprofitable in the study area, the battery cage system gavea higher RRI of 91.69% which translates to 91 kobo for every ₦ 1 invested.Feed conversion efficiency was higher in battery cage system than the deep litter system.This could be as a result of less feed wastage; however, the return on labour for the deep litter system generated higher returns per man-day as compared tobattery cage suggesting that more labour is required inthe deep litter system.

Analysis of the determinants of income on the cost of input used by respondents of the different production system

Multiple regressions were used to determine the relationship between the cost of input used by respondents

Table 3. Multiple Regression, Determinants of Income of Respondent (linear function)

	Battery cage (linear)			Deep litter		
	B	Standard error	t	B	Standard error	t
(Constant)	-35195.8	18939.197	-1.858	1.962	0.350	5.602
Feed cost	0.537*	0.179	3.003	0.456*	0.77	5.907
Medication	0.296	1.638	0.181	-0.057	0.41	-1.402
Electricity	4.605*	1.564	2.945	-0.098*	0.32	-3.036
Fixed cost	8.532	10.711	0.797	0.155*	0.25	6.183
Labour cost	1.695	1.384	1.225	-0.031	0.26	-1.177
Purchase cost (day-old)	4.568*	1.293	3.533	0.573*	0.68	8.427
F	261.556			645.881		
Adjusted R square	0.964			0.963		

* Significant 5%
Source: Field Data, 2014

and income realized on the different system of production as presented in table 3,the linear model was selected as the lead equation. The F values for battery cage (261.5) and deep litter (645) were significant at 5% implying that the regression model is appropriate for the analysis and the independent variable have a significant influence on the dependent variable that is (income).

The $\bar{R}^2$are 0.964 and 0.963 for the battery cage system and deep litter system. The values indicate that the variables in the model account for 96.4% and 96.3% of the dependent variable (income) respectively.

For the battery cage production system, the feed cost, electricity and purchase cost were significant while for the deep litter feed cost, electricity, purchase cost and depreciation are significant.

The result for the feed cost is positive (b = 0.537) which means that the feed cost is positively related to revenue. The positive relationship suggests that a N1.00 spent on feed cost will lead to 53 kobo increase in revenue (y). This will translate to 53% of the income derive from the enterprise.This positive relationship is in line with Emokaro*et al.,*2012 in a study of profitability analysis of poultry egg production in Esan and Ovia North East LGA of Edo state were layers mash feed had positive impact on revenue.Also the result for electricity is negatively related to revenue (y). This is because a N1.00 increase in electricity bill will reduce the revenue by 43 kobo. This is so because the electricity provider often times charged on estimated bills hence, consumer does not pay for what they actually consume. The purchase cost of day old chick also show a significant value of positive signs whichimplies that if the purchase cost increase by N1.00 it willmeans the revenue will be increased by 45 kobo.

Drugs, labour cost and depreciation were not significant in the battery cage system of production. This may due to the fact that battery cage production system labour is less needed and wastages are reduced during drugs administration.

For the deep litter system; the result for the feed cost is positive as well showing that N1.00 spent on feed cost will add additional N0.46 kobo to the revenue. Similarly the purchase cost also show a positive relationship.Conclusively the feed cost and purchase cost are the major determinants of revenue accruing to the farmers of both the battery cage system and the deep litter system of poultry production.

CONCLUSION

From the study it was indicatedthat broiler farming is profitable for the battery cage and deep litter system**s** of production. However, the battery cage system offeredrelatively higher return**s** on investmentin the study area. The system requires high degree of skill and knowledge in management as well as high capital investment in fixed inputs. It is recommended that farmers should constitute themselves in self-group to attract the required high capital investment from corporate financial institutions. Farmers should in additioncompound their own feed as this will help to reduce the cost of feeds which accounted for over 70% of the total cost raising broiler from day old to point of sale.

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