ECONOMICS OF POULTRY EGG PRODUCTION UNDER TWO MANAGEMENT SYSTEMS IN OGUN STATE, NIGERIA

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Abstract

This study examined the economics of poultry egg production under different management systems. The study was conducted in Odeda Local Government Area of Ogun State in 2008. The data were obtained through administration of questionnaire on 60 respondents. The data collected were analysed through a combination of descriptive statistics, budgetary techniques, profitability ratios and multiple regression analysis. The study results showed that the Gross Margin under battery cage system per bird / year was ₦8, 089.56, while the Net Farm Income per bird / year was ₦1, 773. 17. Under deep litter system, the Gross Margin per bird / year was ₦1, 404.09, while the Net Farm Income per bird / year was ₦1,029.43. The regression result showed that educational qualification ($\alpha_{0.10}$), total feed used ($\alpha_{0.05}$), total labour used ($\alpha_{0.05}$), and the stock size ($\alpha_{0.01}$), were significant determinants affecting the quantity of egg produced. The study concluded that poultry egg production under battery cage system was economically more profitable. Hence, the study recommended among others that improved inputs, good management practices and sound knowledge about poultry farming and must be acquired and put to effective use to ensure the success of the poultry business.

Keywords: Economics, Poultry Egg Production, Management Systems, Ogun State.

Introduction

The average Nigerian diet is deficient in the quantity of animal protein required to maintain normal life (Abioye, 2000). Past efforts at ameliorating this deficiency have not produced the desired results. Omololu (1999), further showed that, the effects of low protein intake in children result in kwashiorkor, a form of protein-calorie malnutrition. The present realization that children who have suffered from malnutrition may not attain the full expression of their genetic potential is a grave warning of the long-term effects of malnutrition, especially on the brain (Burton and Cooper, 2007; Osei, 2008). It is quite obvious today that, poultry production business can improve the practice of animal agriculture practice due to its easy adaptability to different climatic conditions, low economic investment per unit, rapid revenue generation time and effective growth rate and returns (Adedoyin, 2000 and Wilson, 2006). Alexander (2004) noted that in many developing countries including Nigeria, chickens are the livestock most commonly owned by rural families.

The decline of commercial poultry production has also been attributed to the shortage of day-old chicks, poor quality feeds, and sometimes scarcity of the feed ingredients especially grains, the problems of effective veterinary services and availability of drugs and vaccines, and availability of capital or finance for expansion programmes and the ability and skill to profitably produce and manage these animals are the other set of problems that affect poultry production in Nigeria. Ogundipe (2008), posited that at present, poultry are by far the most important form of livestock in with a population of 97.86 million; poultry accounts for 72.4 million of this figure with slightly 10 million from the exotic chicken. Today, poultry industry is one of the major sources of animal proteins in Nigeria. Poultry products (meat and eggs) are among the most

nutritional food known to man, and it contributes about 10% of the total national meat production in Nigeria (Mohammed *et al.,* 2007).

A series of radical measures have been adopted to increase poultry production in Nigeria in the last few decades. Over this period, the governments encouraged the development of large- scale modern poultry enterprises as poultry is an important source of animal protein, income, employment and financial security. (Etuk, *et. al,* 2007). Also, Abiola (2007) posited that the embargo on the importation of poultry products in 2002 by the Federal Government was to protect the infant domestic industry especially small-scale commercial poultry producers in Nigeria. However, this expectation is yet to be realized since the output of poultry products (e.g. poultry meat, egg, etc.) lags behind other livestock products. Afolabi (2007) opined that at present, the performance of the subsector in terms of provision of the much needed meat and eggs to the average Nigerian has not been encouraging. For example, egg supply is very low being 10.56g per day as compared with the usual recommendation of 65g per adult per day. This recommendation would imply consumption of 1,95kg (1950g) of eggs per month. Ladanor (2008) noted that overall productivity and output of poultry products in Nigeria is very low and therefore the demand for meat, dairy and other poultry products outstrips the supply.

Poultry production like any other agricultural production activity requires that a farmer has a wealth of experience in the management of the enterprise. According to Durojaiye (2000), luck alone does not explain the difference in the profitability levels of farms or ranches with the same resource endowment. A poultry farmer should hence be able to plan well and execute such plans properly in order to maximise profit, since poultry production involves high level of risks.

Based on the premise above, this study was aimed at analyzing the economics of poultry egg production under two management systems, (deep litter and battery cage) with a view to providing answers to pertinent questions on variations in gross margin and other profitability indices as well as factors affecting quantity of egg production under the two systems.

The specific objectives of the study were to describe the socio-economic characteristics of egg producers under the two management systems, determine and compare the economic performance of each management systems as well as determine the factors which affects the quantity of egg production in the two management systems.

Methodology

Area of study:

The study was conducted in Ogun State of Nigeria. Ogun State is situated within the tropics and covers an area of 16,409.26 square kilometre. It is bounded to the West by Republic of Benin, in the South by Lagos State, in the East by Ondo State and in the North by Oyo State. Odeda Local Government Area is bounded in the North by Ido and Ibarapa Local Government Area of Oyo State. In the South, it is bounded by Abeokuta North and Abeokuta South and Obafemi Owode Local Government Areas.

The Local Government has its headquarter at Odeda with a geographical area of 126,341.02 hectares and estimated population of 88,000 people based on 1991 census data, with about 860 villages under the Local Government. Majority of the people in the Local Government Area are predominantly farmers while their women also farm along-side with trading as their major or complementary occupation. The Local Government Area has a characteristic feature of high but

uniform temperature and mean temperature ranging from 23^0C to about 38^0C. The natural vegetation is characterized by rain-forest; hence, it supports the cultivation of crops like cassava, yam, maize, cocoyam, upland rice, cowpea and vegetables. There is preponderance of poultry establishments in the local governments hence, the choice for this study.

Data Types, Sources and Sampling Techniques:
Primary data were used for the study. These were obtained through administration of a well-structured questionnaire on poultry farmers in the study area. Data collected included the poultry farmers" socio economic and production characteristics. The sample size for the study was 60 poultry farmers. Two-stage sampling technique was used to select poultry farmers from whom data were generated for this study. The first stage involved the random selection of a 10 villages from a list of villages in Odeda Local Government. The second stage involved a random selection of 6 poultry farmers each from the earlier selected ten (10) villages, thus giving a sample size of 60. Two major management systems were examined by this study and these are battery cage and deep litter systems. The primary data used for this study were collected in 2008.

Analytical Techniques:
Data collected were analyzed using descriptive statistics, budgetary technique, profitability analysis and Ordinary Least Square Regression Analysis.

The descriptive statistics such as mean, frequency and percentage were employed to describe the socioeconomic factors e.g. age, sex, educational level etc. of the respondents and how it affects their volume of egg production.

The determination of Profitability was done using:

Gross margin analysis:

According to Odii (1998), 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 = TVP – TVC

Where:

GM = Gross Margin

TVP = Total Value of Production (₦)

TVC = Total Variable Cost (₦)

Net farm income (NFI)
The Net Income is expressed as follows:

Net Income = GM – TFC

TFC = Total Fixed Cost, (which was depreciated using the straight line method).

c. Profitability ratios

These are indices which show the performance of a business.
The ratios as stated by Ayinde and Aromolaran (1998), are as follows:

i. Rate of Return to Investment (RRI)

$$\frac{\textit{Net Income}}{\textit{RRI}} = \textit{TC*100\%}$$

ii. Return to Labour (RL) as stated by Ayinde and Aromolaran (1998), are as follows:

$$RL = \frac{Revenue}{Labour}$$ (where labour is in mandays)

iii. Using the same principle in ii above to calculate return to feed:

Return to feed (RF) $$RF = \frac{Revenue}{Feed \text{ (in Kg)}}$$

Determination of factors affecting quantity of egg produced: This was accomplished using the OLS regression analysis.

The implicit form of the model for objective four is specified as follows: $Y = F(X_1, X_2, X_3, X_7, \mu)$

Where:
Y = Number of crates of eggs per month
X_1 = Age (years)
X_2 = Education (years)
X_3 = Cost of feed per month (₦) X_4 = Labour cost per month (₦)
X_5 = Cost of medication/ month (₦) X_6 = Stock size (No of birds)
X_7 = No of training attended on poultry farm management
μ = Error term.

Results and Discussion

Personal characteristics of poultry farmers:

Age is generally believed to be an important factor in farming activities. Younger farmers are believed to commit more energy into production activities, while older ones are likely to be more experienced which may also impact positively on their productivity. With respect to age, 76%, 77% and 77% of poultry operators involved in egg production under Battery cage, Deep litter and both systems respectively were between less than 29 and 49 years old (Table 1). This implies that most poultry producers involved in these systems were still in the active labour stage, and this invariably increased the volume of egg production given their labour input.

Majority (66%, 78% and 62%) of poultry operators were involved in egg production under Battery cage, Deep litter and both systems respectively were males. This implies that poultry egg production was popular among the males in the study area. Almost all the poultry operators involved in egg production under the three management systems completed at least secondary school education. This implies ease of adoption of latest technology which can enable increased egg production.

Also, 68%, 56% and 77% of poultry operators involved in egg production under battery cage, deep litter and both systems respectively had household size with at least four members. The average household size of the farmers is eight, three and four for operators of battery cage, deep litter and both systems respectively. Household size affords the poultry farmers access to family labour, this will positively influence the volume of egg production.

Distribution of farmers by system of poultry management:

Poultry farmers operating under the battery cage system constituted 63% of the total farmers interviewed; adopters of the deep litter system constituted 15% of the respondents while those operating the two systems were 22% of the respondents. This implies that production of egg in battery cage system was more popular in the study area than the other systems.

Determination and Comparison of Profitability of Egg Production under the two systems:

The gross margin and net farm income of poultry egg production under the two management systems is shown in Table 3. The Gross Margin (GM) under battery cage system was calculated to be ₦3, 049,763.96 for 377 laying birds per year, while the GM/bird/year from egg production was N8, 089.56. The net farm income (NFI), for poultry egg production under the same system was calculated to be ₦668, 484.00 for 377 laying birds per year, while the net farm income/bird/year was ₦1,773.17. This implies that egg production under the battery cage system of egg production was profitable.

The gross margin (GM) for poultry egg production under deep litter system was calculated to be ₦643, 647.50 for 452 laying birds per year. This gives ₦1, 404.09 for egg production per bird under the deep litter system. The net farm income (NFI), for poultry egg production under the same system was calculated to be ₦465, 304.21 / 452 laying birds per year. While the net farm income/bird/year was ₦1, 029.43. This implies that deep litter system of egg production had positive gross margin and net farm income. A face value deduction from these calculations indicates that revenue from production per bird under the battery cage system was higher than the deep litter system. This is expected because damage to egg is grossly reduced in battery cage system relative to deep litter system.

Profitability of Egg Production under both Systems

Profitability analyses were carried out to find out the best option for poultry egg production among the two options available in the study area. A summary of findings is presented in table 4. Higher RORI (36.92%) was recorded for the deep litter system. This implies that for every ₦1 invested into the poultry business, ₦36.92 was obtained as returns. This is likely due to the low level of investment cost per bird under the deep litter system. Also, labour returns for the deep litter generated higher returns per manday. Labour cost seems reduced for deep litter given reduced volume of available routine duties.

Feed conversion efficiency was however higher in battery cage than the deep litter system given the higher value of return on feed consumed (₦6.62). This is as a result of less feed wastage. Generally, deep litter system seems to perform better with respect to the productivity indices examined. This gives a potential investor the latitude to adopt whichever of technologies in egg production. However, care has to be taken with respect to the operational pros and cons of both systems.

Factors Affecting the Quantity of egg Production in the Study Area:

The regression results of the factors affecting the quantity of eggs produced are presented in Table 5. Based on the number of significant variables, the signs of the regression coefficients, the magnitude of the coefficients of multiple determination and in with conformity with the theory of production, semi-log model was chosen as the lead equation. The semi-log had an R^2 was 77.9%, which shows the proportion of the variation in the dependent variable (volume of egg produced) that is explained by the independent variables in the model. The adjusted R^2 value is 74.9%.

Educational qualification ($\alpha_{0.10}$), total feed used ($\alpha_{0.05}$), total labour used ($\alpha_{0.05}$), and the stock size ($\alpha_{0.01}$), were significant factors which affected the volume of egg production. The educational qualification was negatively related to the quantity of eggs produced. This negates the *a priori* expectation of the result. This is probably because almost all the egg producers were formally educated and as such, formal education may just be a necessary but not sufficient reason for increased egg production. Other distinguishing traits such as native intelligence of individual producers may have come to play in this respect. The total feed used was positively related to the quantity of egg produced. This shows that, the more the level of feed intake by the birds, the more the quantity of egg produced. Likewise, total labour used was positively related to the quantity of egg produced by the farmers. This implies that, the more labour employed into the business, the more specialized they became and the more the quantity of egg produced.

The stock size was positively related to the quantity of egg produced. This shows that as the stocking density increases, quantity of eggs produced increases.

Conclusion and Recommendation

The study showed that both battery cage and deep litter system exhibited profitable egg production. While battery cage recorded the higher feed conversion efficiency, deep litter system seemed relatively to be less cost intensive. The factors affecting quantity of egg produced were feed intake and stock size, while negative relationship occurred between formal education and egg quantity produced. This may mean that mastery of native intelligence in egg production may exert more significant positive influence.

In order to make egg production business more profitable, sound knowledge about poultry farming must be acquired about the business and good management practices that will be suitable to the business environment should be encouraged. Also, emphasis should be on the procurement of high quality feeds to boost egg production. Therefore, further research in to the production of high quality livestock feed should be embarked on by the universities and research institutes.

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Table 1: Distribution of respondents by personal characteristics.

	Battery cage		**Deep litter**		**Both systems**	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
Age (years)						
Less than or equal to 29	4	11	3	33	1	8
Between 30 and 39	13	34	1	11	4	31
Between 40 and 49	12	31	3	33	5	38
Between 50 and 59	6	16	2	22	3	23
Above 60	3	8				
Mean Age	**41 years**		**38 years**			
Sex						
Male	25	66	7	78	8	62
Female	13	34	2	22	5	38
Level of Education						
Primary School Education	1	3				
Secondary School Education	3	8			2	15.39
NCE / OND	16	42	4	44.44	6	46.15
HND	6	16	1	11.11	2	15.39
B.Sc.	12	31	4	44.44	3	23.07
Family size						
Less than or equal 3persons	12	31.58	4	44.44	3	23.07
4 to 6 persons	22	57.9	4	44.44	8	61.54
Above 7 persons	4	10.53	1	11.11	2	15.39
Mean household size	8		3		4	

Source: Field Survey, 2007

Table 2: Distribution of farmers by system of poultry management

System of management	Frequency	%age
Battery cage	38	63
Deep litter	9	15
Both system	13	22
Total	60	100

Source: Field survey, 2007

Table 3: Analysis of gross margin and net farm income for poultry egg production under the battery cage system

	Items in total	Battery Cage Value (N)	Deep Litter Value (N)
a.	**Variable Cost**		
	Medication/drug	24,320.84	7,647.50
	Feed	2,854,270.20	984,280.00
	Labour	260,100.00	43,000.00
	Family labour	120,500.00	19,500
	Others	193,735.00	36,500
	Total Variable Cost (TVC)	3,452,926.04	1,090,927.50
	Total Revenue	**6,502,690.00**	**1,725,575.00**
	Gross margin/377 birds/year	**3,049,763.96**	**634,647.50**
	Gross margin/bird/year	**8,089.56**	**1,404.09**
b.	**Fixed Cost**		
	Depreciated TFC	2,381,279.96	169,343.29
	Total cost	5,834,206.00	1,260,270.79
	Net farm income/377 birds/year	668,484.00	465,304.21
	Net-farm Income/bird/year	1,773.17	1,029.43
	Average number of birds	**377.00**	**452.00**

Source: Field Survey, 2007

Table 4: Summary of Profitability of Egg Production under Battery Cage and Deep Litter Management Systems

S/N	Profitability Ratios	Battery Cage	Deep Litter
i.	RORI (%) (NFI/TC *100)	11.46	36.92
ii.	Return on Labour	₦17.48	₦28.09
iii.	(TR/Labour) Return on Feed	₦6.62	₦5.10

Source: Field Survey, 2007.

Table 5: Regression results of the factors which affects the quantity of egg production

Variables	**Symbol**	**Linear**	**Semi Log**	**Double Log**
Constant	Constant	137864.9	- 898392.4**	6.122***
		-1.637	(-2.403)	-3.752
Age of farmers	X_1	-270.438	-32369.61	-0.151
		(-0.233)	(-0.563)	(-0.601)
Educational qualification	X_2	-12857.785**	-149665.5*	-0.469**
		(-2.188)	(-1.901)	(-2.366)
Total feed (₦)	X_3	0.728***	56816.939**	0.232***
		-2.448	-2.62	-3.023
Total labour used	X_4	3.980**	1582.418**	0.01375
		-2.366	-2.283	-0.563
Drugs and Vaccines	X_5	9.856	3362.864	0.02747
used		-0.61	-0.206	-0.386
Total stock size	X_6	118.068***	141843.80***	0.687***
		-4.344	-3.068	-3.405
Training duration	X_7	14321.148	23283.847	-0.0954
		-1.325	-1.247	(-
R^2 (R square)	R^2 (R square)	0.827	0.779	1.171)
Adjusted R^{-2}	Adjusted R^2	0.804	0.749	0.777
F^- Stat	F^- Stat	35.6	26.16	30.44

Source: Field Survey, 2008.

Note: *** Significant at 1% ** Significant at 5% * Significant at 10%

Figures in parenthesis (t-values)