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PROFIT EFFICIENCY OF POULTRY EGG PRODUCTION SYSTEM IN OGUN STATE, NIGERIA.

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Abstract

The study aimed at investigating the disparities in efficiency among deep-litter and Battery-cage Poultry Egg farmers in Ogun State, Nigeria. Primary data from a cross-section of 237 poultry egg farmers through a two-stage random sampling technique were used. The data were analyzed using descriptive statistics, budgetary analysis, and Stochastic Frontier Analysis techniques. Egg production for both systems was male dominated with 87.2% deep-litter and 81.86% battery-cage. The rate of return on investment of Battery-cage (17.07%) is greater than that of Deep-litter (9.05%). The estimated profit efficiency of battery cage (74.74%) is higher than the deep litter (62.28%). The profit inefficiency analysis of the battery cage farmers revealed that farmer's experience ($P<0.01$), age, credit access and education are negatively significant ($P<0.05$). Besides, in deep-litter, age and education were positively significant ($P<0.05$) and household size negatively ($P<0.05$). The study concludes that battery-cage system is more profitable than deep litter production system. Poultry farmers should be trained on the use of inputs.

Key words: *Efficiency, deep-litter, Battery cage, Poultry-Egg, Nigeria.*

Introduction

The challenges of food insecurity and hunger worldwide and in developing countries like Nigeria in particular have continued to receive attention from experts and governments (FAO, 2003). Consequently, several conferences and world Food summit on human nutrition have brought to the fore deliberations on the issue of eradicating poverty and hunger. FAO (1995) asserted that, the most critical in the global food basket crisis is animal protein. In Nigeria, the contribution of poultry production (meat and eggs) to total livestock output increased from 26% in 1995 to 27% in 1999 with an increase in egg production alone accounting for about 13% during the period. (Ojo, 2003). Inadequate protein intake has been identified to be responsible for health hazard and malnutrition among Nigerians. In Nigeria, food demand is increasing at the rate of 3.5%. The population growth of 2.83 is higher than the rate of food production of 2.5 percent (FOS, 2000; Ojo, 2003.) This is an element of food crisis and a problem that requires urgent solution. The task of solving the problem of protein-deficit and malnutrition in Nigeria calls for the collective efforts by all the stakeholders. The subject of profit efficiency of egg production is of significant importance in this case. The specific objectives of this study are to estimate profitability, compare the profit efficiency estimates and determine the factors affecting profit inefficiency of poultry egg production in ogun state, Nigeria. Ogun state has an estimated population of over 3 million people according to National Population Commission (NPC 2006). The state is located in the rain forest vegetation belt of Nigeria within longitude 2^0 45'C and 3^0 55' C and latitude 7^0 01' N and 7^0 8' N in the tropics. The main occupations of the people in the state are agriculture, fishing, clothing, textiles and civil servant.

Materials and Methods

The study was conducted in Ogun State in south-western Nigeria. Livestock are reared extensively in the area and. intensive livestock production is expensive. Findings have shown that 65% of commercial Poultry farms in Nigeria are located in south west. This justifies the choice of the area for this study (Okoruwa and Obayelu, 2004).

Source of Data and Data Collection

Combinations of primary and secondary data were used for this study. A set of primary data was collected from poultry egg farmers by face-to-face questionnaire between March 2012 to December 2012. These farmers used both deep litter and battery cage systems of egg production in Ogun state.

A two-stage sampling technique was employed for the collection of data from the poultry egg farmers (practicing both deep litter and battery cage systems in Ogun state). The first stage involved a purposive selection of three out of the six zones that made up Ogun State. This was due to the predominant position of the three zones in poultry egg production. The poultry farmers in each zone were stratified into deep litter and battery cage based on the production system. The second stage involved a random selection of poultry farmers from farm households. All the total respondents selected for the study were 237 farmers .

Method of Data Analysis

To determine the profitability of poultry egg production in Ogun state, the gross margin was calculated which is the difference between the total revenue and the total variable cost.

The mathematical notation for calculating the gross margin is given by the equation below

$$GM = P_i Y_i - r_i c_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where: GM = Gross Margin in ₦, P_1Y_1= Total Revenue in ₦, r_iC_i =Total Variable cost in ₦, P_i =Farm gate price of the i^{th} egg in crate in ₦, Y_i = Output of the i^{th} farm producing i^{th} egg, r_i = price of the i^{th} variable input, C_i = Quantity of the i^{th} variable input

Stochastic frontier profit function was used to compare the estimates of profit efficiencies of deep litter and battery cage production systems (Battese and Coelli, 1995). Raman (2004) using a normalized profit function, which is assumed to behave in a manner consistent with the stochastic frontier concept. The stochastic frontier normalized profit function is defined as

$$\pi = f(P_{ij} Z_{kj}) exp e_i \quad (2)$$

Where: $e_i = V_i - U_i$ (3)

When linearized, the estimable form of Profit function becomes

$$L_n\pi = A^* + \theta_1 l_n P_1 + \theta_2 l_n P_2 + \theta_3 l_n P_3 + \theta_4 l_n P_4 + \beta_1 l_n Z_1 + \beta_2 l_{nZ2} + Vi - \mu_i \quad (4)$$

Where: π Normalized Profit of egg output per Farmer, P_{ij} = Vector of normalized price of variable input, Z_{kj} = Vector of normalized price of fixed input; A^* = Intercept, P_1 = Price of wage rate normalized by the price of egg output, P_2 = Price of feeds normalized by the price of egg Output per farmer, P_3 = Price of drugs normalized by the price of egg output per farmer, P_4 = Price of day old chicks normalized by the price of egg output

Z_1 = Number of point of lay bird used by the farmers (proxy of farm size) Z_2 = Capital inputs measured in naira including Depreciation charges machinery, equipment, implements, cost of machine hired, interest, charges on loan. $\theta_1, \theta_2, \theta_3, \theta_4, \beta_1, \beta_2$ and A^* are the regression parameters estimated. Vi = Normal random errors which are assumed to be independent and identically distributed having zero mean and constant variance. Ui= It is non negative one sided error term representing the inefficiency of the farm.

To determine the factor influencing profit inefficiency, the farmer's socio economic factors that affect the profit inefficiency were evaluated in a single stage estimation using Frontier4.1. The inefficiency model is stated as:

Where; $\mu_i = \boldsymbol{\delta_0} + \boldsymbol{\delta_1} Z_1 + \boldsymbol{\delta_2} Z_2 + \boldsymbol{\delta_3} Z_3 + \boldsymbol{\delta_4} Z_4 + \boldsymbol{\delta_5} Z_5 + \boldsymbol{\delta_6} Z_6 + \boldsymbol{\delta_7} Z_7 \ldots$.(5)

$\mu_i = Profit\ inefficiency$, $Z_1 =$ Age of farmer (years), $Z_2 =$ Formal education (years),
$Z_3 =$ Membership of cooperative. (1 = membership, 0 = otherwise, $Z_4 =$ House hold size,
$Z_5 = Source$ of income (1 = off farm income, 0 = otherwise),
$Z_6 = Access\ to\ credit$ (1 = access; 0 = otherwise) $Z_7 =$ Experience in egg production measure in years
β_0, β_1, δ_0 and δ_1 are the parameters to be estimated

Results and Discussion

Table1 shows the Socio economic variables of the farmers. Majority of the deep litter farmers (51.22%) whose ages fall between 41-50 years were practicing deep litter system, while the majority of battery cage farmers (66%) were between ages 31-40 years. Egg production was male-dominated in both systems with deep and battery cage systems having 90.24% and 85.71 % respectively.

Deep litter farmers were more educated (65%) compared with battery cage system (46.03%) had secondary education. With regards to farming experience, 65.85% deep litter farmers had 1-10 years' of experience, while 86.51% battery cage farmers had 1-10 years of experience. Majority of the deep litter farmers (53.66%) got their credit facilities from bank. The battery cage system farmers (78.57%) got their credit from personal saving and relation. About 7.14% got their loan from banks. In deep litter system, 97.56% have the house hold size ranging from 1-5; while in the battery cage the majority (67.46 %.) have the household size ranging between 6-10.

Table 1: Socio Economic characteristics of the Poultry Egg Farmers

VARIABLE	RANGE	Deep Litter		Battery Cage	
		Freq.	%	Freq.	%
AGE	21-30	03	07.32	18	14.20
	31-40	11	26.83	66	52.30
	41-50	21	51.22	50	23.80
	51-60	04	09.76	08	6.35
	> 61	02	04.87	04	5.17
	Total	41	100.00	126	100.00
EDUCATION	Primary	03	07.31	12	09.53
	Secondary	11	26.34	58	46.03
	Tertiary	27	65.85	56	44.44
	Total	41	100.00	126	100.00
EXPERIENCE	01-10	27	65.85	109	86.51
	10-20	14	34.15	17	13.49
	Total	41	100.00	126	100.00
CREDIT	Bank	22	53.66	09	07.14
	Cooperative	13	31.71	18	14.29
	P/Savings	06	14.63	99	78.57
	Total	41	100.00	126	100.00

Source: Data Analysis, 2013.

The profitability analysis of both deep litter and battery cage system (in table 2) shows that the average total revenue of the deep litter farmers was ₦5, 920,063 while that of battery cage farmers was ₦1,222,510. The total variable cost for deep litter and battery cage systems was ₦ 5,212,070 and ₦9, 020,810 respectively. The battery cage system was more profitable than the deep litter system with average profit of the farmers ₦1,782,750 compared with ₦491350 in deep litter. The rate of return to investment of the cage system 17.07 was higher than that of deep litter 9.05. This implies that for every naira spent on battery cage, will give the return of 17.07 and 9.05 for battery cage and deep litter respectively.

On the profit efficiency analysis, the values vary widely from minimum of 12.89 percent to a maximum of 93.53 percent. The average efficiency estimate for cage system is 77.86.However, in deep litter; the minimum is 10.22 and the maximum value is 93.10, the mean value is 62.28. This

suggests that on the average, about 22.14 percent efficiency in cage system is lost to profit inefficiency. While about 37.72 percent is lost to profit inefficiency in the deep litter system. From the result it can be concluded that cage system of egg production are more profit efficient than deep litter system.

Table 2: COST AND RETURN STRUCTURE OF POULTRY EGG FARMERS

Description	DEEPLITTER	BATTERY CAGE
INCOME in '000₦		
Egg Revenue	5038.03	10,434.24
Spent layer	441.30	1,781.12
Bags & Litters	14.64	11.15
Total Revenue	5920.63	12,226.51
COSTS in '000₦		
DOC	90.55	452.92
Feeds	4,200.43	4,799.09
Vet. Services	362.97	1,357.32
Labour	147.47	1,147.35
Water	81.58	205.65
Energy	97.75	365.67
Transport	117.88	478.39
Other Variable Cost	113.44	214.42
Total Variable Cost	5,212.07	9020.81
Total Fixed Cost	217.21	1,422.95
Total Cost	5,429.28	10,443.76
G/Margin	708.56	3,205.70
Profit	491.35	1,782.75
Profitability Indicators		
RROI	9.05	17.07
RRFC	326.21	225.29
Farm Size 605.43		2,036.42

Source: Data Analysis, 2013.

The sources of inefficiency in deep litter and battery cage were examined by using the estimated δ coefficient for the egg production system from the maximum likelihood estimation as shown in table 3 below

The profit inefficient analysis of the battery cage farmers, the estimated coefficient of age, education and credit access are negatively significant ($p<0.05$). It means that age and education variables would decrease the profit inefficiency. Farmer's experience is found to be negatively significant ($p<0.01$). This means that the more experience the farmers, the more profit efficient he becomes. In contrast, in deep-litter, age and education were positively significant (00$P<0.05$) and household size negatively ($P<0.05$). This implies that, the more aged and educated the deep-litter farmers are, the more profit inefficient they tend to be

. Table 3. The Profit inefficiency of the Poultry Egg Production System

Inefficiency	Parameter	Deep Litter System	Battery Cage System
Age	δ_1	**0.031**** **(0.0145)**	**-0.0507**** **(0.0235)**
Education	δ_2	**0.0428**** **(0.0201)**	**-0.0310**** **(0.0142)**
Cooperative	δ_3	**0.0221** **(0.093)**	**0.2618** **(0.033)**
House hold size	δ_4	**-0.1059**** **(0.0414)**	**-0.1423** **(0.1016**
Source of Income	δ_5	**0.4756** **(0.1163)**	**-0.1499** **(0.4627)**

Credit Access	δ_6	**0.1665 (0.0880)**	**-0.2272** (0.0437)**
Experience	δ_7	**-0.0147 (0.009)**	**0.0148*** (0.1052)**
Sigma-squared	σ^2	**0.87**	**0.74**
Gamma	γ	**0.73**	**0.50**
Log likelihood Function		**-83.38**	**-31.25**
Log-likelihood		**6.38**	**11.23**

Source: Data Analysis 2013. ***significant at 1%, **significant at 5% *significant at 10%

Conclusion

The results of the study showed that battery cage poultry egg system is more profitable than deep litter system. The statistical analysis reveals that there is no significant difference in the two egg production technology. However, Variables that are necessary to launch policy for poultry egg industry includes: Education, credit access, Age, Household size, and years of experience.

Policy Recommendations

- Policies and strategies that will promote the local production of battery cage equipment at affordable price and also support the farmers' use of the locally made cage materials.
- Capacity Building of the Poultry Farmer should be encouraged by government through training and education at the grass root level through farmers' professional association.
- Farmers should be subsidized to have access to credit facilities in cash or in kind without collateral security.Such credit should be committed to farm use.

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