

ANALYSIS OF PROFITABILITY AND CONSTRAINTS IN POULTRY EGG FARMING UNDER BATTERY CAGE AND DEEP LITTER SYSTEMS IN OGUN STATE, NIGERIA: A COMPARATIVE STUDY

By

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Abstract

This paper examines the analysis of the profitability and constraints of battery cage and deep litter poultry egg farming in Ogun State, Nigeria. Structured questionnaire were used in sourcing primary data of 150 poultry egg farmers which comprises of 75 each of battery cage and deep litter poultry egg farmers. Multi-stage sampling procedure was adopted for the study. The analytical tools of descriptive statistics and budgetary technique were applied for the study. The mean ages of the battery cage and deep litter farmers were 46 and 44 years respectively implying the farmers are still in their active and very productive years. All the battery cage farmers had formal education as against 4% of deep litter farmers. The average Net Farm Income (NFI) per production period in battery cage production at small, medium and large scales were ₦324,995.07, ₦1,467,611.32, and ₦2,727,405.30 respectively. That for the deep litter farmers was ₦205,978.87, ₦1,213,428.86 and ₦2,396,751.10. The NFI per bird were ₦525.88, ₦813.08 and ₦1,159.65 in same order for the battery cage while in the latter, they were ₦382.86, ₦658.85 and ₦858.94 respectively. The major constraints in egg production ranked in order of high feed cost, non-remunerative price for egg and birds and supply of poor quality feed and feed ingredients. In addition are high costs of medicines and vaccines, lack of disease control facilities and high rate of electricity tariff. The paper recommends the reduction in electricity tariff, credit provision and subsidy of feed input prices. In addition are the establishment of more and strengthening of existing research centres to develop genetically improved and efficient feed converting breeds of poultry. These on the long run will encourage egg production at all scales and alleviate the national problem of low per caput consumption of animal protein.

Keywords: Budgetary technique, Battery cage, Deep litter, Poultry egg farmers

IJAFA 4, 2013, 20: 581- 595

Accepted for publication, September, 2013.

Cite as IJAFA 4 (1&2), Pp 581–595

Introduction

Food production in Nigeria has not been increasing at the rate that can meet the increasing population (Ojo, 2003). While food production increases at the rate of 2.5%, food demand increases at a rate of more than 3.5%. This is due to the high rate of population growth of 2.83% (FOS, 2006) or 3.2% according to the provisional estimate of the 2006 population census. The obvious difference between the rate of food production and demand for food in Nigeria has led to a food demand supply gap that

has led to a widening gap between domestic food production and total food requirement. This has led to increasing resort to food importation and high rates of increase in food prices.

In realization of the importance of animal protein, the various governments in Nigeria have been pursuing programmes at national, state and community levels to boost the mass production of livestock products, to ensure the attainment of Food and Agriculture Organization (FAO) recommendation of thirty-five grams per caput of animal protein per day (Ojo, 2003). Some of these programmes include the Farm Settlement Scheme, Agricultural Development Programme (ADP), Better Life Programme, Micro Credit Scheme for Livestock Production and lately, the United Nations Development Programme (UNDP) sponsorship of the establishment of livestock parent/foundation stock at community level in Nigeria. The latest UNDP programme has the objectives of training farmers on adopting and rearing through modern methods improved livestock breeds for gradual upgrading of local breeds for increased livestock products and farmers' income.

The Poultry industry plays important role in the development of Nigerian economy. It is a major source of egg and meat which have high nutritional value particularly in the supply of protein (Olagunju and Babatunde, 2011). Poultry farming serves as an auxiliary occupation to complement the income of small and marginal farm families. It occupies an essential position in the rural space because of its vast potential to bring about rapid economic growth, particularly benefitting the weaker section of the populace (Ekunwe *et al.*, 2006).

In Nigeria, poultry represents an appropriate system to feed the fast growing population and to provide income for small-scale farmers. The development of the poultry industry in Nigeria has been described as the fastest means of bridging the protein deficiency gap prevailing in the country. It has been reported that most Nigerian diets are deficient in animal protein, which results in poor and stunted growth as well as increase in spread of diseases and consequently death (Federal Government Nigeria/UNICEF, 1994; Apantaku *et al.*, 1998; Maziya-Dixon *et al.*, 2004).

Rajendran and Mohanty (2003) studied on comparative economic analysis and constraints in egg production under cage vs. deep litter systems of rearing in India and stated that the fixed investment per farm is found to be more on battery cage system of rearing for small, medium and large scale poultry egg production. In both systems, they observed that the feed cost decrease gradually when the stock size increases except in medium size group in deep litter system and accounts for more than 84% of the total cost of production irrespective of stock size and system of rearing. In their study battery cage system appeared to be more efficient than the deep litter system in producing eggs and the feed efficiency increases with decrease in stock size in both the system of rearing. The net returns per farm increase as the size of the farm increases in both the systems and the returns per farm is, however, higher in battery cage system than in deep litter system in all the three groups. They observed that the major constraints in egg production in India are high cost of feed, high cost of medicine and vaccine, supply of poor quality feed and feed ingredients, non remunerative price for eggs, lack of disease control facilities and higher rate of electricity tariff.

According to Ekunwe *et al* (2006) who worked on Economics of small scale deep litter system of egg production in Oredo Local Government Area of Edo State in Nigeria reiterated that fixed capital per bird in deep litter egg production was ₦624.17 and total

fixed cost less depreciation per bird was N208.88 and total variable cost per bird was N331.62. Their study further revealed that total revenue from sales of egg and other sources per bird were N3,749.22 with gross margin per bird of N3,417.6 and net profit of N3,208.72. They discovered that the major constraint facing poultry egg farmers in the study area are inadequate finance, high cost of feed, low egg price and high cost of medicine and vaccine investment on poultry.

Laying hens are usually kept in at least four types of management systems which include battery cages, deep litter, free range and perchery housing systems. For the purpose of this study, two systems shall be considered i.e battery cage system and deep litter system. These two systems were selected for evaluation because it was observed that they are the major systems of operation adopted by the poultry egg farmers in the study area. Battery cage and Deep litter was adopted in the study area based on the availability of capital to the farmers and ready market for poultry product. In line with the above, this paper seeks to undertake a comparative analysis of the profitability and constraints in egg production under battery cage and deep litter system in Ogun State, Nigeria. The specific objectives however are to:

1. Describe the socio-economic characteristics of poultry egg farmers under battery cage and deep litter system.
2. Determine and compare the costs and returns of poultry egg farmers under the two production options
3. Assess and compare the constraints encountered by the two sets of poultry farmers

Methodology

Study area: The study area is Ogun state, Nigeria. The State was chosen as the study locations because according to Afolami and Oladimeji (2003) Ogun State is an area with many commercial poultry farms and it is popularly known for egg production and marketing in Nigeria. Ogun State is one of the six states of the South western Nigeria. It is located in the tropical rainforest belt within latitude 6°N and 8°N and longitude 2°E and 15°E. The state shares an international boundary with the Republic of Benin to the west and interstate boundaries with Ondo State in the east, Lagos State and Atlantic Ocean in the south and Oyo State in the North. The state comprises of 20 Local Government Areas (LGAs) and overall total population of 3,728,098 (NPC, 2006). Ogun State is approximately 1.9% (i.e. 16,762 km²) of Nigeria's 923,218km² land area. There are two distinct seasons in the state, namely the rainy season which lasts from March to October and dry season which lasts for the remaining part of the year. The state is mainly agrarian and produces permanent crops and arable crops because of the favourable climatic conditions. The occupations of the rural inhabitants are predominantly farming, cultivating food and cash crops. They also embark on small, medium and large-scale livestock production such as rearing of goat, sheep, pigs, rabbits and poultry as well as marketing of the products.

Sampling procedure and sample size: A multi-stage sampling technique was adopted. At the first stage, a purposive sampling technique was used to select three (3) out of the six (6) Poultry Association of Nigeria (PANOG) zones in the state based on higher population of poultry egg farmers in these zones and availability of market for poultry products. The zones include, Egba, Ota and Ijebu. The second stage employed random selection of two (2) LGAs from each of the zones, this gave a total of six (6) LGAs - Odeda, Abeokuta south, Ado Odo/Ota, Ifo, Ijebu Ode and Ijebu North East. The third stage employed random selection of five (5) villages from each LGA giving a total of thirty (30) villages. The final stage involved random selection of five (5) poultry egg

farmers that practice either battery cage or deep litter systems of poultry egg production in each of these villages. This was followed by a snowball sampling in selecting the seventy five (75) poultry egg farmers each that practise battery cage and deep litter systems. This gave a total of one hundred and fifty (150) poultry egg farmers that use battery cage and deep litter systems in the study area. Structured questionnaire was used to elicit information on socio-economic characteristics, costs and returns and possible constraints encountered by the respondents who operated on small, medium and large scale respectively. This was based on Omotosho and Oladele (1988), Subhash *et al.* (1999) and Ojo (2003) classification on small, medium and large scales being ≤ 1000 birds, between 1001 and 3000 birds and > 3000 birds in that order.

Analytical procedure: The analytical tools adopted for this paper involve descriptive statistics that was used to describe socio-economic characteristics and constraints encountered while the budgetary technique was used for costs and returns structure of the poultry egg farmers. The descriptive statistics encompassed frequency tables, means and percentage distributions. Socio-economic characteristics that were described are age, gender, marital status, household size, experience of farmers (years) and other demographic characteristics of the farmers. Economic variables considered were quantity of eggs produced (number), stock of birds (number), feed cost (Naira), operating expenses (Naira), other cost (Naira). The poultry farmers in the study area were asked to rank the factors that limit poultry egg production among non-remunerative price of egg and bird, supply of poor quality feed and feed ingredients, high cost of feed, lack of disease control facilities, high rate of electricity tariff and high cost of medicines and vaccines. Budgetary technique was used to estimate the financial outcome and profitability of poultry egg farmers that use either battery cage or deep litter system of poultry egg production in the study area.

The budgetary technique is as specified:

$$\text{GM} = \text{TR} - \text{TVC} \dots\dots\dots (1)$$

Where:

- TR = Total Revenue from sales of eggs and birds (₦)
- TVC = Total variable cost for eggs and birds
- GM = Gross Margin (Naira per farmer)

The net farm income is derived as follows:

$$\pi = \text{TR} - \text{TC} \dots\dots\dots (2)$$

Where:

- π = Net Farm Income (Naira per farmer)
- TR = Total Revenue from sales of eggs and birds (₦)
- TC = Total Cost for egg and bird which include Total Variable Cost (TVC) plus Total Fixed Cost (TFC)

The straight line depreciation method was used to calculate the depreciation cost of the equipments (fixed assets) used in poultry egg production because it is most commonly used and it is easy to calculate. According to Yusuf and Malomo (2007) in their use of straight line depreciation method in their work reiterated that the salvage value of the fixed asset used in poultry production is assumed to be zero. It is represented as follows:

$$\text{Annual Depreciation} = \frac{Pp - S}{n} \dots\dots\dots (3)$$

Where; Pp = Purchase price, S = Salvage value, n = No of years of the useful life of the asset.

The total variable cost include cost of feed (₦), cost of Day Old Chick (₦), cost of brooding (₦), cost of veterinary services (₦), cost of labour (₦), cost of water (₦), cost of energy (₦), cost of transportation (₦), cost of drugs (₦) and miscellaneous (other) expenses (₦).

The total fixed costs on the other hand were those costs that did not vary with output on the short run and are independent of the size of production. They include depreciation on building, battery cages, feeders, drinkers, generators, pumping machines, water tankers, debeakers and interest on capital.

Results and Discussion

Socio-economic Characteristics of Poultry Egg Farmers: The mean age of the poultry egg farmers was 46 years for the battery cage farmer and 44 years for that of the deep litter (Table 1). Also 46.6 percent and 58.7 percent of battery cage and deep litter poultry egg farmers are aged below 45 years. This indicates that a very active age group are involved in both systems of production. In terms of gender, the study revealed that 61.3 percent are male while 38.7 percent are female for battery cage farmers while for deep litter farmers 66.7 percent are male and 33.3 percent female. The majority of poultry egg producers being male can be attributable to lack of easy access to loans by female farmers as compared to their male counterparts. Bamiro *et al* (2001) also asserts that the female gender as compared to the male folks is less efficient as poultry egg farmers.

The majority of farmers in battery cage or deep litter egg production are married (81.3 percent and 82.7 percent in that order). The respondents that are widowed for battery cage and deep litter farmers account for 8.0 percent and 2.7 percent respectively. The marital status of a poultry egg farmer has implication on the household size and subsequently on the availability of family labour to assist on the farm. The majority (74.4 percent) of the battery cage and 51.0 percent of the deep litter farmers have post-secondary education and by implication, more literate farmers were present in battery cage production option. This accounts for the higher level of technology and innovation in the battery cage option of egg production.

Depending on the number of birds owned by the proprietors of each farm, the poultry farms are divided into various scales of operation. According to Omotosho and Oladele (1988), Subhash *et al.* (1999) and Ojo (2003), poultry egg farmers having less than 1000 birds were considered as small scale farmers, 1001-3000 as medium scale farmers while those having 3000 and above birds were large scale farmers. The distribution shows that 41.3 percent of battery cage farmers and 48.0 percent of deep litter farmers were of medium scale. On the other hand, 33.3 percent and 20.0 percent are into large scale production by battery cage and deep litter systems respectively.

Table 1: Socio-economic Characteristics of Poultry egg Farms Sampled

Variable	Battery cage	Percent age	Deep litter	Aggregate		
	Frequency		Frequency	Percentage	Frequency Percentage	
Age Group (Years)						
25-34	13	17.3	14	18.7	27	18.0
35-44	22	29.3	30	40.0	52	34.7
45-54	23	30.7	14	18.7	37	24.7
55-64	9	12.0	12	16.0	21	14.0
65-74	8	10.7	5	6.7	13	8.7
Total	75	100.0	75	100.0	150	100.0
Mean		46		44		
Sex						
Male	46	61.3	50	66.7	96	36.0
Female	29	38.7	25	33.3	54	64.0
Total	75	100.0	75	100.0	150	100.0
Marital Status						
Married	61	81.3	62	82.7	123	82.0
Single	8	10.7	11	14.7	19	12.7
Widowed	6	8.0	2	2.7	8	5.3
Total	75	100.0	75	100.0	150	100.0
Educational Level						
No Formal Education	0	0.0	3	4.0	3	2.0
Primary	6	8.0	7	9.3	13	9.7
Secondary	13	17.3	14	18.7	27	18.0
NCE/OND	20	26.7	23	30.7	43	28.7
HND/B.Sc	31	41.3	24	32.0	55	36.7
M.Sc/Ph.D	5	6.7	4	5.3	9	6.0
Total	75	100.0	75	100.0	75	100.0
Scale of Operation						
Small (<1000 birds)	19	25.3	24	32.0	43	28.7
Medium (1001-3000 birds)	31	41.3	36	48.0	67	44.7
Large (>3000 birds)	25	33.3	15	20.0	40	26.6
Total	75	100.0	75	100.0	150	100.0
Experience (years)						
≤ 5	16	21.3	27	36.0	43	28.7
6-10	28	37.3	31	41.3	59	39.3
11-15	16	21.3	14	18.7	30	20.0
16-20	10	13.3	3	4.0	13	8.7
≥ 21	5	6.7	0	0.0	5	3.3
Total	75	100.0	150	75	150	100.0

Source: Field Survey, 2012.

That more of the poultry egg farmers (battery cage and deep litter) operate on medium scale is in line with the findings of Oleke and Isinika (2011), who reiterated that 67.4 percent of commercial poultry egg farms in Tanzania operated on medium scale. The result further showed that 79.9 percent of battery cage and 96 percent of deep litter farmers had above 15 years experience in the industry. The years of experience of the poultry egg farmers is supposed to have a positive influence on the profitability of the poultry farm unit *ceteris paribus*.

Costs and Returns Structure per Production Period of an Average Poultry Egg Farmer:

The total variable costs for battery cage system on small, medium and large scale were estimated as ₦1,699,213.37, ₦5,227,628.40 and ₦19,883,941.53 (Table 2). These accounted for 91.68 percent, 91.94 percent and 91.57 percent respectively of total cost of production for battery cage. Those for deep litter poultry egg farmers on small, medium and large scale were ₦1,501,569.23, ₦4,962,310.00 and ₦20,051,840.83 respectively. The cost of feeding accounted for the highest proportion of the total variable costs for both systems under small, medium and large scale operations. For battery cage system, these percentage distributions of the cost of feeding were 71.97, 73.45 and 73.99 percent respectively while for deep litter, these accounted for 73.62, 73.45 and 76.94 percent distribution in that order.

This lends credence to the findings of Ashagidigbi *et al.* (2011) who revealed that the cost of feeding of laying birds accounted for over 70 percent of the total cost of production. The cost of purchase of laying bird's i.e cost of day old chick and brooding are next to cost of feeding in order of magnitude. For battery cage farmers, they were 5.41, 5.29 and 4.65 percent and 7.15, 6.97 and 6.13 percent in that order respectively. There was no major difference in this trend with respect to the deep litter system in all scales. The total fixed cost was estimated as ₦154,159.65, ₦458,140.98, ₦1,831,450.77 and ₦90,085.45, ₦328,537.54, ₦1,480,475.31 and accounted for 8.32, 8.06, 8.43 percent and 5.66, 8.06, 6.88 percent of the total cost of production for small, medium and large battery cage and deep litter farmer's respectively. This shows that variable cost constitute larger proportion than total fixed cost in both options in poultry egg production.

The result further revealed that the revenue from poultry eggs was higher at all levels in the battery cage than the deep litter production option. For the small, medium and large scale battery cage farmers, revenues were ₦1,797,958.19, ₦6,015,617.00 and ₦21,033,367.45 and for the deep litter option, they were ₦1,469,227.61, ₦5,363,884.62 and ₦20,332,330.81. The result also showed that gross margin and net farm income were positive for both categories under the different scales of operation. The values of the revenue items, total revenue, total fixed cost, total variable cost, gross margin and net farm income are higher in battery cage under small, medium and large scales when compared to the deep litter farmers under same scales of operation.

Costs and Returns Structure per bird of an average poultry egg Farmer:

The Costs and returns structure for the profit per bird of an average poultry egg farmer is presented in table 3. This was determined by dividing the costs and revenues of the battery cage and deep litter farmers under the different scale of operations by their corresponding mean flock size. The mean flock size of battery cage and deep litter users based on small, medium and large scale of operation was estimated as 618, 1,805, 5,601 birds and 538, 1,853, 5,211 birds respectively. The cost of feed per bird was highest of all variable cost and accounted for over 70 percent of the total cost of production for the different scale of operation under both battery cage and deep litter system. and deep litter under small, medium and large scale. The feed cost per bird for the battery cage option of production was estimated as ₦2,158.86, ₦2,313.55, ₦2,862.52 and for the deep litter option, they were ₦2,178.11, ₦2,210.65 and ₦3,175.38 respectively. This is in line with the findings of Bamiro *et al* (2001) and Effiong and Onyenweaku (2006) that feed cost is the major important single cost item associated with poultry production. This increased cost of poultry feed ingredients such as maize, groundnut cake, soya bean and wheat could be attributable for this. The fixed

cost for both the battery cage and deep litter systems under the different scales of operation were less than one percent.

The total revenue per bird which constitutes revenue from sales of egg and spent layer, gross margin and net farm income per bird were discovered to be higher in small, medium and large battery cage users when compared with the deep litter users under similar scales of operation. The gross margin per bird for small, medium and large battery cage and deep litter users were estimated as ₦775.33, ₦1,066.90, ₦1,541.12 and ₦550.31, ₦832.15, ₦1,143.05 in that order respectively. The net farm income per bird for battery cage and deep litter for small, medium and large scales were ₦525.88, ₦813.08, ₦1,159.65 and ₦382.86, ₦658.85, ₦858.94 respectively. The gross margin per bird and net farm income per bird were found to increase progressively with the increase in flock size for both systems of operation.

Table 2: Costs and Returns Structure per Production Period of an Average Poultry Egg Farmer by Scale of Operation

Cost and revenue item	Battery cage				Deep litter							
	Small Scale Amount (₦)	% of Total Cost	Medium Scale Amount (₦)	% of Total Cost	Large Scale Amount (₦)	% of Total Cost	Small Scale Amount (₦)	% of Total Cost	Medium Scale Amount (₦)	% of Total Cost	Large Scale Amount (₦)	% of Total Cost
Description												
Revenue from Eggs (₦)	1,797,958.19		6,015,617.00		21,033,367.45		1,469,227.61		5,363,884.62		20,332,330.81	
Revenue from Spent Layers (₦)	380,409.90		1,137,763.70		3,409,430.15		328,405.96		1,140,391.79		3,596,736.42	
Total Revenue (₦)	2,178,368.09		7,153,380.70		24,442,797.60		1,797,633.57		6,504,276.41		23,929,067.23	
Variable Cost Items												
Cost of initial stock (DOC)	100,247.63	5.409	300,670.00	5.288	1,009,666.35	4.650	96,933.66	6.090	332,942.31	5.288	993,560.77	4.614
Cost of brooding (DOC)	132,549.82	7.152	396,400.00	6.972	1,331,044.12	6.129	113,138.78	7.108	418,653.85	6.972	1,174,452.53	5.454
Cost of transportation	6,175.12	0.333	1,9820.00	0.349	59,519.23	0.274	5,698.01	0.358	25,692.31	0.349	75,755.64	0.352
Cost of medication	113,126.00	6.104	281,090.00	4.944	1,231,775.91	5.672	10,0973.49	6.344	383,588.46	4.944	999,366.24	4.641
Cost of fuel	1,354.42	0.073	5,400.00	0.095	2,9001.94	0.134	1,647.60	0.104	7,961.54	0.095	25,425.42	0.118
Cost of electricity	576.11	0.031	6,120.00	0.108	27,189.32	0.125	266.93	0.017	1,000.00	0.108	8,071.56	0.037
Cost of repairs and maintenance	420.81	0.023	2,640.00	0.046	13,775.92	0.063	312.95	0.020	1,923.08	0.046	3,632.20	0.017
Cost of water	0.00	0.000	400.00	0.007	5,437.86	0.025	46.02	0.003	384.62	0.007	6053.67	0.028
Cost of feed	1,334,174.32	71.986	4,175,956.40	73.446	16,032,971.26	73.832	1,171,821.71	73.623	3,725,740.77	73.446	16,567,769.54	76.944
Cost of Labour	10,589.16	0.571	39,132.00	0.688	143,559.61	0.661	1,0730.09	0.674	64,423.08	0.688	197,753.25	0.918
Total Variable cost (₦)	1,699,213.37	91.682	5,227,628.40	91.942	19,883,941.53	91.566	1,501,569.23	94.340	4,962,310.00	91.942	20,051,840.83	93.124
Fixed Cost Items												
Land cost	4,314.50	0.233	49,268.31	0.867	195,763.11	0.901	6,716.85	0.422	50,193.49	0.867	45,931.03	0.213
Fence cost	891.30	0.048	4,736.25	0.083	30,814.56	0.142	0.00	0.000	0.00	0.083	6,461.64	0.030
Building cost	104.37	0.006	2,133.33	0.038	0.00	0.000	0.00	0.000	0.00	0.038	0.00	0.000
Farm stead cost	8,0768.04	4.358	1,98575.71	3.493	1,008,678.90	4.645	65,032.59	4.086	195,321.09	3.493	106,9607.79	4.967
Feed store cost	1,170.95	0.063	265.00	0.005	4,531.55	0.021	80.54	0.005	0.00	0.005	4,689.90	0.022
Farm vehicle cost	2,398.20	0.129	3,2371.72	0.569	115,835.14	0.533	2,071.00	0.130	11,474.36	0.569	93,798.00	0.436
Borehole/Deep well cost	559.53	0.030	6,231.62	0.110	3,7617.07	0.173	1,102.81	0.069	8,840.36	0.110	36,676.79	0.170
Pump cost	295.26	0.016	1,101.43	0.019	3,933.39	0.018	28.99	0.002	0.00	0.019	0.00	0.000
Generator set cost	279.64	0.015	3,199.37	0.056	21,099.34	0.097	135.99	0.009	3,165.40	0.056	11,455.37	0.053
Battery cage cost	6,2067.78	3.349	1,56474.92	2.752	70,9196.74	3.266	0.00	0.000	0.00	2.752	0.00	0.000
Feeder cost	0.00	0.000	0.00	0.000	0.00	0.000	8,226.52	0.517	30,660.02	0.000	97,575.46	0.453
Drinker cost	0.00	0.000	0.00	0.000	0.00	0.000	6,635.22	0.417	28,520.39	0.000	106,603.92	0.495
Water tanker cost	1,275.01	0.069	2,942.93	0.052	3,356.80	0.015	14.31	0.001	0.00	0.052	2,605.50	0.012
Drum cost	27.55	0.001	721.20	0.013	5,010.43	0.023	25.28	0.002	278.22	0.013	3,595.93	0.017
Bucket cost	6.17	0.000	107.01	0.002	791.94	0.004	12.82	0.001	77.28	0.002	952.88	0.004
Debeaker cost	1.36	0.000	12.19	0.000	0.00	0.000	2.53	0.000	6.92	0.000	521.10	0.002
Total Fixed Cost (₦)	154,159.65	8.318	458,140.98	8.058	1,831,450.77	8.434	90,085.45	5.660	328,537.54	8.058	1,480,475.31	6.876
Total Cost (₦)	1,853,373.02	100.00	568,5769.38	100.00	21,715,392.29	100.00	1,591,654.68	100.00	5,290,847.54	100.00	21,532,316.13	100.00
Gross Margin (₦)	479,154.72		1,925,752.30		4,558,856.07		296,064.34		1,541,966.41		3,877,226.41	
Net Farm Income (₦)	324,995.07		1,467,611.32		2,727,405.30		205,978.89		1,213,428.86		2,396,751.10	

Source: Field Survey, 2012

Table 3: Costs and Returns Structure per Bird of an Average Poultry Egg Farmer by Scale of Operation

Cost and revenue item	Battery cage						Deep litter					
	Small scale (₦)	% of Total Cost	Medium scale (₦)	% of Total Cost	Large Scale (₦)	% of Total Cost	Small Scale (₦)	% of Total Cost	medium scale (₦)	% of Total Cost	Large Scale (₦)	% of Total Cost
Description												
Revenue from Eggs (₦)	2,909.32		3,332.75		4,381.04		2,730.91		2,894.70		4,300.81	
Revenue from Spent Layers (₦)	615.55		630.34		710.15		610.42		615.43		690.22	
Total Revenue (₦)	3524.87		3963.09		5091.19		3341.33		3510.13		4991.03	
Variable Cost Items												
Cost of initial stock (DOC)	162.21	5.41	166.58	5.29	180.27	4.59	180.17	6.09	179.68	6.29	190.67	4.61
Cost of brooding (DOC)	214.48	7.15	219.61	6.97	237.64	6.04	210.30	7.11	225.93	7.91	225.38	5.45
Cost of transportation	9.99	0.33	10.98	0.35	10.63	0.27	10.59	0.36	13.87	0.49	14.54	0.35
Cost of medication	183.05	6.10	155.73	4.94	219.92	5.59	187.68	6.34	207.01	7.25	191.78	4.64
Cost of fuel	2.19	0.07	2.99	0.09	5.18	0.13	3.06	0.10	4.30	0.15	4.88	0.12
Cost of electricity	0.93	0.03	3.39	0.11	4.85	0.12	0.50	0.02	0.54	0.02	1.55	0.04
Cost of repairs and maintenance	0.68	0.02	1.46	0.05	2.46	0.06	0.58	0.02	1.04	0.04	0.70	0.02
Cost of water	0.00	0.00	0.22	0.01	0.97	0.02	0.09	0.00	0.21	0.01	1.16	0.03
Cost of feed	2,158.86	71.99	2313.55	73.45	2862.52	72.81	2,178.11	73.62	2,210.65	70.42	3,179.38	76.94
Cost of Labour	17.13	0.57	21.68	0.69	25.63	0.65	19.94	0.67	34.77	1.22	37.95	0.92
Total Variable cost (₦)	2749.54	91.68	2896.19	91.94	3550.07	90.30	2791.02	94.34	2677.99	93.79	3847.98	93.12
Fixed Cost Items												
Land cost	6.9814	0.23	27.2955	0.87	34.9515	0.89	12.4848	0.422	27.0877	0.95	8.8142	0.2133
Fence cost	1.4422	0.05	2.6240	0.08	5.5016	0.14	0.000	0.000	0.0000	0.00	1.2400	0.0300
Building cost	0.1689	0.01	1.1819	0.04	0.0000	0.00	0.0000	0.000	0.0000	0.00	0.0000	0.0000
Farm stead cost	130.6926	4.36	110.0142	3.49	180.0891	4.58	120.8784	4.086	105.4080	3.69	205.2596	4.9675
Feed store cost	1.8947	0.06	0.1468	0.00	0.8091	0.02	0.1497	0.005	0.0000	0.00	0.9000	0.0218
Farm vehicle cost	3.8806	0.13	17.9345	0.57	20.6812	0.53	3.8494	0.130	6.1923	0.22	18.0000	0.4356
Borehole/Deep well cost	0.9054	0.03	3.4524	0.11	6.7161	0.17	2.0498	0.069	4.7708	0.17	7.0383	0.1703
Pump cost	0.4778	0.02	0.6102	0.02	0.7023	0.02	0.0539	0.002	0.0000	0.00	0.0000	0.0000
Generator set cost	0.4525	0.02	1.7725	0.06	3.7671	0.10	0.2528	0.009	1.7083	0.06	2.1983	0.0532
Battery cage cost	100.4333	3.35	86.6897	2.75	126.6197	3.22	0.0000	0.000	0.0000	0.00	0.0000	0.0000
Feeder cost	0.0000	0.00	0.0000	0.00	0.0000	0.00	15.2909	0.517	16.5462	0.58	18.7249	0.4532
Drinker cost	0.0000	0.00	0.0000	0.00	0.0000	0.00	12.3331	0.417	15.3915	0.54	20.4575	0.4951
Water tanker cost	2.0631	0.07	1.6304	0.05	0.5993	0.02	0.0266	0.001	0.0000	0.00	0.5000	0.0121
Drum cost	0.0446	0.00	0.3996	0.01	0.8946	0.02	0.0470	0.002	0.1501	0.01	0.6901	0.0167
Bucket cost	0.0100	0.00	0.0593	0.00	0.1414	0.00	0.0238	0.001	0.0417	0.00	0.1829	0.0044
Debeaker cost	0.0022	0.00	0.0068	0.00	0.0000	0.00	0.0047	0.000	0.0037	0.00	0.1000	0.0024
Total Fixed Cost (₦)	249.4493	8.32	253.8177	8.06	381.4728	9.70	167.4451	5.660	177.3003	6.21	284.1058	6.8756
Total Cost (₦)	2,998.99	100.00	3,150.01	100.00	3,931.54	100.00	2,958.47	100.000	2,855.29	100.00	4,132.09	100.0000
Gross Margin per bird (₦)	775.33		1066.90		1,541.12		550.31		832.15		1,143.05	
Net Farm Income per bird (₦)	525.88		813.08		1,159.65		382.86		654.85		858.94	

Source: Field Survey, 2012

Constraints Encountered by Poultry Egg Farmers:

The analysis revealed that battery cage (53.3 percent) and deep litter (38.7 percent) farmers ranked high cost of feed as the major problem encountered in the study area (Tables 1 and 2). This is similar to the findings of Brown (1974) and Singh (1980). The cost of transportation was the major cause as much of the feeds were supplied from the neighbouring state of Lagos. Cooperative feed manufacturing that could reduce feed cost was not prevalent in the study area. The result further revealed that 52.0 percent of battery cage farmers and 38.7 percent of deep litter ranked non-remunerative price for egg and birds as the second major problem and in that order. This is so because increasing feed cost has made cost of eggs higher. The prices received by the farmers become less than the costs of production resulting in negative returns.

In addition, 41.3 percent and 42.7 percent of battery cage and deep litter farmers also ranked supply of poor quality feed and feed ingredients as the third and second major problem respectively. With the supply of good quality feed and feed ingredients, feed efficiency will be ensured and the cost of production reduced to a considerable extent. It was further revealed that 44.0 percent and 57.3 percent of battery cage and deep litter farmers respectively ranked high cost of medicine and vaccines as the fourth major problem encountered by poultry egg producers. As the layers require periodical vaccinations and medications, cost of medicines and vaccines affect the cost of production of eggs. The supply of medicines and vaccines to poultry egg farmers is mostly in the hands of people in the private sector and not necessary steps are being taken by the state and central governments to regulate them to supply at reasonable prices.

Battery cage farmers (38.7 percent) and deep litter farmers (62.7 percent) ranked lack of disease control facilities as the fifth major problem. The mortality of birds in study area is high due to diseases infestation of poultry birds e.g. mareks and infectious bursal diseases and infectious bronchitis. No proper disease diagnosis and control measures that can reduce mortality rates are in place. The consequence is reduced farm income. Finally, the farmers also complained of high electricity tariff. This was applicable to 65.3 percent and 77.3 percent for battery cage and deep litter farmers respectively. Subsidy in any form in this respect was not prevalent in the study area.

Table 4: Constraints Encountered by Battery Cage Poultry Egg Farmers

Constraint	1st	2nd	3rd	4th	5th	6th	Remark
Non-remunerative price of egg and birds	9 (12.0)	39 (52.0)	19 (25.3)	5 (6.7)	2 (2.7)	1 (1.3)	2
Supply of poor quality feed and feed ingredient	21 (28.0)	19 (25.3)	31 (41.3)	2 (2.7)	2 (2.7)	0 (0.0)	3
High cost of feed	29 (38.7)	17 (22.7)	6 (8.0)	14 (18.7)	9 (12.0)	0 (0.0)	1
Lack of disease control facilities	2 (2.7)	0 (0.0)	17 (22.7)	16 (21.3)	29 (38.7)	11 (14.7)	5
High rate of electricity tariff	1 (1.3)	1 (1.3)	6 (8.0)	18 (24.0)	0 (0.0)	49 (65.3)	6
High cost of medicine and vaccine	3 (4.0)	0 (0.0)	11 (14.7)	33 (44.0)	15 (20.0)	13 (17.3)	4

Figures in parenthesis are the percentages

Source: Field Survey Data, 2012

Table 5: Constraints Encountered by Deep Litter Poultry Egg Farmers

Constraint	1st	2nd	3rd	4th	5th	6th	Remark
Non-remunerative price of egg and birds	24 (32.0)	14 (18.7)	29 (38.7)	6 (8.0)	2 (2.7)	0 (0.0)	3
Supply of poor quality feed and feed ingredient	30 (40.0)	32 (42.7)	5 (6.7)	3 (4.0)	0 (0.0)	5 (6.7)	2
High cost of feed	40 (53.3)	24 (32.0)	4 (5.3)	5 (6.7)	1 (1.3)	1 (1.3)	1
Lack of disease control facilities	1 (1.3)	4 (5.3)	3 (4.0)	12 (16.0)	47 (62.7)	8 (10.7)	5
High rate of electricity tariff	0 (0.0)	1 (1.3)	0 (0.0)	5 (6.7)	11 (14.7)	58 (77.3)	6
High cost of medicine and vaccine	5 (6.7)	3 (4.0)	7 (9.3)	43 (57.3)	9 (12.0)	8 (10.7)	4

Figures in parenthesis are the percentages

Source: Field Survey Data, 2012

Conclusion and Recommendation:

The study revealed that majority (61.3 percent and 66.7 percent) of battery cage and deep litter poultry egg farmers in the study area were male. The mean age of the poultry egg farmers were 46 years and 44 years respectively in that order. This implies that they are in their economically active age. In the same order also, 81.3% and 82.7%; 41.3 % and 48.0 %; and 33.3 % and 20.0 % are married, own medium and large scale farms respectively. The total revenue per production season for an average battery cage farmer on small, medium and large scales were ₦1,797,958.19, ₦6,015,617.00 and ₦21,033,367.45. The gross margin in same order were ₦479,154.72, ₦1,925,752.30 and ₦2,727,405.30 while the net farm incomes for same categories of farmers were ₦324,995.07, ₦1,467,611.32 and ₦2,727,405.30. Those for deep litter farmers operating on small, medium and large scales for, total revenue were ₦1,469,227.61, ₦5,363,884.62 and ₦20,332,330.81. The gross margins were ₦296,064.34, ₦1,541,966.41 and ₦3,877,226.41 while the net farm incomes were ₦205,978.89, ₦1,213,428.86 and ₦2,396,751.10. These results indicate a better performance for the battery cage farmers as compared to the deep litter farmers.

The gross margin and net farm income per bird were superior in the small, medium and large scale battery cage users when compared with the deep litter users under similar scales of operation. The major constraints in egg production were high cost of feed and high rate of electricity tariff. Reduction in electricity tariff, credit provision and subsidizing feed input prices will make both small and medium scale farmers to benefit in terms of cost reduction and enhanced income. Other areas where subsidy is needed are costs of day old chicks and veterinary medications. Policies targeted at labour resource shifts to enhance the availability and so reduction of this cost item need to be put in place.

Research centres and Agricultural Development Programmes (ADPs) focused at developing genetically improved breeds of poultry will help in efficient feed conversion. There is no doubt if these are put in place, efforts would have been made on the long run in encouraging investment on all scales of egg production especially in the battery cage system and the per caput protein consumption requirement problem will be on the way to being completely solved.

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