ISSN 0189-0514
*J. Anim. Prod. Res. (2018) 31(1):179-192*

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# COMPARATIVE PROFITABILITY AND SOLVENCY ANALYSIS AMONG LAYER-EGG FARMERS IN JOS METROPOLIS OF PLATEAU STATE, NIGERIA

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## ABSTRACT

This study determined the profitability and solvency of layer-egg production in Jos metropolis of Plateau State, Nigeria. A two-stage sampling technique was used to select 143 respondents. Primary data were collected on socioeconomic variables, (age, gender, marital status, educational level, farm size, farming experience, source of capital, cooperative membership and extension contacts) using structured questionnaires and interview schedules. Data collected were analyzed using descriptive statistics, budgetary technique and solvency tools. The results shows that age, gender, marital status, education level, family size, farming experience, capital source, cooperative membership and extension contacts were the socio-economic factors identified and described in the study area. The total revenue generated per bird is ₦6,916, ₦7,877 and ₦9, 772 for small, medium and large scale farms respectively. The total Variable Cost per bird is ₦5, 743, ₦5,945.40 and ₦5,282.22 for small, medium and large scale farms respectively. The result revealed that the major cost in layer-egg production in all the three scales of production is cost of feed which accounted for 89%, 91% and 93% of the total variable cast in small, medium and large scale farms respectively. Depreciated cost of fixed cost items per bird is ₦44, ₦58 and ₦54 for small, medium and large scale respectively. The total cost incurred per laying bird is ₦5,787, ₦6,003 and ₦5,336 for small, medium and large scale farms respectively. The result of profitability analysis indicate that egg-poultry production is profitable in the study area with ₦1,129.11, ₦1,874.18 and ₦4,436.23 for small, medium and large scale farms. Rate of return to investment per bird from small farm size, medium and large farm sizes were found to be 19.51%, 31.21% and 83.13%respectively. The capital turnover per bird was ₦ 1.20, ₦1.31 and ₦1.83 respectively for small, medium and large scale respectively. Also, the profitability indices for the small, medium and large scales are ₦0.16, ₦0.24 and ₦0.45. The problems encountered by poultry egg farmers are high cost of feed, diseases and infections, scarcity of quality day old stock, limited access to credit, marketing constraints and poor rural infrastructure. The study recommends that; i. farmers should increase their scale of operation by increasing the number of birds, reducing the labour inputs and improving management practices which will distribute the over utilized resources. This is in particular to the small scale farmers, ii. The government, through research institute and National Agricultural Extension and Liaison Services (NAERLS) should make drugs and vaccines available to the farmers at the right time and subsidized to reduce losses due to diseases. iii. The Ministry of Agriculture through the State and Local Government councils should enact and implement policies geared towards transforming scale of production in order to enjoy the benefits of economies of scale and thereby derive optimum profit from layer-egg farming while meeting the increasing demand for poultry iv. Students and researchers in research institutions should be encouraged to conduct researches aimed at developing

a cheap and more efficient poultry layer feed. This will reduce the high cost of production due to high cost of feed v. Private investors should be encouraged alongside extension services to keep the poultry egg farmers abreast of the modern/improved technology in the study area.

**Key words:** Profitability, layer-egg Production, Plateau state, Nigeria.

## INTRODUCTION

Poultry is a collective name given to a group of birds reared or hunted for useful purposes. They are domesticated birds kept for egg or meat production which include chickens (domestic fowls), turkeys, ducks and geese (Busari and Okanlawon, 2015). Poultry is the quickest source of meat and its production process involves the least hazardous and arduous in relation to other livestock enterprises. Hence, increased poultry production is one of the surest and quickest ways of bridging the animal protein intake gap between developing and developed countries of the world (Haruna *et al.*, 2002). According to Ayoola (2015), the protein gap is evident in the number of eggs consumed by a Nigerian annually. He stressed that Nigerians consume 70 pieces of eggs per person annually while developed countries such as China records 370 pieces of egg per person annually. The task of bridging this protein intake gap appears formidable in view of the present economic and technological constraints besetting our livestock industry. According to Bamiro *et al.* (2006), poultry egg production is one of the major sub-sectors in the Nigerian agricultural industry which supply protein, lipids and vitamins of high zoological value to man. Poultry eggs, apart from supplying protein are also good sources of high energy nutrients. Poultry egg is one of the most nutritious and most complete foods known to man and it provides the means by which rapid transformation of animal protein intake can be achieved (Ayoola, 2015). Small scale poultry egg production are made of farms having less than 1000 birds while medium scale are farms having between 1000 and less than 5000 birds. A farmer who maintains at least 5000 birds is classified as a large scale producer. Small scale poultry refers to those operations in which the farmers frequently have difficulty to obtain sufficient input to allow use of technical inputs available to medium and large scale farmers and finally, eggs, one of the major products of poultry production, are more affordable for the low income population than other sources of animal protein (Aboki *et al.*, 2013).

Nigeria has the highest poultry farms as well as the highest participation of people in poultry industry in Africa (FAO. 2010), however in spite of this, various research outcomes have shown that most of these farmers run their farms at very unsustainable profit margins due to various degrees of risks, lack of technical experience, poor production methods as well as poor management practices which have discouraged most farmers from investing more in the industry (FAO, 2010). In Nigeria, the production of food has not increased at the rate that can meet the increasing population. While food production increases at a 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% (Ojo and Fagbenro, 2010). The apparent disparity between the rate of food production and demand for food in Nigeria has led to a food demand supply gap thus leading to a widening gap between domestic food production and total requirement, an increase resort to food importation and high rates of increase in food prices and as a result, wide spread hunger and malnutrition are evident in the country (Ugwumba and Chukwuji, 2010). With the afore mentioned growth rate, Nigeria population is estimated to about 179,700,000 by 2015 (NPC, 2006), which is far above the animal protein supply. Nigeria presently produces and supply above 550,000 tons of poultry meat per annum and 700,000 tons of

eggs (FAO, 2010). Despite this, Nigeria is far from meeting her domestic demand (1.5 million tons for poultry meat and 1.8 million tons for eggs, (PAN 2015),thus creating a shortfall of 950, 000 tons for poultry meat and 1.1 million tons for eggs when compared with developed countries that are involved in poultry production. In comparison, Brazil produces over 13 million tons of poultry meat per year while China produces about 13.5 million tons. Top on the list of poultry meat production is USA with over 25 million tons per year (FAO, 2010).

The animal protein consumption in Nigeria is below the standard of United Nations. Food and Agricultural Organization recommended minimum of 20 grammes for developing countries as against the 75grammes optimal daily requirement for normal growth and development (FAO, 2006). This could be attributed to numerous problems that poultry farmers in Nigeria are facing which include; low capital base, inefficient management, low technical efficiency, economic inefficiency, disease, parasite and poor housing. High cost of feed, poor quality of day old chick, inadequate extension agent and training facilities are also problems faced by poultry farmers. The poultry production capacities of farm has to increase rapidly to be able to meet up with the increasing protein demand, and for this to be achieved, there is a need to improve the present level of production (Prabakaran, 2003).

In most parts of Nigeria and the world over, the large scale poultry industry do better in terms of technical efficiency, economic efficiency and allocative efficiency. According to Ume, *et al.*, (2016), the large scale poultry industry makes more profit and has the least cost of production as compared to small and medium scale poultry industry. The large scale poultry firm also enjoys economies of scale which cuts down its cost of production and maximizes its profit. There is a great margin between the scale of production of large poultry industries and the other two scales of production. For instance, Yusuf and Malomo (2007) in their result show that a large farm has the lowest cost of production per bird. As the farm size increases, the total cost of production decreases which means that large farm size has the highest average gross margin. This is because most large scale poultry firms hatch the chicks instead of buying them, formulates feeds instead of purchasing them in bags and has good channels of marketing and an excellent source of obtaining other inputs such as water, veterinary services, electricity and fuel at the lowest cost per naira. Despite the fact that large scale egg production industry do best economically, there is however few large scale poultry farms in Nigeria to meet the protein demand by the country. There is a need therefore to compare the scales of production so that the majority of farmers who do not have the huge startup capital to start on a large scale will learn a more advanced method of production which will improve their efficiency in resource allocation, marketing and storage and thus increase egg production from the grass root. The major problem here is that egg production is in short supply in Nigeria as compared to other developed countries, a comparison of small, medium and the ultimate large scale poultry industry will make it easy for small and medium scale poultry egg farmers to enlarge their scale of production as information on marketing strategies will be available to them Esibiodu *et al* (2014).

## METHODOLOGY

### Study Area

The study was conducted in Jos metropolis of Plateau State. Jos metropolis is made up of Jos north and Jos south Local Government Areas of Plateau State. The study area is located between latitude $9^{o}$ 56 North and longitude $8^{0}$ 53 East and has an average monthly temperature ranging from 21 – 25 $^{0}$C and from mid-November to late January, night temperature drop as low as 11 $^{o}$C (52$^{o}$F). The annual rainfall

of Jos metropolis is about 1,400mm. Jos metropolis has a population figure of 876, 214 and projected to 1,179,700 people in 2015 (NPC, 2006). The ethnic composition includes the Birom, Afizeere, Naraguta, N'gas, Irigwe, Yoruba, Igbo and the Hausa. The major occupation of the inhabitant of Jos metropolis is mainly trading and farming. The major crops grown in Jos metropolis include Maize, Guinea corn, Irish potato, Cassava, Yams and Acha and vegetables such as Tomatoes (Amos, 2006).

**Sampling techniques and sample size**

A two-stage sampling technique was adopted. The first stage included a purposive selection Jos metropolis from the 17 local Governments in Plateau state. Jos metropolis is chosen based on preponderance of poultry farmers in the area as contained in the information from the Poultry Association of Nigeria (PAN), Plateau state chapter (2011). According to PAN, (2016), there are about seven hundred and fifteen registered poultry farmers in the metropolis of which there are 216 small scale farmers, 373 medium scale farmers and 126 large scale farmers as at the time this research was conducted. The second stage of the sampling procedure involves the random selection of twenty percent of farmers registered under small, medium and large scale production in the metropolis. This gave a sample size of 143 (one hundred and forty three) respondents.

**Method of data collection**

Primary data used for this study was generated by the use of structured questionnaire which were administered to poultry egg farmers. The questionnaire was designed to elicit information on the socio-economic characteristics of the respondents, constraints of egg production, and size of flock, age of respondents, access to credit, cost of inputs and revenue generated from output. One hundred and forty three questionnaires were distributed. However, one hundred and one questionnaires were retrieved. The reason for this is that some of the questionnaires were lost to crisis that erupted in the city.

**Method of data analysis**

The analytical tools used are; descriptive statistics, among the descriptive statistics used are frequency counts, percentages, and mean in achieving objective i and iv; Net Farm Income analysis, which is used to achieve objective ii, and stochastic frontier function, which is used to achieve objective iii.

**Model specification**

***Descriptive Statistics***

The descriptive statistics used include frequency, percentages and mean. These was used to achieve objective 1

***Budgetary technique***

The net farm income of poultry egg production in each of the three scales of production was analyzed using net farm income analysis, mathematically expressed as:

**Net farm income analysis**

Net farm income (NFI) determines the return to unpaid family labour, operator's land, labour, capital and management Olukosi and Erhabor (2008). It is represented in equation (1)

$$NFI = \sum P_y - \sum P_X - \sum P_K \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:

NFI = Net Farm Income (₦/hectare)

$\sum$ = Summation sign

$P$ = Unit price

$y$ = Output

$X$= Input (Variable)

$K$= Input (fixed)

According to Ronald *et al.* (2008), NFI should be considered more as a starting point for analyzing profitability than as a good measure of profitability itself. Because profitability is concerned with the size of the profit relative to the size of the business.

Size is measured by the value of the resources used to produce the profit. A business can show a profit but have a poor profitability rating if

this profit is small relative to the size of the farm business. Two farms with the same NFI, for example, are not equally profitable if one used twice as much land, labour and capital as the other to produce that profit. Therefore, profitability is a measure of the efficiency of the business in using its resources to produce profit or net farm income. So, in order to conclude whether the enterprise is profitable or not, there is need to compute the profitability index as follows;

Profitability Index (PI) – This is the Net Farm Income (NFI) per unit of Gross Revenue

(GR). That is; PI = $\frac{NFI}{GR}$ …….. (3)

Equation (3) shows the level of return per naira gross income. For a farm to be profitable, the PI should be greater than zero. If PI is negative, it implies that the farm is losing money

The following profitability measures were calculated:

i. Rate of Returns on Investment (%)

RRI = $\frac{NFI}{TC} \times 100\%$ …… (4)

Where: TC = total cost, hence (TVC + TFC)

Equation (4) shows the ratio of the accounting profit to the investment in the farm, expressed as a percentage. The RRI should be greater than the cost of capital for the investment to be worthwhile. The RRI should also be greater than or equal to the interest/hurdle rate on fixed deposit.

ii Capital Turnover (CTO): = $\frac{TR}{TC}$..... (5)

Where: TR= Total Revenue

CTO is defined as the total revenue divided by total cost of production. It describes roughly how much naira in revenue the farm can generate for each naira invested over a given period. That is, it is used to analyze the relationship between the money used to fund operations on the farm and the sales generated from the operations. This ratio should be greater than 1 for the investment to be profitable.

## RESULTS AND DISCUSSION

### Socioeconomic Characteristics of Respondents

#### *Age of respondents*

Table 1 revealed that the mean age of small and medium scale respondents in the study area was 27 years. Majority of the farmers in these categories are younger compared to the mean age (41 years) of the farmers in large scale farms. Under small scale poultry producers, nine percent (9%) were within the age range of 10 – 20years, seventy seven % (77%) were within the age range of 21- 30 years and fourteen % (14%) were within the age range of 31- 40 years. As compared to the medium scale farmers who had twenty eight % (28%) of the farmers in the range of 21- 30years, forty six % (46%) in the range of 31 – 40years, twenty one % (21%) in the range of 41 – 50 years and four % (4%) in the range of 51 – 60 years. However, only one % (9%) of large scale farmers was in the range 21- 30 years, thirty six % (36%) in the range of 31 – 40years, forty five % are of the range 41- 50 years and nine % (9%) were in the range of 51 – 60 years. The majority (77%) of small scale farmers are within the range 21 – 30, while the majority of medium scale farmers (45%) and large scale farmers (45%) are within the range of 31 – 40 and 41 – 50 respectively. This shows that adults in the range of 30 – 50 years are more involved in egg production business in the study area. Twenty three % (23%) of the small scale respondents were married while the remaining seventy seven % (77%) were single. However, majority (63%) of medium scale respondents and majority of large scale respondents (90%) were married while thirty seven % (37%) and ten % (10%) were single respectively.

#### *Household size of respondents*

The result in table 1 also shows that the mean household size of small scale respondents was 4years while the mean household size of

medium scale farm respondents was 6 years. The table shows that large farm respondents had the highest mean household size when compared to small and medium scale farm respondents. The table also shows that the respondents had different household sizes. It can be seen from the table that the ninety six % (96%) of small scale farmers had household size within the range 1 – 5 persons and four % (4%) had household size within the range of 11 – 15 persons. The table also shows that small scale farmers have smaller household size compared to medium scale farmers. Forty eight % (48%) of medium scale farmers had household size within the range of 1 – 5, fifty % (50%) had household size within the range of 6 – 10 and only two % (2%) had household within the range of 11–15. Similar to medium scale farmers is the large scale farms in which majority (55%) of its respondents had household size within the range of 6 – 10 persons. This shows that the larger the scale of production, the more the number of people dependent on it. This result is in agreement with the findings of Haruna *et al*. (2007), which recorded that 40% of the poultry egg farmers had household size of less than 5 persons while 60% had household size of more than 5 persons. This implies that household size is important in egg production, as members will help in supplementing hired labor on the farm.

***Level of education of respondents***

Table 1 revealed that majority (95%) of small and 94% of medium scale farmers had received formal education. This is also true about the large scale poultry egg farmers in which seventy eight percent (100%) had received formal education. This is in agreement Bingin, (2007), which mentioned that most of the poultry egg farmers in Jos metropolis had formal education to tertiary level. This enhances their ability to adopt new technology which could translate to increased poultry egg production (Haruna *et al*., 2002).

***Years of farming experience of the respondents***

The productivity of respondents is expected to be improved considering their years of experience. Table 1 shows that the mean years of farming experience of respondents in medium and large scale farms was 6 years while the mean years of farming experience of respondents in small scale farms was 4 years. This implies that an average farmer who has either medium or large scale farm was two years more experience in the business than average farmers who has small scale farms in the study area. This shows that large and medium scale poultry farmers are more experienced as compared to small scale poultry egg farmers in the study area. The table shows that most poultry farmers in Jos metropolis had less than 10 years of farming experience. It also indicates that 82% of small scale respondent has 1 – 5 years of experience and 18% had 6 – 10 years of farming experience. However, majority (57%) of medium scale farmers had farming experience within the range of 6 -10 years. This shows that those who engage in large scale poultry egg production had more experience which is necessary for efficiency make more profit than those who are engaged in medium and small scale farms. The result also shows that medium scale poultry farmers are more experienced as compared to small scale farmers in the study area. This is in line with the work of Ashagidigbi *et al*. (2011), which states that farming experience reduces losses is farm business and also enhances efficient allocation and utilization of resources which increases productivity.

**Table 1: Socioeconomic characteristics of respondents**

| | Small scale | | medium scale | | large scale | |
|---|---|---|---|---|---|---|
| | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Age** | | | | | | |
| 10 – 2 | 2 | 9 | - | - | - | - |
| 21 – 30 | 17 | 77.27 | 19 | 27.94 | 1 | 9 |
| 31 – 40 | 3 | 13.63 | 31 | 45.58 | 4 | 36 |
| 41 – 50 | - | - | 14 | 21.58 | 5 | 45 |
| 51 – 60 | - | - | 4 | 5.88 | 1 | 9 |
| Total | 22 | 100 | 68 | 100 | 11 | 100 |
| Mean | | 27.45 | | 27.48 | | 41.18 |
| **Marital status** | | | | | | |
| Married | 5 | 22.73 | 43 | 63.23 | 10 | 90.90 |
| Single | 17 | 77.27 | 25 | 36.76 | 1 | 9.09 |
| Total | 22 | 100 | 68 | 100 | 1 | 100 |
| **Gender** | | | | | | |
| Male | 10 | 45 | 21 | 30.88 | 4 | 36.36 |
| Female | 12 | 55 | 47 | 69.11 | 7 | 63.63 |
| Total | 22 | 100 | 68 | 100 | 11 | 100 |
| **Household size** | | | | | | |
| 1 - 5 | 21 | 95.45 | 33 | 48.52 | 4 | 36.36 |
| 6- 10 | - | - | 34 | 50.00 | 6 | 54.54 |
| 11 -15 | 1 | 4.54 | 2 | 2.94 | 0 | 0 |
| 16 – 20 | - | - | - | - | 1 | 9.09 |
| Total | 22 | 100 | 68 | 100 | 11 | 100 |
| Mean | | 4 | | 6 | | 7 |
| **Level of Education** | | | | | | |
| Non-formal | 1 | 4.54 | 3 | 4.41 | - | - |
| Primary education | 1 | 4.54 | 9 | 13.23 | - | - |
| Secondary education | 3 | 13.63 | 2 | 2.29 | - | - |
| Tertiary education | 17 | 86.36 | 53 | 77.94 | 11 | 100 |
| Total | 22 | 100 | 68 | 100 | 11 | 100 |
| Mean | 15 | | 15 | | 17 | |
| **Farming experience** | | | | | | |
| 1 – 5 | 18 | 81.18 | 29 | 42.64 | 2 | 18.18 |
| 6 – 10 | 4 | 18.18 | 39 | 57.35 | 9 | 81.18 |
| Total | 22 | 100 | 68 | 10 | 11 | 100 |
| Mean | | 4 | | 6 | | 6 |

Source: Field survey, 2016.

***Gender of respondents***

The result in table 1 further indicates that forty five % (45%) of the respondents in small scale poultry farming were male while the majority (55%) was female. Also, the majority (69%) of medium scale farmers were female while the remaining 35% were male. The case is the same in large scale poultry respondents as the majority (63%) were female while thirty six percent (36%) were male. The result shows that 65% of the respondents were female while the remaining 35% were male. This is in agreement with the findings of Haruna *et al*.(2007), which estimated that majority of poultry farmers in Jos metropolis are female. The result shows that small scale farm respondents had 15% more male as compared to the 30% male in medium scale farm respondents. However, medium scale category had more female respondents. This is followed by large scale farms and then small scale farm category which had the least percentage of females when compared to the percentage of females in the other two scales of production in the study area.

**Profitability in layer Poultry Production**

The result in table 2 shows the net farm income per bird for the three categories of farm. The result indicate that the total cost incurred on a bird is about ₦5,787, ₦6,003and ₦5,336 in small, medium and large scale farms, respectively. The cost include variable costs per bird such as cost of stock, the cost of feed, the cost of medication, cost of water, cost of electricity, cost of kerosene, cost of litter materials, cost of crates and cost of transportation. The result revealed that the major cost in the production in all three scales of production was cost of feed which accounted for 89%, 91% and 93% of the total variable cast in small, medium and large scale farms respectively. Table 7 also indicates that the total revenue generated per bird in small scale farms is ₦6,916 while ₦7,877 and ₦9,772 in medium and large scale farm respectively.

Finally, the budgetary analysis per bird indicated that small scale poultry farm has a profit of ₦1,129 while medium and large scale farm have a profit of ₦1,874 and ₦4,436 respectively. This is supported by Yusuf and Malomo, (2007), Umar,(2012) and Busari and Okanlawon,(2015) who pointed out that the profits depend on the scale of production. This reduction in cost of drug, feed and utilities (such as water, electricity etc.) reflect the fact that large scale farms have better management measures towards diseases and benefit more from economies of scale. The huge profit made per bird in the large scale farm category is probably due to the benefit of economies of scale and the ban imposed on the importation of poultry products. From the table 2, the large scale farms made a profit of ₦2,562 (per bird) more than medium scale farms which made about ₦745 (per bird) more than small scale farms.

The Rate of Return to Investment (RRI) per bird from small farm size, medium farm size and large farm size were found to be 19.51%, 31.21% and 83.13% respectively. The Capital Turnover (CTO) per bird was ₦1.20 for the small farm size, ₦1.31 for the medium and ₦1.83 large farm size respectively. The capital turnover values imply that for every one naira invested in small scale poultry-egg production, ₦1.20 was returned to the farm size. For every one naira spent on medium scale poultry-egg production, ₦1.31 was generated as revenue. Also, ₦1.83 was obtained as revenue for every one naira invested in large scale poultry-egg production in the study area.

Also, the profitability indices for the small farm size, medium size and large farm size were ₦0.16, ₦0.24 and ₦0.45 respectively. This imply that for every one naira earned as revenue from each of the different categories of farms, 16 kobo, 24 kobo and 45kobo returned to the three categories of farmers as net income respectively. The profit made by the different farms may be as a result of many factors, such as cost of bird, and volume of sales among others. All these depend of farm size. The higher PI, RRI and CTO of N0.45, ₦83.13 and

1.83 respectively obtained by the large scale poultry-egg farms in the study area are indications of efficiency. Also, bulk purchases of inputs and large operation may lead to a reduction in their cost and allow them to enjoy economies of scale. The profit of the small scale poultry-egg farmers was lower compared to the medium and large scale in the study area.

With these values of capital turnover and profitability index, improvement in poultry egg production is likely to increase the returns of poultry egg farmers in the study area.

The higher RRI, CTO and PI in the study area revealed that poultry-egg production in general, was profitable and the large farm size had the highest profit, followed by medium farm size and then small farm size. This finding is at variance with the findings of Umar (2012) who recorded higher results in RRI, CTO and PI respectively in his work titled economic analysis of poultry-egg production in Bauchi LGA., Bauchi state, Nigeria.

**Test of Differences in Income between the Different Farm Sizes**

Analysis of variance (ANOVA) and Double Difference Estimator tests were carried out to establish whether significant difference exists among the three categories of farms in terms of income as proxy for profit. The result presented in table 4 showed the average income/Bird of the small, medium and large scale poultry farm in the study area. The F-value (93.07) revealed that there were significant differences among the income obtained by the three sizes of the poultry farms under consideration. The result of coefficient of variation as presented in table 3 indicated that there is more variability in the incomes of the small and medium scale farmers than with the large scale farmers. The result of Double difference Estimator (DDE) on table 5 shows that there is significant difference in the small, medium and large scale layer-egg production (6.00, 13.61 and 10.93).

**Problems Encountered by Poultry Layer Farmers in the Study Area**

Table 3 shows the problems encountered by poultry egg farmers in the study area. Theft was one of the problems faced by the respondents under the three scales of production. Four percent of small scale farmers identified theft as a constraint in the production process. Also, 4% and 3% of medium and large scale poultry egg farmers were faced by the constraint respectively. The figures from the table imply that theft is not a major threat to poultry egg production in the study area.

Another constraint faced by 1% of small scale respondents, 2% of medium scale respondents and 3% of large scale farm respondents in the study area was poor transportation. The result also implied that poor transportation was not a major constraint limiting egg production in small, medium and large scale poultry egg production in the study area.

However, a major problem faced by small scale poultry egg production farms in the study area was high cost of feed. High cost of feed was mentioned by 78% of the respondents under the small scale farm category as constraint limiting egg production in the study area. The constraint was however, was mentioned by few (21%) large scale farms. The result implied that majority of small scale farms and 30% of medium scale farms were limited by high cost of feed. The could be due to the fact that most farms in these categories purchase commercial feeds unlike the large scale farms which formulate poultry feed to reduce cost and also produce feeds in large quantity which makes them enjoy the benefits of economies of scale. This practice reduces the effect of high cost of feed on large scale poultry egg production.

Poor storage facility was another constraint faced by 1% and 2% of small and medium scale poultry egg farms respectively. However, this was not a major problem in large scale farms as most large scale poultry producing farms had a developed storage facility.

A major constraint faced by livestock farmers in Nigeria is outbreak of disease or disease infestation. In Jos metropolis, the result in table 3 indicated that almost all the respondents (99) of small scale farms faced disease infestation as a constraint. Also, majority (86%) of medium scale farm respondents identified disease as a major problem in the production process. However, under the large scale poultry farm respondents, disease infestation was identified by only 34% of the respondents as a major constraint. This implied that small and medium scale farms lack the basic management skills to combat disease infestation as compared to large scale poultry farms which were able to reduce losses due disease infestation.

Procurement of day-old chick was a problem in small scale poultry egg farms in the study area. Thirty five percent of the small scale poultry farms identified procurement of day old chick as a constraint to egg production. Likewise, 18% of medium scale farmer identified procurement of day-old chicks as a problem faced in egg production. Large scale farms on the other hand had little problem with procurement of day old chick. Most large scale farms seen in the study area had hatchery which makes day-old chicks available to the farm. This was an advantage as compared to most small and medium scale poultry farms that purchase day-old chicks. The major problem here is that the chicks may be supplied late to these farms (that is, small and medium scale farms). Also, some small and medium scale poultry egg production farms have to pay in advance to get the chicks supplied to them. Therefore, the farmers in these categories go through a lot of stress and end up paying more than the current price to procure day old chicks due to difference in time value of money.

The start- up capital is usually a challenge to new or small scale enterprises. One of the major problems identified by small and medium scale poultry egg farmers is financial problems. Majority, 95% and 64% of small and medium scale poultry egg farm respondents (respectively) pin point financial constraints as the major bottle- neck to the success of the firm. The result however, revealed that only 3% of large scale farms respondents identified finance as a problem in poultry egg production.

Finally, the three scales of poultry egg production were faced by poor marketing of eggs in the study area. The constraint was identified by 51% of small scale farm respondents, 23% of medium scale farmers and 17% of large scale farmers. The result shows that majority small scale farms had poor marketing channels for the sale of poultry eggs and poultry products while medium and large scale had a better market in the study area.

**Table 2: Profitability per bird of small, medium and large scale layer farms of respondents**

| Inputs | Small | % | Medium | % | Large | % |
|---|---|---|---|---|---|---|
| A. Variable Inputs | | | | | | |
| i. Cost of stock/bird | 208 | 3.62 | 196 | | 192 | 3.63 |
| ii Cost of feed/bird | 5167 | | 3.29 | | 4933 | 93.38 |
| iii. Cost of medication/bird | 89.97 | | 5444 | | 32 | 0.605 |
| iv. Cost of labor/bird | 49 | 0.85 | 91.56 | | 9 | 0.170 |
| v. Water | 28 | 0.48 | 43 | | 8 | 0.151 |
| vi. Electricity | 16 | 0.27 | 0.723 | | 13 | 0.246 |
| vii. Kerosene | 19 | 0.33 | 9 | | 0.1 | 0.002 |
| viii. Litter materials | 6 | 0.10 | 0.151 | | 0.3 | 0.006 |
| ix. Disinfectant | 2 | | 12 | | 0.02 | 0.004 |
| x. petrol/diesel | 0.034 | | 0.201 | | 0.9 | 0.017 |

| | | | | |
|---|---|---|---|---|
| xi. crates | 3 | 16 | 0.1 | 0.002 |
| xii. Transportation | 0.052 | 0.269 | 0.8 | 0.015 |
| xiii. Mortality cost | 5 | 5 | 93 | 1.760 |
| TVC/bird (₦) | 0.087 | 0.084 | 5,282.22 | |
| | 4 | 0.8 | | |
| | 0.069 | 0.013 | | |
| | 6 | 0.9 | | |
| | 0.104 | 0.015 | | |
| | 230 | 4 | | |
| | 4.00 | 0.067 | | |
| | 5,743 | 2 | | |
| | | 0.034 | | |
| | | 0.7 | | |
| | | 0.012 | | |
| | | 212 | | |
| | | 3.56 | | |
| | | 5,945.40 | | |
| B. Fixed Cost/bird(₦) | | | | |
| i. Feeder and drinkers | 16 | 17 | 16 | 29.62 |
| ii. Nest cost | 36.36 | 29.31 | 22 | 40.74 |
| iii. Housing cost | 12 | 24 | 16 | 29.62 |
| TFC/Bird | 27.27 | 41.37 | 54 | |
| | 16 | 17 | | |
| | 36.36 | 29.31 | | |
| | 44 | 58 | | |
| **C. Total cost (₦)** | **5,787** | **6,003.4** | **5,336.22** | |
| **D. Revenue(₦)** | | | | |
| i. Spent later/bird | **2916.11** | **2823.57** | **3628.71** | **37.0** |
| ii. Eggs/Crate | **42.16** | **35.84** | 1948.74 | 19.9 |
| iii. Poultry dropping/bag | 2307 | 2642.01 | 4145 | 42.4 |
| iv. Price of empty bag | 33.35 | 33.53 | 50 | 0.51 |
| **TR** | 1640 | 2352 | **9,772.45** | |
| **NFI** | 23.70 | 29.85 | **4,436.23** | |
| **PI** | 53 | 60 | **0.45** | |
| **RRI** | 0.766 | 0.761 | **83.13** | |
| **CTO** | **6,916.11** | **7,877.58** | **1.83** | |
| | **1,129.11** | **1,874.18** | | |
| | **0.16** | **0.24** | | |
| | **19.51** | **31.21** | | |
| | **1.20** | **1.31** | | |

Source: Field survey, 2016.

**Presentations of Tables for C.V, DDE and ANOVA analysis**

**Table 3: Level of income among the scale of farmers**

| Level of income | Mean | Standard deviation | CV | Frequency |
|---|---|---|---|---|
| Small scale | 1745343 | 1611709.4 | 92 | 22 |
| Medium scale | 12556206 | 8629149.5 | 69 | 68 |
| Large scale | 38641251 | 4880970.4 | 13 | 11 |

Note: CV=Coefficient of variation

**Table 4: Analysis of variance among level of income**

| Source | SS | Df | MS | F-value | Prob>F |
|---|---|---|---|---|---|
| Between groups | 1.00E+16 | 2 | 5.02E+15 | 93.07*** | 0.000 |
| Within groups | 5.28E+15 | 98 | 5.39E+13 | | |
| **Total** | 1.53E+16 | 100 | 1.53E+14 | | |

Note: SS=Sum of square, df= degrees of freedom and MS= Means square.

**Table 5: Post hoc test**

| Total annual by scale | Contrast | Standard error | t-value |
|---|---|---|---|
| Medium scale vs Small scale | 1.08E+07 | 1800660 | 6.00 |
| Large scale vs Small scale | 3.69E+07 | 2710975 | 13.61 |
| Large scale vs Medium scale | 2.61E+07 | 2385827 | 10.93 |

**Table 6: Problems encountered by poultry layer farmers**

| | Small scale | | medium scale | | large scale | |
|---|---|---|---|---|---|---|
| **Problems** | **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| Theft | 2 | 3.5 | 8 | 4.3 | 1 | 3.4 |
| Poor transportation | 1 | 1.7 | 4 | 2.2 | 1 | 3.4 |
| High cost of feed | 16 | 79.0 | 69 | 30.4 | 39 | 21.0 |
| Poor storage facilities | 1 | 1.7 | 3 | 1.6 | 0 | 0 |
| Disease infestation | 21 | 98.8 | 66 | 85.8 | 10 | 34.4 |
| Day old chick procurement | 3 | 35.3 | 16 | 18.6 | 2 | 2.8 |
| Financial constraints | 1 | 95.7 | 8 | 64.3 | 1 | 3.4 |
| Marketing constraints | 12 | 51.0 | 23 | 22.5 | 5 | 17.2 |

Source: Field survey, 2016. * Multiple responses allowed

## SUMMARY AND CONCLUSION

The result of data analysis shows that poultry egg production is profitable in the study area, but the level of profit depends on the scale of production. Large scale poultry egg producers were observed to have higher profit than the small and medium scale farmers. The study also revealed that the amount spent on drug, utilities and cost of feed was a significant determinant of net farm income accruable to poultry egg farmers in the study area. The study

recommends that farmers should increase their scale of operation by increasing the number of birds, reducing the labour inputs and increasing management practices which will distribute the over utilized resources. This is in particular to the small scale farmers, the government, through research institute and National Agricultural Extension and Liaison Service (NAERLS) should make drugs and vaccines available to the farmers at the right time and subsidized price to reduce losses due to diseases, the Ministry of Agriculture through the state and Local Government should implement policies geared towards how small scale poultry egg farmers will transform their scale of operation in order to enjoy the benefits of economies of scale and thereby derive maximum profit from poultry egg farming while meeting the increasing demand for poultry by introducing subsidy schemes that will encourage our teeming unemployed youths to take to poultry production as a means of livelihood, students and researchers in research institutions should be encouraged to embark on researches aimed at developing cheap and more efficient poultry feed. This will reduce the high cost of egg production due to high cost of feed; private investors should be encouraged alongside extension services to keep the poultry egg farmers abreast of the modern/improved technology in the study area.

Finally, deliberate efforts should directed at recruiting veterinary doctors as part of the extension team that will offer advisory services to these farmers at no cost.

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