Eastern and Southern Africa Journal of agricultural Economics & Development
Vol. 12 No. 2 (2022)

Profitability Analysis of Layer Chicken Production in Dar es Salaam, Tanzania

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Abstract

This study employed Gross Margin (GM) analysis to assess profitability of layer production and the Ordinary Least Square (OLS) linear regression to determine factors that influence layer production GM in Dar es Salaam, Tanzania. Cross-sectional data form 127 layer producers were collected and analyzed. The study findings revealed that layer keeping in Dar es Salaam was profitable earning an average GM of 3483 TShs. per tray of 30 eggs. The main components of the production costs were feeds (54.1%), housing (16.6%), day-old chick (9.4%), and Labor costs (7.2%). Furthermore, age, experience, flock size, and access to market information have a significant influence on profit. With these findings, the study recommends subsidization of animal feeds or stimulation of innovation in the feeding industry to decrease the cost burden and increase profitability. Layer keepers are encouraged to form strategic associations for easy access to credit acquisition as well as collective purchase of inputs and marketing of outputs.

Keywords: Profitability, Gross Margin Analysis, Layers Egg Production, Tanzania

1 Introduction

Livestock production remains one of the world's most important sectors concerning the economy, food security, and the livelihoods of people. It accounts for 40% of global agricultural production and provides livelihood and income for at least 1.3 billion people (ILRI, 2022). Poultry is the fastest-growing livestock subsector and crucial for food safety and nutrition, particularly in low-income countries like Tanzania (Dessie, 2015). Such growth has been substantially influenced by urbanization, rising population, and rising purchasing power.

In Tanzania, the poultry industry consists of approximately 72 million chickens, of which 32 million are exotic (with 24 million broilers and 8 million layers), and 40 million indigenous chickens

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(Ringo, 2018). The extensive scavenging system that is practiced by indigenous chicken has been predominant and it accounts for over 46% of the current poultry population being characterized by low levels of eggs (70 eggs per year) and meat production. The remaining (intensive production) system that is practiced by dual-purpose and exotic chicken producers accounts for the rest (54%) of the flock and is characterized by high-yielding exotic breeds (broilers and layers) for both meat and eggs (Da Si*lva e*t al., 2017; MLF, 2017). Exotic layers produce over 250 eggs per year. The last decade has experienced emergence of small-scale exotic chicken keepers because of their superior traits such as high feed conversion rate[2] (FCR), disease resistance, and high yielding (FAO, 2019).

Processing and value addition of chicken products are still at the infant stage in Tanzania. According to Ringo and Mwenda (2018), consumers in many parts of Tanzania buy live chicken straight from the producers and slaughter them at home. On the other hand, there is no known commercial company in Tanzania processing eggs into liquid or powder eggs (Ibid). Furthermore, the marketing of poultry and poultry products is mainly conducted domestically. The domestic market is mostly in the urban areas and it mainly involves buying, selling, and re-selling chicks, live chicken, meat, eggs, and processed products like sausages (Ringo and Lekule, 2020).

The current demand for chicken eggs is estimated to be 6.36 billion eggs per year in Tanzania, which is higher than the reported local supply of 4.05 billion eggs per year (Ringo and Lekule, 2020). In a situation where there is a surge in demand for a particular product, a rational producer would be inclined to increase production and hence supply of the product in demand. Any behaviour to the contrary may attract empirical question such as the one posed by this study; is chicken keeping in Tanzania profitable?

Profit is one of the factors for attracting investment in medium sized enterprises in the poultry subsector. Consolidated investment in poultry contributes to employment and welfare improvement. Therefore, exploring whether profit affects the gap between supply and demand for chicken eggs is imperative. Profitability analysis in this study offer a close empirical scrutiny of

[2] [1] In animal husbandry, Feed Conversion Ratio (FCR) or feed conversion rate is a ratio or rate measuring of the efficiency with which the bodies of livestock convert animal feed into the desired output.

producers' profit from different perspectives by identifying the variables with greatest impact.

Majority of studies example Oleke and Isinika (2011) on the production of poultry (mostly broilers) focused on the technical and management characteristics of the chickens in an attempt to determine the main constraints in poultry production. However, there is very little information regarding the factors affecting the profitability of layer production. This knowledge gap served as the inspiration for the current study. This study has therefore attempted to fill this gap by establishing, analyzing, and calculating the profitability of layer keeping in Dar es Salaam city and determine the relationship between socio-economic and institutional factors and the profitability of layer keeping. This information will be handy to both layer-keepers (in making decisions) and policymakers (in policy formulation to address and improve the situation in the study area).

The reminder of the paper proceeds as follow: The introduction of the paper is followed by methodology presenting the theoretical framework, study design data collection and analytical framework. The methodology is followed by results and discussion of section after which the

2 Methodology

2.1 Theoretical Framework

This study is guided by the theory of the firm, especially the theory of profit maximization. In this theory the firm's objective is assumed to be either maximizing profits or minimizing costs subject to resource constraints. Profit is considered as the difference between revenues and the costs incurred in producing goods or services (Debertin, 2012). Farmers' decision on whether to produce or not is influenced by numerous factors. Across different times production economists and other scholars have identified three notions underlying farmers' production decisions namely attitude toward risk, the utility derived from production, and profit (Omondi, 2019). From this theoretical understanding, the current study is based on the profit of the firm as notion underlying farmers' production decision. In the agricultural business, profits are affected not only by economic factors but also by the farmers' characteristics (Samboko, 2011). This compels the need for assessing farmers' characteristics in the profitability.

2.2 Study Area

The study was carried out in Dar es Salaam City located at **6°48' S, 39°17' E** in the eastern part of Tanzania bordered by Coast Region and the Indian Ocean (Fig. 1). According to the National Bureau of Statistics (NBS) (2021), the study area has a population of over six million people and it is the largest city in Tanzania and the business capital. Dar es Salaam was deemed suitable for this study due to its large and growing population that offers not only a market for eggs but it is also among the predominant regions in which commercial layer keeping is common.

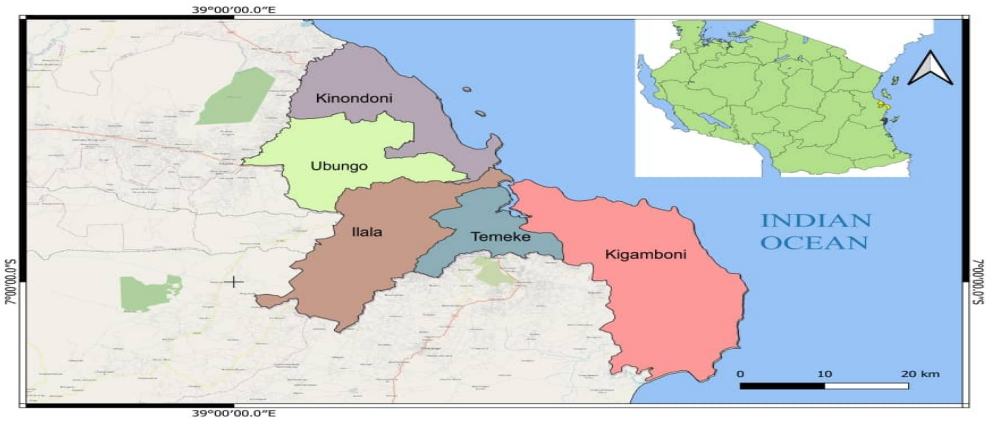

Figure 1: Map of Dar es Salaam Tanzania showing five districts.

2.3 Sampling and Data Collection

Since the targeted population is finite and the total number of layer keepers in the study area was known (N = 189), the sample size was established using the conventional method suggested by Krejcie and Morgan (1970) as follow:

$$n = \frac{x^2 * N * p * q}{d^2 * (N-1) + x^2 * p * q} \quad \text{.....} \quad (1)$$

Where n = sample size, χ^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (95% confidence level, χ^2 = 3.8416≈ 3.84), N = total number of layer keepers, p = population proportion considered to be 0.5 to provide maximum sample size, q = (1-p) = 0.5 and, d = degree of accuracy expressed as a proportion (d = 0.05). By applying the formula above, the sample size for the study was 127 layer keepers.

The study area is constituted of 5 districts as shown in Fig. 1. The lists of all layer keepers in the districts were obtained from their respective district livestock officers. The population of layer keepers in the respective district was then divided by the overall population of layer keepers in the whole region to determine the weight/proportionate sample to be drawn from each district. Thus, the number of layer keepers for the survey for each district (weighted district sample size) was obtained by multiplying the weight by the total sample size (127). After arranging all layer keepers in alphabetical order in each district, simple random sampling was applied to constitute the sample as seen in Table 1.

Table 1 : Sampling Procedure

District	**Total Population of layer keepers**	**Weight**	**Sampled Layer Keepers in District (Weighted)**	**Percent (%)**
Ilala	67	0.3541	45	35.40
Kinondoni	54	0.2834	36	28.30
Ubungo	28	0.1496	19	15.00
Kigamboni	21	0.1102	14	11.10
Temeke	19	0.1023	13	10.20
Total	**189**	**1.000**	**127**	**100.00**

Source: Field Survey 2022

A cross-sectional design was used to collect data in respective districts of the study area between June and August, 2022. The structured questionnaire was pretested and used to obtain information on socioeconomic characteristics of layer keepers in the study area. The information collected from the respondents (i.e. flock size, and input and output prices) was based on the situation at the time of the survey. Checklist for key informant interview was also administered to the respective ward livestock officers to validate the general information given by the local layer keepers in their respective areas.

2.4 Data Analysis

The Gross Margin analysis was used to determine the profitability of the layers production in the study area. The Ordinary Least Square regression was used to determine factors influencing the profitability estimated. Microsoft Excel and SPSS

were used to analyze the data. The GM was calculated using Microsoft Excel, with variables of the cost structure such as feed costs, stocking costs, drug costs, electricity and water costs, labor cost (hired labor and imputed cost of family labor). The SPSS was used to determine descriptive statistics and analyze data on the influence of socio-economic and institutional factors on the layer keepers' profit.

2.4.1 Gross Margin analysis

Profitability results sheds light on the magnitude of returns when revenues are compared with variable costs. To this effect, Gross Margin (GM) analysis was employed as specified below:

$$GM_i = \sum_{i=1}^{n} (TR - TVC) = \sum P_y Y - \sum P_{xi} X_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where GM-Gross Margin, TR-Total Revenue of selling eggs, TVC-Total Variable Costs of producing eggs, Y-Eggs (in trays), P_y- Price of a tray of eggs, X_i- input, and P_{xi}- Cost of input.

2.4.2 Regression analysis

Gross Margin analysis was further followed by an Ordinary Least Square (OLS) estimation to identify factors influencing layer producers' Gross Margin. As indicated in equation 3, ***Y*** represents farmer's Gross Margin (which was used as a proxy for profit) and ***X*** denoted a set of explanatory variables (institutional and socio-economic characteristics of households).

The model was expressed as follow:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \varepsilon$$

…… (3)

Other variables in equation 3 include β_0 which is the intercept of the regression model; $\alpha_1 - \alpha_4$ *and* $\beta_1 - \beta_5$ are the parameters to be estimated and ε is an error term.

(X_1-Age, X_2-Household size, X_3-Experience, X_4-Flocksize, X_5-Education level, D_1-Sex (Dummy;1 Male, 0 Otherwise), D_2-Credit access (Dummy;1 Yes, 0 No), D_3- Extension services access (Dummy;1 Yes, 0 No) and D_4- Access to Market price information (Dummy;1 Yes, 0 No)

2.4.2.1 Hypotheses formulation

Related to profitability and given the theoretical foundation of this study, the following hypotheses were tested: **H_1:** Layer keeping in the study area is not profitable.

Related to impact on profitability by socio-economic factors and institutional attributes, the overall hypothesis is: **H_2:** Socio-economic factors and institutional attributes have no significant influence on the profit of layer keepers in the study area.

Several regression diagnostics were conducted to ensure that the regression model was correctly specified under the assumptions of Ordinary Least Squares (OLS). The dataset was checked for heteroskedasticity which is commonly a problem in cross-sectional data. Initial estimates of the Breusch-Pagan/Cook-Weisberg test suggested the presence of heteroskedasticity; the data was thus corrected using White's heteroskedasticity corrected standard errors for OLS estimators to avoid drawing erroneous conclusions (Wooldridge, 2012). The model was also checked for multi-collinearity using the Variance Inflation Factor (VIF), whereby results show low multicollinearity in the model. Lastly, the model was checked for normality by plotting the residuals in the histogram and the plot showed the normal distribution of the residuals.

3 Results and Discussion

3.1 Socio-economic Characteristics of Sampled Layer Keepers

Descriptive statistics were employed to analyze the socio-economic characteristics of respondents in the study area. The results in Table 2 show that layer keeping in Dar es Salaam city is dominated by females (60.9%). This is in line with other studies in Africa, where poultry keeping is regarded as a women's business. For example Omondi (2019) found that the female population was more involved in poultry keeping compared to male. The age groups of the layers keepers in the study area were mostly between 36 to 50 years representing about 44.1% with a mean age of 48 years, which implies that most of the respondents were in the active labor force. In this study, it was found that 13.4% of the respondent didn't attend any formal education whereas 23.6% had attained primary education, about 33.1% had secondary education and the remaining 29.9% had attained tertiary education. Education is one of the most important socioeconomic factors to pay attention to since it is directly linked with farmers'

ability to make an informed decision which is expected to lead to higher productivity and profitability all else being equal.

The mean family size was about 6 people which is relatively high. In line with Itam (2014), a relatively large household size enhances the availability of family labor which reduces constraints of labor costs in agricultural production. About 47.2% of the respondents are involved in other business apart from egg production as their main occupation. About 23.6% of respondents are civil servants and the remaining 29.1% only keep layers as their main economic activity.

Results show that 34.6% of the respondents had 1-10 years of experience in chicken-keeping while 65.4% had 11 years and above on the same. Experience is an important variable in chicken keeping as it impact many aspects of chicken production such as disease control, good chicken husbandry, and overall productivity. The average flock size in the study area was 354 layers. The maximum was 1992 layers and the minimum was 100 layers. The study area is dominated by smallholder layer keepers with less than 400 layers (78.8%) as indicated in Table 2.

The study further revealed that 77% of the layer keepers were using hired labor as compared to 23% using family labor. However, in farm households, family labor is too important to ignore, hence, the imputed family labor cost (was calculated and included in the analysis). Moreover, about 58%, 39% and 34% of the sampled layer keepers in the study area had access to financial services, extension services and market information respectively. Financial services included access to short-term concessional loans[3] which were made available by their respective municipal council through a small business loan scheme. Extension services included farm assessments, physical exams, vaccine administration, on-site fecal exams and warnings on the possible disease outbreaks i.e. avian flu.

Market information accessible in the study area including information on prices and market trends which were mainly available through egg-collectors and layer keepers, particularly for the 46% that had a membership to poultry association.

[3] A concessional loan is a loan made on more favorable terms than the borrower could obtain in the marketplace. The concessional terms may be one or more of the following: a lower interest rate below the most common, deferred repayments and Income-contingent repayments.

Table 2: Socio-economic characteristics of sampled layer keepers

Variable	Frequency	Percentage
Sex		
Male	50	39.40
Female	77	60.60
Total	**127**	**100.00**
Age		
18-35	16	12.60
36-50	56	44.10
51 and Above	55	43.30
Total	**127**	**100.00**
Mean (S.D)	**48.97 (11.139)**	
Educational Status		
Not Attended	17	13.40
Primary Education	30	23.60
Secondary Education	42	33.10
Tertiary Education	38	29.90
Total	**127**	**100.00**
Mean (S.D)	**7.82 (4.752)**	
Household Size		
1-4	31	24.40
5 and Above	96	75.60
Total	**127**	**100.00**
Mean (S.D)	**5.53 (1.408)**	
Experience in Layers Keeping		
0-3 Years	10	7.87
4-6 Years	19	14.96
7-10 Years	15	11.81
11 and Above	83	65.40
Total	**127**	**100.00**
Mean (S.D)	**15.38 (9.481)**	
Flock size per Household		
Less than 199	27	21.3
200-399	73	57.5
400-599	15	11.8
600-799	4	3.1
800-999	3	2.4
1000 and Above	5	3.9
Total	**127**	**100.00**
Mean (S.D)	**354.23 (258.705)**	
Main Occupation		
Business/Self-Employed	60	47.20
Civil Servant	30	23.60
Layers Keeping	37	29.10
Total	**127**	**100.00**
Source of Labor		
Family labor	29	22.84
Hired labor	98	77.16
Total	**127**	**100.00**
Access to Financial/Credit services		
Yes	74	58.30
No	53	41.70

Total	**127**	**100.00**
Access to Extension/Veterinary services		
Yes	50	39.40
No	77	60.60
Total	**127**	**100.00**
Access to Market Information		
Yes	44	34.6
No	83	65.4
Total	**127**	**100.00**
Membership in Poultry Association		
Yes	46	36.2
No	81	63.8
Total	**127**	**100.00**
Feed Acquisition		
Buying packed feeds	61	48.03
Mixing Feed Components	66	51.97
Total	**127**	**100.00**
Animal Housing System		
Deep litter	106	83.46
Battery cages	21	16.64
Total	**127**	**100.00**
Location of Farm		
Urban	69	54.30
Peri-Urban	58	45.70
Total	**127**	**100.00**

3.2 Results from Gross Margin Analysis

Gross Margin analysis was employed in calculating the profitability of layer keepers in the study area. According to Odemenem and Otanwa (2011), gross margin analysis is preferred because it allows for easy enterprise selection and establishment of net farm income and is useful in subsistence enterprises with small fixed incomes. The GM analysis has been used in a number of studies such as Adeoti and Soyele (2019); E*gbe e*t al. (2020); Olad*ipo e*t al. (2020); Olorunwa (2018); Sulei*man et* al.(2017) to assess the profitability of poultry production.

Table 3: Average costs, Returns and Gross Margin per layer keeper in the study area

Cost items (TShs)	**Amount (TShs)**	**Percentage (TVC)**

Variable Costs:		
Chicks (D.O.C)	1,110,618	12.42
Feeds	6,384,291	71.40
Transportation	155,670	1.74
Electricity/Charcoal (Brooding) and Water	233,890	2.62
Medication (Drugs and Vaccines)	205,229	2.30
Labour (family and hired)	851,488	9.52
Total variable costs	**8,941,186**	**100.00**
Revenues:		
Egg Tray selling price (P)(TShs)	7,429	
Quantity of Trays sold (Q)	2,266	
Total Revenue (PXQ)	**16,834,114**	
Gross Margin:		
Gross Margin (TR-TVC)	**7,892,928**	
Gross Margin per Tray Sold (TShs)	**3,483**	

Table 4 represents an independent T-test statistic; the computed t value 29.485 is bigger than the tabulated t value at 5% probability level indicating that the first hypothesis ($\mathbf{H_1}$) which stated that layer keeping in the study area is not profitable was rejected. This implies that the layer keeping is statistically profitable in the study area.

Table 4: An Independent T-test in layer keepers' gross margins

Sample	**Mean**	**n**	**t-value**	**sign.**
Layer keepers' gross margins	3483	127	29.485	0.000

3.3 Profitability Analysis

The Profitability analysis shows that the mean GM of layer keepers was 3483 TShs per tray of eggs. This analysis accompanied by the tested hypothesis show that layer keeping in the study area was profitable meaning that layer keepers in the study area are motived to produce eggs. The maximum GM was 6,426 TShs per tray of eggs and the minimum was 494 TShs. It was further established that some layer keepers earned the lowest GM per tray due to limited access to market information on prices of trays of eggs. Consequently, they end up selling eggs at the lowest farm gate price.

3.4 The Cost Structure of the Layers Production

3.4.1 Feed costs

The GM results revealed that cost of feed form a large part of the variable and total costs of layer production in the study area. As indicated in Table 3, feed costs occupy over 71.4% of the total variable costs of production. The result conform to the findings of Arif and Shafi (2021) and Oladimeji *et al* (2017) who found that feed costs amount to 60% and 77% of the total variable costs of poultry production. The feed costs are followed by the cost of bird stocking which forms 12.4% of the total variable costs. In the study area, day-old chicks cost between 2000 and 3000 TShs. The fluctuation in the price was mostly triggered by the scarcity or unreliable supply of chicks and the quality of chicks which is subjected to the supplier because chicks from the renowned big suppliers were considered superior by the layer keepers. Layer keepers could buy day-old chicks directly from the supplier (i.e Interchick Co. Ltd.) or through one of their many agents, who are spread throughout Dar es Salaam. Direct supply is the most preferred delivery method. The dominant chick suppliers in the study area are Interchick (Dar es Salaam), Mkuza chicks (Kibaha), Organia (Kibaha), Irvines (Bagamoyo), and Silvelands (Iringa).

3.4.2 Other inputs costs

Other inputs including drugs, transport, electricity, and water were contributing a fair share (6.6%) to the total variable costs. Drugs (vaccines) and electricity (brooding) were mostly incurred in the early stages of chicks' growth (from week 1 to week 6). Labor costs amount to 9.5% of the variable costs. The combination of both family and hired labor was observed in the study area and its cost ranged from TShs. 720,000 to 1,200,000 annually. Labor is the input that affects the efficiency of other inputs as timely administration of medication, feeds, and water is essential for the growth and development of chicks and the production of eggs.

3.5 Pricing and Marketing of the Layers' Eggs

Eggs are marketed in the study area in a very traditional manner with minimum or no value addition. About 97.6% of the layer keepers in the study area sell their eggs to neighbors and egg collectors at the farm gate. Unreliable markets and the inability to safely transport eggs to markets with high prices are

contributing factors in the selection of the marketing channel. The market forces determine the per-tray price, which varied from 6500 to 8000 TShs with an average of 7429 TShs. According to layer keepers, unlike the dry season when egg production is at its highest, the cold season experiences decreased egg production rendering maximum price per tray.

The only added value made by the few of the sampled layer keepers in the study area included sorting by size, that does not affect the market price. Smallholders are compelled to sell their eggs at set prices because they lack sophisticated storage facilities or alternative market channels.

3.6 Results from Regression Analysis

The GM of the layer chicken farmers was computed and also factors affecting the GM were analyzed using SPSS. From the regression result, the F-statistic was 10.57 which is sufficiently higher enough to reject the null hypothesis ($\mathbf{H_2}$) which stated that Social-economic and institutional factors have no significant impact on layer keeper's profit. The regression results show that both socio-economic and institutional factors included in the regression model jointly and significantly impact the layer keeper's profit. The coefficient of determination (R squared) indicates that socio-economic and institutional factors explain the variation in gross margin of the layer chicken farmers by 44% even though the individual effects of some of the variables are not statistically significant.

Results, in Table 5 show that four explanatory variables which are age, experience, flock size, and access to market information on price were statistically significant in this study. The age of the layer keeper was statistically significant at 5% of the layer keeper's gross margin. This means that an increase in one year of age will increase the average gross margin per tray by 28.1 TShs holding all other factors constant. However, this interpretation is made considering the law of diminishing returns after a certain age since age cannot positively be contributing to the gross margin indefinitely. This finding agrees with Ayieko *et al.* (2014) who found that age has positive and significant effect on the profitability of chicken.

Access to market information on prices was statistically significant at 1% on the layer keepers' gross margin. The study revealed that the average gross margin per tray of layer keepers with access to market information was higher than those with no information by 2001.2 TShs holding all other factors constant. The

results are confirming the findings by Nmadu *et al.* (2014) who found that farmers' access to market information had a significant influence on the profitability of chicken egg production.

The coefficient of experience had a negative sign and it was statistically significant at a 5% probability level. This means that, while keeping all other variables constant, an increase in one year of experience will result in a decrease in the average gross margin per tray by 32.6 TShs. One possible explanation is that more experienced farmers are often reluctant in adopting new and improved methods or technologies of keeping layers such as battery cages. They keep on practicing conventional technologies. This result confirm the findings by Yevu and Onumah (2021), who found that experience had a negative effect on gross margin. Apparently, about 52% of layer keepers were buying ingredients for self-mixing for feed. This is a coping mechanism for minimizing cost of feed that is exorbitantly high. Feed self-mixing could be the main reason for low productivity and profitability because locally made feeds are not proven to be efficient enough for egg production.

Flock size was statistically significant at 1%. This means that an increase in one-layer chicken will increase the average gross margin per tray by 1.2 TShs per tray holding all other factors constant. It goes without saying that more layers will lead to more eggs *ceteris paribus*. The same results were revealed by Nmadu *et al.* (2014), Hassan *et al.* (2005), and Altahat and Al-Sharafat (2012).

Table 5: Regression results on factors influencing layer keeper' Gross Margin

Variable	**Coefficient**	**t-**

	s	statistic
(Constant)	805.763	0.89
Age (number of years)	28.123**	2.28
Experience (in layers keeping years)	-32.588**	-2.40
Education (Number of years in formal education)	-25.961	-1.05
Sex (0 Female, 1 Male)	38.417	0.16
Household size (number of family members)	38.835	0.54
Flock size (number of layers)	1.188***	2.64
Access to Credit (0 No, 1 Yes)	164.080	0.82
Access to Extension or Veterinary services (0 No, 1 Yes)	172.153	0.86
Access to Market info on prices (0 No, 1 Yes)	2001.904***	7.80

(***) (**) (*) Significant at 1, 5, and 10 percent levels respectively, R square 0.44 and Adjusted R square 0.40, F-statistic 10.57

3.7 Constraints Associated with Layer Keeping

The challenges facing layer keepers in the study area are presented in Table 6. High cost of feeds and food supplements (100%) was the most serious problem. Based on a quick evaluation of the four feed companies that are mostly used in the research area (Falcon, Hill, Backbone, and Nassad), it was noted that the average feeds prices rose by at least 19.27% from June 2021 to June 2022. The rise in feed prices was attributed to the shortage of maize which is the main ingredient in chicken feeds. According to the Ministry of Agriculture (2022), the shortage of maize in the study area has led to an increase in prices of raw maize from 42,000 TShs per 100kg bag in June 2021 to 105,000 TShs per 100 kg bag in June 2022 which is 150% increase in maize price. In effort to reduce the high expenditures of these feed charges, a sizable part (52%) of the sampled layer keepers purchased feed components and mixed them for their layers. The effectiveness of their feeds in terms of the nutritional value recommended for egg production remained an open subject and an interesting area for further research. Moreover, high cost of feeds has led to several layer keepers either forced to sell some of their layer chickens for meat to acquire additional income to support the remaining ones or a complete shift from keeping layers to keeping broilers since broiler keeping has relative fewer costs of keeping and it takes a relatively shorter time to realize profits compared to layers.

Day-old chick shortage was the second most significant constrain to layer keeping in the study area (86.25%). The demand for day-old chicks in Tanzania has grown in the last few years but

the supply to the market remains low (Ringo and Lekule, 2020). Frequent import ban of day-old chicks has had an impact on the supply of day-old chicks. The most common local day-old chicks' suppliers in the study area were Interchick, Mkuza chicks, Organia, Irvines, and Silvelands. Ringo and Mwenda (2018) have associated this shortage of day-old chicks with the low capacity of local hatcheries to meet domestic demand.

Low output price (low egg tray price, 83.75%) is another significant challenge. The average price per tray of 30 eggs in the study area was 7,429 TShs with 6,500 TShs as minimum and 8,000 TShs as maximum. This price range is still very low compared to ever-increasing costs of production. Market forces determine the prices per tray which are mostly at a minimum during dry season when layers lay more eggs as compared to the cold season when egg laying frequency is affected. Several farmers have tried at the very least to conduct value addition activities such as cleaning and sorting eggs according to size but still, they are unable to influence the prices.

Poor price per tray is followed by an unreliable market for eggs (76.25%). In the study area, about 90.6% of the layer keepers are selling their eggs at a farm gate to egg-collectors. This could be one of the reasons that they are unable to enjoy a fair share of their outputs (eggs) since farm gate prices are usually low.

Shortage of capital (75%) is among the challenges facing layer keepers in the study area. About 58.3% of layer keepers in the study area did not have access to financial services such as credit. Many of the respondents would have liked to acquire financial capital to expand scales of their enterprises but limited access to financial capital contributed to their low operational scales.

Table 6: Challenges facing layer keeps in the study area

Constraint	**Percentage**	**Rank**
High Costs of Feed and supplements	100.00	1st
Shortage of D.O.C	86.25	2nd
Low Price (Per Tray)	83.75	3rd
Unreliable Market for eggs	76.25	4th
Shortage of Capital	75	5th
Costs of Medication	73.75	6th
Untimely Extension Services	65	7th

Note: *Total percentage exceeds 100 due to multiple responses*

The cost of medication (drugs and vaccines) (73.75%) is another constraint to layer keepers in the study area. These costs are of paramount importance and cannot be skipped because they may have a major impact in the long run when skipped. After purchasing the day-old chicks, especially from the agents, some layer keepers are forced to re-administer the first vaccine (Mareks) to chicks since some of the agents are not faithful. The costs associated with this process is high (200 TShs.) as they require a veterinary expert and vaccine purchase.

Another important challenge facing layer keeps is lack of timely extension or veterinary services (65%). Many assigned livestock officers are overwhelmingly busy due to their shortage. In that sense they take time to respond to calls from layer keepers. This may lead to huge losses especially when the problem encountered is fatal. In this regard, most of the layer keepers in the study area ask for medical advice from veterinary pharmacies in the neighborhood.

4 Conclusion and Policy Implications

Based on the study findings, the policy implication is the need to come up with a policy to control the volatility of the feed prices or to subsidies feed price as it has been done in other agricultural inputs such as fertilizers and seeds. This must be given special attention as feed cost was found to form a large and deterministic part of poultry production costs. In the selling aspect, since farmers failed to influence the egg selling price based on sorting according to size, there is need for a policy guide. Time has come that eggs be graded in terms of their external quality characteristics which include eggs weight (g), egg length and width (mm), shape index (egg width/egg length x 100), shell weight (g) and shell thickness (mm) to influence its price. This will pave the way for foreign (high-value) market penetration since layer keepers will be inclined to follow improved practices for high-quality eggs as they aim for a high-value market rather than the current situation where egg external quality does not make any difference in prices when offered to a market for sale.

Furthermore, layer keepers in the study area should be encouraged to form a strategic association that will be helpful in credit acquisition as well as collective marketing. This will enhance farmers' profit and ensure that they are insulated from problems associated with untimely production, credit access, price fluctuations, and inconsistent supply. This mode of marketing has proven to be practical in several countries in the world.

Acknowledgement

This article is an output of the thesis submitted to Sokoine University of Agriculture for an award of Master of Science in Agricultural and Applied Economics. Authors are grateful to African Economic Research Consortium (AERC) and Building Stronger University (BSU) III for funding this study.

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