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Broiler, Layer Production Costs and Returns at Animal Production Division (APD) Njala University, Sierra Leone West Africa

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Abstract: ***This study details a profitability analysis on a flock of broilers and layers raised for the purpose of meat and egg production. Production (input) costs and sales (output) prices were used to determine the feasibility of growing broilers and layers in the region. The flock was introduced into the poultry house in January11th, 2020 and managed until final egg lying and spent chickens sold as broilers, on June 20th, 2020. Total production cost was, Le945, 260, 000 (cost of feed, cost of day old chicks, labor salaries, electricity cost, and other miscellaneous costs). The flock produced 30753.7902kg of meat at a market selling price of Le40, 000 per spent bird gives a total sum of Le198, 900, 000. Hundred and twenty-three thousand three hundred (123, 300) dozens of eggs at Le 18, 000 per dozen made a total ofLe2, 223, 000, 000. Manure amounted to 51 bags at Le 50, 000 per bag which gives Le 2, 550, 000. Thus, total sales wereLe2, 424, 450, 000, resulting in a net profit of Le1, 479, 190, 000. Conclusively the research revealed that there was a high profit margin due to proper management practices.***

Keywords: layer, broiler, spent chicken, profitability

1. Introduction

Poultry farms are fast pace operations that can fulfill the demand for meat and eggs, and can be expanded easily to meet the ever-growing demand (C. V. Reddy and S. Qudratullah, Sparks, N. H. C, 2006). In Sierra Leone poultry farms have witnessed a rapid growth in recent times. With an increasing population, growth in urbanization and increased incomes the demand for poultry products is expected to increase appreciably. (World Bank Group, 2018)

The significance of poultry farms lies in thequality of products that are provided to consumers. Broiler and Layer farms provide meat and eggs that supplies the human body with high quality proteins, and vitamins (A, D, E, and K) thus increases nutritional intake, provide greater family health and overall contributes to more food security. (David Farrell, 2011, FAO, 2013, Windhorst, H. W.2008

Consumption of poultry meat and eggs is important for pregnant women, children and the elderly. Poultry can make a significant contribution in areas where child malnutrition is common. Enhanced nutrition improves growth, mental development, school performance and labor productivity and reduces the likelihood of illness. (David Farrell, FAO, 2013.)

Chicken eggs and meat provide not only high quality protein but also important for vitamins, minerals and essential fatty acids. A typical egg would contribute~3-4% of an adult's daily average energy requirement, approximately 6.5g of protein, 15% of vitaminB6, 10-20% of folate, saturated and polyunsaturated fatty acids are important constituents of our diet. (David Farrell, FAO, 2013)

Poultry farms can be profitable enterprises with a better understanding of husbandry practices, and use of new technologies. As a business venture, the success and profitability of poultry farming depends on several major factors including proper cultural practices, dependable source of healthy stocks, a balanced nutrition program, dependable infrastructure, sound financial management practice, and a good marketing strategy (Manuel V. Duguies, Victor et al, 2016).

Prior to starting a poultry enterprise it is important to know the potential market demand for various poultry products. One has to consider price, quantities and acceptable quality levels. Costs need to be understood such as initial investment costs, production and marketing costs as well as expected revenues and the profit margin that can be made. (Lawrence J. A., Jr. B. A. Pasternack, 2002, Small and Medium Enterprise Development Authority.2002,)

In this regard a feasibility analysis prior to investment and proper planning and management during the operation are required to optimize production outlay which gear towards high profitability.

Starting a poultry farm requires start-up capital and a budget for the operations. The startup cost of a poultry farm varies with the size, and the facilities required for the farm to run.

The budget represents the income, fixed and variable costs, profits, and investment amounts for the poultry farm, depending on its size. Determining these values and using an enterprise budgeting sheet will give the broiler and egg producer a clear view of the operation and whether or not it is feasible (Rhodes et al., 2008).

The broiler and egg producer can use estimates of income and costs to estimate gross income, variable and fixed costs, leading to an estimate of the net income. A cash flow statement of the poultry operation represents the total cash revenues, costs, and required investments that will be spent on the operation. (DanielSmyth May 2021).

Feasibility of a poultry enterprise mainly rests in the calculation of estimated costs and expected profits. Calculations need to be made for all production and marketing costs. Investment costs in the case of a new poultry enterprise involve such aspects as housing, equipment, fencing, buying chicks, etc. Production costs relate to labor, feed, water, veterinary costs and medicines. Marketing costs typically involve transport, market fees, etc. Once costs have been estimated they will need to be compared against market prices and this will provide an estimate of the profit potential for the poultry enterprise. (Products and profit from poultry, FAO, 2000)

Proper management ensures efficient production of good quality meat, and eggs. This is accomplished by maintaining feed efficiency, control of disease by adequate provision of correct chemo and immuno-prophylaxes, proper sanitation, and correct handling of waste management. Feed efficiency is a major variable to determine cost of a kilogram of poultry meat, number and quality of eggs laid. (Expertise and Products for Feed Millers, 2014)

Increasing the revenue of poultry enterprise, it is important to know how to improve the Feed Conversion Ratio and reduce feed cost which serves as an important benchmark to determine profitability. The feed conversion ratio (FCR) is the amount of feed ingested by an animal which can be converted into one kilo of live weight. The technical FCR is the total amount of ingested feed divided by the number of animals that have exited the house while the economic FCR is the total amount of feed ingested divided by the weight of poultry animals that can be accepted at the Slaughterhouse. That is to say that the weight of seized meat is deducted from the total weight of goods (Travis D. Maddock, 2009).

Some farms specialize in producing eggs for market consumption, or for hatching chicks for the purpose of meat production. Many large farms specialize in raising broilers for meat production. Other businesses are focused on feed preparation or on using the wastes of poultry farms for compost production and fertilizing farmlands. If managed and marketed well, all segments of the poultry business can be profitable. (P. Gerber, C. Opio and H. Steinfeld, 2016)

Feed costs have a major impact on the profitability of poultry farm operations. The high cost of feed is related to the energy and protein contents of the diet. In an unbalanced diet, with an excess protein, feed would cost more, thus increasing production costs. With low protein diets, chickens would take more time to grow, and could be at a higher risk of catching diseases. Chickens have different nutrient (feed) requirements depending on their type, age, and sex. Rations formulated to meet nutrient requirements produce faster growing, and healthier chickens, and thus better products and more profits (Beutler, A.2007, Shrivastav, A. K., 2000).

Excess dietary nutrients are often excreted in the feces. The excess nitrogen and phosphorus in feces could cause a threat to the environment. For this reason, managing feed formulas for accuracy is an important step in the poultry farm management to safeguard the environment, and reduce operating costs (Karcher, 2009).

In the management of poultry farms, probably one of the most difficult phases is the management of the newly introduced flock. For the operation to be profitable, a good disease prevention program should be available for the newly introduced chicks to avoid any future losses. Diseases can be transmitted via humans, other birds, newly introduced chicks, or contaminated equipment. Controlling diseases from the beginning is important for the success of the operation (Mobley and Kahan, 2007).

Vaccination is an effective way to reduce the negative effects of diseases that can cause losses in a poultry operation. Viruses can cause several diseases; the major ones include: Marek's disease, New castle disease, infectious bronchitis, larynx gotracheitis, fowl pox, fowl cholera, and avian encephalomyelitis (DeWitt. J. et al, 2011). Vaccination is mainly done to prevent Marek’s disease, which can infect laying hens and hence, a whole flock if the eggs are infected.

The objective of this research is to determine the productivity level of the poultry enterprise at Agricultural Production Division (APD) at Njala University with regards to sustainability.

2. Materials/ Methods

To determine feasibility of poultry production, this study used Animal Production Division located at Njala University Southern Sierra Leone. On January 11th, 2020, 5000 day-old chicks were introduced into the poultry house furnished with wood chips and supplied with heaters, feeders, and drinkers. The chicks were bought at a price of Le 11, 500 each from a local supplier. The poultry house preparation cost was Le 6, 700, 000 which included the cost of wood chips and gas for heaters, cost of the feeders and drinkers. All cost figures used in this report are in local currency, the Leone.

Feed for layers and broilers vary according to age. The percentage ingredients differ between the Starter, Grower, Layers, and Finisher feeds. However, the ingredients in all feeds used were corn, soya, sisal granule, mono di-calcium, broiler pre-mix, methionine, lysine, enzymes, coline, coxi, salt, stone granules, oyster shell and soya oil. Starter feed was used for chicks between the age of 1 and 10 days.

For this study, a total of one (1) ton of starter feed was used at a cost of Le6, 800, 000 per ton. Grower feed was used for chicks between the age of 11 and 28 days. The amount used

was 7 tons at a cost of Le6, 500, 000 per ton. The finisher feed was used for chicks between the age of 29 and 50 days. The amount used was 6 tons at a cost of Le 6, 000, 000/ton. The variation in feed quantities was related to chick size and growth stage. The conversion of feed differs between the three levels of growth, with broilers in the growth phase consuming more of the grower feed as compared to the other feeds.

Four vaccines were used throughout the grow-out: B1, Gumboro, Gumboro Stress, and Clone. Vaccine B1 was applied to the chicks at 7 days of age; Gamboro was applied at the age of 12 days, and Gumboro Stress at the age of 22 days. Clone was applied at three stages, at the age of 18, 27, and 35 days. The cost of vaccine B1 was Le 120, 000. Gumboro Le110, 000, Gumboro Stress Le154, 000, and Clone Le256, 000 (this is the per flock costs of vaccines).

SOURCE: (Technical Marketing Poultry Vaccines, Lehmann Animal Health, 2021)

3. Results and Discussion

Production Costs

This poultry farm feasibility study was conducted with improved methods of production. Daily records were kept throughout the study; these records included the daily chick deaths, vaccination, and feed used for the flock (Table 1). The initial start-up costs for this operation included the cost of purchasing the chicks, and the cost of preparing the poultry house for the flock. The cost of one chick was Le 11, 500. The capacity of the poultry house was5000 birds, so the total cost was Le67, 500, 000. The preparation cost was Le6, 500, 000 which covered the cost of wood chips that furnished the floor and gas for heaters during cold nights.

Each poultry house was having one laborer to manage the flock. In this study, each laborer was paid Le1, 500, 000 Per month and other emoluments such as leave allowance, rent allowance and child allowance were also paid for a period of one year six months. Table 2 summarizes the main costs of the layer and broiler farm operations. The cost per spent chicken was Le 40, 000, but it could vary between a minimum of Le 35, 000 and maximum of Le 40, 000, depending on the market and size of chicken.

Four vaccines were used, with a total cost of Le45, 435, 000. Although the cost of vaccines was not significant with respect to the profitability of the project, the use of vaccines can save the farm from major losses associated with diseases. (Meritxell Donadeu et al, 2019)

Feeding costs represented the major cost in this poultry operation. Feed varied throughout the operation according to chick age. Each feed type consisted of different ratios of ingredients which affected the feed cost. The feed cost at end of lay was a little higher than start of lay (Table1). Starter feed was the most expensive per ton due to its high protein content. The total cost of feed for the project was Le454, 350, 000. This value may vary depending on the management practices followed throughout the operation to reduce feed losses. The price is also affected by market prices, with variation of about 10%, to a maximum of 15%. (James M. Macdold, 2000)

Income

Eggs were sold at a cost of Le 18, 000per dozen, spent chicken at Le40, 000 per bird and manure at Le50, 000 per bag. Poultry meat from the study was sold on a kilogram basis. Therefore, the total sale of eggs, spent chicken and manure wasLe2, 424, 450, 000.

Subtracting the total cost that is purchases and expenses (Le936, 260, 000) from the total sales (sales and receipts), the net profit was Le.1, 488, 190, 000.

Examining the debit (Purchases and Expenses) and credit (sales and receipts) the data revealed that the sales and receipts are higher than the purchases and expenses. This implies that profit was achieved. This was accomplished because the management practices were good and the mortality rate was very low which just 1% was. Proper sanitary measures were implemented and appropriate chemo and immune prophylaxes were used to control and prevent diseases. (Williams C.2007).

The food conversion ratio (FCR) was low which indicates that more weight gain and less food was consumed with respect to food cost. Food cost usually account for high percentage of the production cost but when properly managed with respect to selection of cheap and nutritious feed a breakeven would be achieved. (Dan W. Shike, 2013, Travis D. Maddock, 2009).

4. Conclusion

This study shows that the layer and broiler business at Njala University is profitable assuming variation in prices of chicks, feed, and price/kg of meat remain within reasonable levels, while all other costs are fixed. Even when the cost of feed is high, the price/kg of spent chicken and cost per dozen of eggs could be above the average, compensating for the high costs of the operation. Also when the cost/chick is high, the feed cost could be low, compensating for the initial high cost per flock. Sensitivity analysis in this study has shown that even if chick and feed costs are increase (5%-10%) while egg and spent chicken prices drop, the poultry farm would still break even.

A poultry farm investment focusing on both layer and broiler production is a relatively easy business to run. The fluctuating prices tend to compensate for each other for a positive net profit. However, if a worst-case scenario of low prices of eggs and spent chicken and high prices of feed and chicks occur, good management practices would be critical to maintain profitability.

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Commercialized poultry production at Njala University

Table 1: Cash flow for broiler and layer production of meat and eggs

Cost of day-old chicks	Le11, 500x 5000= Le 57, 500, 000
Cost of feed consumed	
a. Point of lay (P. O. L)	
FCR= Feed Consumed in a period	2.17x2400g=5208g\chick
Weight gained in the same period	5000x5208g=26, 040, 000g
Feed consumed=FCR X Weight gained	26, 040, 000\1000=26040kg
For 5000 chicks	
	26040\50kg=520.8 bags of feed (26 Tons)
Number of bags of feed consumed	Le400, 000
Cost of feed consumed	520.8 bags = Le300, 000x520.8 bags
One bag cost	=Le208, 320, 000
	Feed consumed=5545.61g\bird.
b. cost of feed up to end of lay	
knowing the FCR as 2.27 and weight gained at end of lay (2443g)	For 4950 remaining 4950x5545.61= 30, 753, 790.27g
	30, 753, 790.27/1000= 30753.79027kg
One percent mortality was envisaged. Therefore 50 birds demised remaining 4, 950birds	
Feed consumed:	Number of bags= 30753.79027/50=615.075 bags

Number of bags of feed consumed **Cost of feed consumed** One bag cost Le 300, 000 **Total cost of feed**	615.075bagsx Le300, 000=Le246, 030, 000 P. O. L=Le208, 320, 000 E. O. L =Le246, 030, 000 Le454, 350, 000
Vaccines Gumboro Newcastle IBDV Fowl pox Komoov	 10% Cost of feed= Le454, 350, 000x10/100 =Le45, 435, 000
Cost of Labor 5 Men including Farm manager, and salesman Subtotal for cost of labor for 1yr.6months Allowances a. Leave allowance b. House allowance c. Child allowance	 Le 17, 500, 000 per month Le 210, 000, 000 for 1yr.6months Le 70, 000, 000 Le 35, 000, 000 AllowanceLe 41, 600, 000 Subtotal =Le146, 600, 000 Le 210, 000, 000 subtotal= Le 356, 600, 000 Subtotal= Le454, 350, 000 Le45, 435, 000 Le 356, 600, 000 Le856, 385, 000
Miscellaneous 5% of sub total	Le856, 385, 000 x5/100= Le42, 819, 250 **Grand Total**= Le856, 385, 000 Le42, 819, 250 Le899, 204, 250
Revenue from sale of manure Cost of a bag of manure	2250kg= 51 bags 50kg Le50, 000 51 bagsxLe 50, 000= Le 2, 550, 000
Revenue from sale of eggs One bird produces 300 eggs 4950 birds Revenue received from sale of spent chickens 4950 birds Percentage contribution of feed to total cost of production	 4950 birds x 300=1, 485, 000 eggs (123, 750 dozens) 123, 750xLe18, 000=Le2, 227, 500, 000 They were contracted to supply 1, 500, 000 eggs Which is 125, 000 dozens All the eggs were supplied to various individuals and firms. So there was no glut. A dozen of eggs cost Le 18, 000 4950 birds x Le 40, 000=Le198, 900, 000 Le454, 350, 000x 100 = 50.52% Le899, 204, 250 **TOTAL INCOME=** **Le2, 223, 000, 000+Le198, 900, 000**+Le2, 550, 000 = **2, 424, 450, 000**

Table 2: Profit and Loss Account for Animal Production Unit (APD) Njala University for the Year 2019

DEBIT		**CREDIT**	
PURCHASES AND EXPENSES		**SALES AND RECEIPTS**	
OPENING VALUATION	Le c	**CLOSING VALUATION**	Le c
Cost of day old chicks Cost of feed Cost of drugs Electricity bill Wages of workers Allowances Transportation cost Depreciation Loss due to mortality	57, 500, 000 454, 350, 000 45, 435, 000 3, 500, 000 210, 000, 000 146, 600, 000 5, 600, 000 2, 500, 000 575, 000 6, 700, 000	Sales of Spent Layers Sales of Eggs Sales of Manure	**198, 900, 000** **2, 223, 000, 000** 2, 550, 000.00

Poultry house preparation Miscellaneous **Total expenditure** **Net Profit** **Grand Total**	 3, 500, 000 **945, 260, 000** **1, 479, 190, 000** **2, 424, 450, 000**	**Grand Total**	**2, 424, 450, 000**