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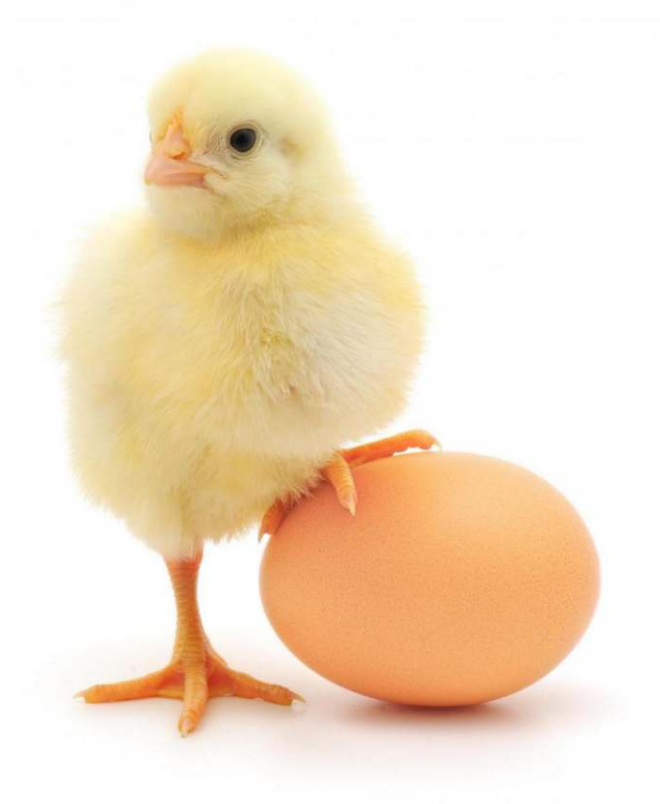

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A Survey of Small-scale Layer Production Systems in Botswana

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Abstract: A questionnaire-based survey was conducted to investigate small-scale layer production systems in Botswana. The survey covered layer farms in the districts of Francistown and Letlhakane in the eastern part of Botswana, and examined aspects of productivity parameters, housing, management and diseases. The average hen day production in small-scale layer farms was 71.7% and the average daily feed intake was 108.1 g per hen. An average of 1 740 g feed was required to produce one dozen eggs. Hens were culled after 52 weeks in production (around 78 weeks of age). During this period, a hen produced an average of 245 eggs. These productivity levels were well below the standards indicated by the breeding companies. The average mortality from 18 weeks of age to culling was 8.46%. Diseases or conditions reportedly associated with these deaths included Newcastle Disease, prolapse of the uterus and enteritis. Factors responsible for the poor layer performance under small farm conditions in Botswana are clearly complex, but poor managerial skills, irregular feed supply and, poor quality of feed and pullets are major contributing reasons. The lower production levels, however, suggest that there is considerable potential for improvement.

Key words: Layers, productivity, small-scale farms, Botswana

Introduction

Commercial layer industry in Botswana is still in its infancy. The main source of eggs for the rural population prior to the 1970s was backyard operations based on the local Tswana chicken, which is characterized by low production levels (Mushi *et al*., 2000). Backyard chickens still remain an important source of eggs in rural areas even though their contribution to the national egg supply is small. The commercial layer industry in Botswana consists of small, medium and large-scale projects. Of these, small-scale projects that are generally funded by Government are important in terms of both the number of projects and the employment they create. Medium-scale layer projects are either self- or government-funded, while large-scale layer projects are mostly self-funded. Layer operations are concentrated on the eastern side of the country. The reason for this high concentration on one side of the country is due to the better transport links for inputs and proximity of market for products. Most urban centres are situated on the eastern side of the country. The country is self-sufficient in egg production, although some imports were allowed during 1999 from the Republic of South Africa and Namibia to meet local shortages (MOA, 1999).

Although the Government has actively supported the expansion of the poultry industry under the auspices of Financial Assistance Policy (FAP) for the past two decades, the commercial production systems have never been characterized. Over the years, the Ministry of Agriculture has used several production indices for the budgeting of small-scale layer projects. The average hen-day production is considered to be 75%, and it is assumed that each bird consumes 120 g of layer feed per day with a hen-housed production of 300 eggs (MOA, 1999). How closely these assumed standards compare with actual farm productivity levels is not known. The present study was initiated with the objective of obtaining baseline information on specific aspects of production systems and productivity in small-scale commercial poultry operations in Botswana.

Materials and Methods

A single-visit questionnaire survey was conducted. The questionnaire incorporated open-ended and closed questions, and was designed to obtain data to meet the objectives of the study. Data collection techniques included direct questioning and discussions with the producers as well as, where possible, a review of farmer-kept records. In all cases, informal discussions and observations were employed as techniques of verifying collected data. The survey was carried out over a period of three months commencing in January 2001. A list of layer producers was obtained from the Department of Animal Health and Production in the respective areas, and the survey focused only on the small-scale layer producers. For the purpose of this survey, small-scale poultry operations are defined as those valued up to P75 000 (P1.00 = US$0.179) in terms of fixed assets and flock sizes of less than 2 000 hens. Small-scale projects were selected because these comprise about 80% of the total poultry projects and have a significant employment and income generation role for the rural-based population of Botswana. No reliable data is available on the exact number of small-scale layer projects in Botswana, but it is thought around 80 projects are currently in operation. Of which about 30

are located in the survey districts. Questionnaires were given to all farms in the survey districts, but only 14 were returned.

The questions in the survey covered demographic details, flock details, performance parameters, management, housing, labour use, diseases, income and cost of production. The questionnaire was pre-tested in two small-scale farms to get an indication of the possible responses. Data from pre-testing were not included in the results. The survey covered layer farms in the districts of Francistown and Letlhakane in the eastern part of Botswana. These are referred to as districts according to the Department of Animal Health and Production zoning. The locality of these districts provides easy access for inputs as the main North to South road and railway pass on the eastern side. Francistown district has a land area of approximately 57 600 km^2 and has an estimated population of 143 400. Letlhakane district has a land area of approximately 31 650 km^2 and a population of 42 670.

Data were analyzed using SAS (1997) to calculate frequency of distribution and to examine correlations between selected production parameters. Percentage hen-day production was calculated by dividing the number of eggs produced for the particular day by the average number of hens and then converting to a percentage. Number of hens in a farm was calculated by averaging total number of hens at the start of the month of study and at the end of the month. Feed intake per hen was estimated based on the total amount of feed given per flock during the month. Feed conversion ratio was calculated by dividing the total feed intake of the flock by the total number of eggs produced per year.

Results and Discussion

Of the total 14 projects surveyed, nine were owned by women. Under the FAP, the Botswana Government has actively encouraged the involvement of women in business (MFDP, 1995). This policy stipulates that women are to be granted an additional of 15% of the total cost of the project while men receive no weighting. Therefore, it was not surprising that, in the two districts studied, majority of the layer projects were female owned.

All (100%) farms used open sided houses with bird mesh on the sides. The houses are built facing an east-westerly direction to prevent direct sunshine entering the shed in the mornings and in the late afternoons. The open sided houses with a ridge at the top allowed good ventilation. The houses or sheds had a concrete floor, brick walls with 1 m high sidewalls. Above the brick sidewalls, mesh wire stretched up to the roof level. The roof was mainly corrugated iron. The height of the house is on average 3 m in the centre and 2 m on the sides allowing for an overhang, which provided shelter from rain. One producer had sidewalls made of corrugated iron, with mesh wire extending to the roof level.

All producers used cage systems for housing the layers. On average, four birds were housed per cage. The types of cages used were traditional two-tier cages with a total area of 1800 cm^2 per cage, with an area space of 450 cm^2 per bird. Although this system is expensive, it has advantages over the deep litter system with easier management, cleaner eggs, improved feed conversion as a result of reduced feed wastage, and reduced parasite load and mortality. The main strains used for egg production are Lohmann Brown (64.3%) and Hy-Line Brown (35.7%). The dominance of these strains is not by choice, but due to the fact that they are the only available breeds in the market. All producers (100%) purchased their point-of-lay pullets through local agents. Pullets (18-week old) were sourced from either South Africa or Zimbabwe.

The flock size and productivity parameters for the 14 farms are presented in Table 1. Flock sizes in individual farms differed markedly. The minimum number of hens per farm was 189 while the maximum was 995. Eight farms (57.1%) had flocks of over 500 layers. The average flock size was 541.2 ± 237. The average hen-day production was calculated to be 71.7 ± 12.9%, which is lower than the strain standard of 84% (Hy-Line, 2000). All producers culled their hens when the hen-day production starts to decline below 50%. This typically occurred after 52 weeks in production (around 74-78 weeks of age). Under optimum management conditions, modern layer strains produce 300 or more eggs per production cycle (Hy-Line, 2000). The average hen-house production level of 245 ± 22.5 eggs recorded in the present survey is also lower than the levels (272 eggs) obtained for similar strains under South African conditions (D. Barnard, Meadow Feeds, South Africa, Personal communication) and this poor performance is suggestive of the potential for further improvement. Detailed studies are needed to examine the underlying causes of the lower production levels in Botswana. Factors responsible for low productivity levels may include *inter alia* poor managerial skills, irregular supply of feed, and poor quality of feed and pullets.

Data showed considerable variation in daily feed intake per bird (101-120 g) from week 18 of age to culling. The average daily feed intake was 108.0 ± 6.49 g. On average each bird consumed 35.6 ± 2.1 kg during the period from 18 weeks of age to culling. The observed variability appears to be influenced by factors such as ambient temperature, management, water availability and temperature of the water. There was a significant ($P=0.03$; $R^2 = 0.92$) positive correlation between feed intake per day and eggs produced per day, indicating that hen-day production was strongly influenced by feed intake.

The most important parameter, which dictates profitability, is the amount of feed used to produce a

Table 1: Average production parameters in the small-scale layer farms in Botswana

Farm No.	Flock size (%)	Hen-day production	Hen-house production day (g)	Feed per bird per (kg)	Feed per dozen eggs	Mortality per flock (%)
1	995	80.0	264	109.6	1.64	1.0
2	500	68.3	226	109.1	1.91	8.6
3	500	76.0	251	103.0	1.63	8.0
4	460	34.0	216	112.0	2.06	6.6
5	600	68.0	224	110.0	1.95	0.8
6	498	80.3	265	100.4	1.50	12.0
7	292	65.0	215	104.8	1.93	10.6
8	473	74.0	244	110.0	1.78	10.0
9	500	71.0	233	100.0	1.70	6.3
10	300	81.0	267	120.0	1.78	2.3
11	189	75.1	248	120.0	1.92	33.0
12	500	72.0	238	109.1	1.82	7.0
13	990	76.0	250	101.0	1.60	6.0
14	780	70.3	295	103.0	1.40	6.3
Mean±SD	541.2 ± 237	71.7 ± 12.9	245 ± 23	108.0 ± 6.5	1.75 ± 0.19	8.46 ± 7.8

dozen eggs. In the present study, 1.75 ± 0.19 kg feed was required to produce one dozen eggs. This efficiency level is better than the value of 2.71 reported by Al-Awadi *et al*. (1995) for caged layers in Kuwait, but comparable to the average value of 1.70 obtained for similar layer strains under South African conditions (D. Barnard, Meadow feeds, South Africa, Personal communication). However, the feed conversion value obtained in small Botswana farms is still higher than the recommendation by the breeder company that a hen should consume only around 1.58 kg feed to produce one dozen eggs (Hy-Line, 2000).

Information on the type of feeds used in the layer farms was also obtained. Of the 14 farms surveyed, ten (66.7%) used medium energy layer mash, while three (20%) used only high energy layer mash the remaining two (13.3%) producers used both medium and high energy layer mash for their hens. Medium energy layer mash have an apparent metabolizable energy concentration of 11.5 MJ/kg (2750 Kcal/kg) and a crude protein content of 16.5% while high-energy layer mash have an energy concentration of 11.9 MJ/kg (2850 Kcal/kg) and a crude protein content of 17.0%. These feeds are sourced from Agents who either import from South Africa or Zimbabwe or purchased from the local feed milling company. Although there was considerable interest, on-farm mixing of feeds was not practiced owing to the scarcity of raw materials and the lack of knowledge on proper feed formulation.

There was wide variation in mortality between the farms, with values ranging from 1.0 to 12.0%. The average mortality (18 weeks of age to culling) per flock was 8.46 ± 7.81%. Diseases or conditions reportedly associated with these deaths included Newcastle disease, prolapse of the uterus and enteritis. The presence of enteritis may be reflective of symptoms of infectious diseases such as salmonellosis, Newcastle Disease, fowl cholera and fowl typhoid. Despite this, none of the producers vaccinated their birds.

Of the 14 farms, one farm used family labour only, while three farms used hired labour only. The balance (71.4%) used both family and hired labour. Of all the labour in the farms surveyed, 78.6% was female labour and the remaining was male labour. Four farms (28.6%), used children as part of their labour force, but usually during the school holidays. In general, farms with small flock sizes tended to use more family labour while farms with larger flock sizes used more hired labour. The aim of Botswana Government policies has been to create employment for the local citizens. It is therefore not surprising to find that farm operations on most small farms rely heavily on family labour. Family labour formed the major part of the labour personnel in small-scale layer projects because producers who own these projects were mostly previously unemployed. Women play an important role in the management of small poultry farms. Majority of the operators were women, and additionally farms also used female family labour.

Even though some information on income and expenditure was obtained, the cost of production was not easy to calculate, as over half of the small-scale egg producers did not indicate costs related to their production systems. This is a clear indication that accurate record keeping is a problem, which needs to be addressed by poultry extension staff. The profitability and viability of a poultry enterprise is influenced by a number of factors, the most important ones being feed costs and market prices. To operate an efficient operation, the producer needs to maintain proper production and financial records.

Conclusions: The aim of the present survey was to obtain baseline information on specific aspects of production systems and productivity in small-scale layer farms in Botswana, which can be used for budgeting purposes by the Ministry of Agriculture. Although only around 50% of the small farms in the survey areas were studied, the results can be considered representative of the general condition of this sector in Eastern Botswana where most of the layer operations in the country are concentrated. In general, the results showed that egg production levels in small-scale layer farms in Botswana are poor, although the amount of feed required to produce a dozen of eggs was comparable to those achieved under commercial conditions in South Africa. Factors contributing to this lower egg production are complex, but management skills, feed supply and quality and pullet quality appear to be immediate areas for improvement. Farmer training needs to play a crucial role in poultry production if better returns are to be realized. Better understanding of the importance of critical inputs and of proper record keeping is especially vital.

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