SMALL-SCALE POULTRY PRODUCTION SYSTEMS IN BOTSWANA AND EVALUATION OF A NATURAL ZEOLITE IN BROILER DIETS

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ABSTRACT

Two entirely separate research issues form the two parts of this thesis. A survey of small-scale poultry production systems in Botswana is presented in Part A and an evaluation of a natural zeolite in broiler diets in Part B.

Part A examined the aspects of management, productivity parameters, farm inputs, housing, feeding, diseases and marketing in small-scale poultry farms in Botswana. In both small-scale layer and broiler farms, only a small percentage of producers were below the age of 30 years, probably reflecting the high costs associated with these systems. Clearly young people would not have the necessary capital to start the projects and the finding emphasises lack of credit being a major constraint to the growth of poultry industry in Botswana. In the two production systems, female producers showed a higher percentage of ownership of poultry projects showing that the government policies have achieved the objective of encouraging involvement of women in business.

The average hen day production in small-scale layer farms was 71.7% and the average feed intake was 108.1g per hen per day. Correlation analysis showed that the feed intake was positively related ($P = 0.03$; $R^2 = 0.92$) to egg production. It was observed that hen day egg production was low in farms where feed intake was low, highlighting the importance of providing sufficient amounts of feed. An average of 1 740g of feed was required to produce one dozen of eggs. This feed efficiency level was better than those recorded in some countries, but poorer than the breeder's recommendation (1 580g feed/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; this was lower than 300 or more eggs for modern layers under optimum conditions. Factors responsible for the poor layer performance under small farm conditions in Botswana are clearly complex, but poor managerial skills and, poor quality of feed and pullets are major contributing reasons. The lower production levels, however, show that there is room for improvements and also highlight the need for better record keeping. 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 diarrhoea, but none of the producers vaccinated their flocks.

The small-scale broiler farms in Botswana grow an average of 4-5 batches per year. The number of production cycles is determined by the number of sheds in a farm, the interval between broiler batches and the availability of the market in a given location. Most broiler farms adhered to the extension advice of two weeks interval to prevent any disease transmission between batches. The average slaughter age was 48.3 days at an average carcass weight of 1.46 kg. The average amount of feed required to produce a broiler bird was 4.6 kg. The feed conversion ratio for small-scale broiler birds in Botswana was 2.72 kg feed/kg gain, considerably higher when compared to Cobb standards (1.60 kg feed/kg gain). The high feed conversion ratio values in small-scale farms are due probably reflective of, among others, the poor quality feeds, management conditions, length of the production cycle and feed wastage. Correlation analysis showed that when the age at slaughter increases, the average feed conversion ratio is increased ($P = 0.0001$). This finding is of economic relevance in Botswana, because small-scale producers keep the broilers longer to satisfy consumer preferences. But the cost of keeping these birds would be higher than the returns from sales because of decreasing feed efficiency. The average mortality was 9.15%. Diseases or conditions reportedly associated with these deaths included Newcastle disease, infectious bursal disease, diarrhoea, chronic respiratory disease, paralysis of the limbs and coccidiosis. In most cases, productivity parameters recorded in the current study are higher than those used by the Ministry of Agriculture for budgeting purposes.

In the present survey, baseline data have been generated on the performance levels in small poultry farms and the production systems have been characterised. In addition to establishing the production standards, it has raised several issues needing attention. The results showed that the future growth of poultry industry in Botswana is constrained by a number of factors including lack of proper knowledge in poultry husbandry and nutrition, irregular supply and poor quality of feeds and breeding stock, inadequate support services and access to credit, as well as a poor marketing infrastructure. It is also clear that intensive systems of raising poultry may not be financially viable long-term in Botswana, because of the strong dependence on external sources for all major inputs (chicks, pullets, feed etc). The Government, in association with organisations such as Botswana Poultry Association, should formulate policies to address these issues.

The results from a 35-day feeding experiment, conducted to evaluate the influence of a natural zeolite (Mordenite) on the performance of broiler chickens fed maize-soyabean meal diets, are presented in Part B of the thesis. Four levels of Mordenite (0, 2.5, 5.0 and 7.5%) were incorporated in diets formulated to provide similar levels of apparent metabolisable energy, lysine and methionine plus cysteine. Each dietary treatment was fed to ten replicate pens (4 birds/pen). Inclusion of 2.5% Mordenite improved weight gains of broilers by 4.1% over that from control diet with no Mordenite, but the difference were not statistically significant ($P > 0.05$). Weight gains of birds fed diets containing 5.0% Mordenite were similar ($P > 0.05$) to those fed the control diet. There was, however, a significant ($P < 0.05$) depression in weight gain of birds fed the 7.5% Mordenite diet compared to those fed the diet with 2.5% Mordenite. The detrimental effect on weight gain at this level is due largely to the reduction in feed intake. Feed intake of birds fed diets containing 7.5% Mordenite was lower ($P < 0.05$) than those on the 2.5% Mordenite diets. Inclusion of Mordenite at 2.5 and 5.0% had no effect ($P > 0.05$) on feed intake compared to controls. Inclusion of Mordenite to levels up to 5% had no effect ($P > 0.05$) on the feed efficiency of broilers. The inclusion of 2.5% Mordenite, however, caused a numerical improvement in feed utilisation (1.47 versus 1.51g feed/g gain). Feed efficiency was significantly ($P < 0.05$) depressed when 7.5% Mordenite was included in the diets. Excreta nitrogen and phosphorus contents were affected linearly ($P = 0.001$) by increasing levels of Mordenite. Excreta quality scores were not influenced by the inclusion of Mordenite. Overall, the findings are encouraging and showed that the addition of low levels of Mordenite (2.5%) is beneficial in improving broiler production and litter attributes.

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"Sa siiwa tsasting se ikisa meriting: Bojang ja Pitse ke jo bo mo maleng...e bo lebile "

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LIST OF ABBREVIATIONS

ADG	AVERAGE DAILY GAIN
ALDEP	ARABLE LAND DEVELOPMENT PROGRAMME
AME	APPARENT METABOLISABLE ENERGY
BMC	BOTSWANA MEAT COMMISSION
DON	DEOXYNIVALENOL
EDS	EGG DROP SYNDROME
FAO	FOOD AND AGRICULTURAL ORGANISATION
FAP	FINANCIAL ASSISTANCE POLICY
FCR	FEED CONVERSION RATIO
FEPNZ	FEDERATION OF EGG PRODUCERS NEW ZEALAND
GDP	GROSS DOMESTIC PRODUCT
GIT	GASTRO INTESTINAL TRACT
HSCAS	HYDRATED SODIUM CALCIUM ALUMINOSILICATES
IBD	INFECTIOUS BURSAL DISEASE
Kcal	KILO CALORIES
MCI	MINISTRY OF COMMERCE AND INDUSTRY
MFDP	MINISTRY OF FINANCE AND DEVELOPMENT PLANNING
MJ	MEGA JOULE
MMRWA	MINISTRY OF MINERAL RESOURCES AND WATER AFFAIRS
MoA	MINISTRY OF AGRICULTURE
NCD	NEWCASTLE DISEASE
NDP	NATIONAL DEVELOPMENT PLAN
NIV	NIVALENOL
NVL	NATIONAL VETERINARY LABORATORY
SADC	SOUTHERN AFRICAN DEVELOPMENT COMMUNITY
SMME	SMALL, MEDIUM AND MICRO-ENTERPRISES
SZA	SODIUM ZEOLITE A