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EVALUATION OF QUALITY OF POULTRY FEEDS SOLD IN KATSINA METROPOLIS, KATSINA STATE, NIGERIA

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ABSTRACT
In Katsina metropolitan, a variety of poultry feeds are available, and the quality and standards of these feeds are critical for the production of eggs and meat. As a result, the quality of selected chicken feeds sold in Katsina metropolitan was assessed by performing proximate analysis using AOAC methodology. Super starter, grower concentrate, broiler finisher, broiler starter, broiler super starter, layer mesh, grower mesh, and layer concentrate were among the samples used. The percentage mean to standard deviation was used to express the findings. The crude protein content of the diets studied ranged from 0.46 ± 0.00 percent to, 8.24± 0.02 percent, ash content 6.31± 0.01 percent – 33.30± 0.04 percent, crude fiber content 1.03 ±0.00 percent – 3.21± 0.00 percent, lipid content 0.11± 0.00 percent, 2.30 ±0.00 percent, moisture content 4.28 ±0.25 – 6.66 ±0.78 percent, and carbohydrate content 51.78± 2.68 – 83.72 ±0.57 percent. Although there was variation in the mean and standard deviation levels among the samples analyzed, such variations were not statistically significant (P>0.05) according to a one-way analysis of variance (ANOVA) for the difference in the mean levels of parameters evaluated in eight samples.

Keywords*:* Poultry Feeds, Proximate Analysis, Katsina Metropolis

INTRODUCTION

Poultry production is a crucial element of agricultural productivity. The poultry business has grown to be a large industry with many different interests, including egg production, hatcheries, broiler production, and poultry equipment (Lateef and Gueguim – kana, 2014). The development in poultry farming as a source of self-employment has resulted in the establishment and proliferation of small-scale feed mills for poultry. Some of these feed mills have been unable to meet the quality standards required of poultry feeds, resulting in quality issues with some feeds sold on the open market. Because sustaining the physiological function of the poultry, which influences the productivity and safety of the consumer birds (Lateef and Gueguim – kanar, 2014), the quality of poultry feeds in terms of nutritional content as well as microbial safety cannot be compromised.

As a result, quality poultry feed manufacturing is critical to the success and operation of any poultry company. A suitable amount of protein and carbohydrates, as well as the necessary vitamins, dietary minerals, and an acceptable supply of water, are required for healthy poultry. 2010 (Gillespie and Flanders). Lactose-fermentation of feed can help chickens get more vitamins and minerals. Pitino (Pitino, 2014). Laying chickens need 4 grams of calcium per day, of which 2 grams are needed in the egg. Oyster shells are a common source of calcium in the diet. Certain diets also call for the inclusion of grit, or small rocks such as granite fragments, in the feed. By crushing food as it passes through the gizzard, grit promotes digestion. Damerow (2012; Damerow, Damerow, Damerow, If commercial feed is utilized, no grit is required. Damerow et al., 2010. Iodine is supplemented using calcium iodate.

Feed evaluation is the process of determining the nutritional value of feed or feed ingredients, as well as their suitability for poultry. The amount of feed and the nutritional requirements of the feed are determined by the poultry's weight and age, their pace of growth, their rate of egg production, the weather (cold or wet weather promotes higher energy consumption), and the amount of nutrition obtained through foraging. As a result, a wide range of feed formulas are possible. Additional diversity is introduced by substituting less priced local ingredients. (Esonu, n.d.) The feed must be kept clean and dry at all times (Gillespie and Flanders, 2010). Poultry can be infected by contaminated feed. Fungal growth thrives in damp feed.

The purpose of this study was to determine the proximate composition of a few different poultry diets offered in the Katsina metropolis in Nigeria. This was done to ensure that feeds marketed in the city by small and medium-scale feed mills fulfilled the quality criteria set by the Nigerian Standards Organization, which is the regulating authority for feed formulation.

MATERIALS AND METHODS

Study Area

The analyses were conducted on selected poultry concentrates and mashes sold in Katsina metropolis at the Federal University Dutsin-Ma, Applied Chemistry Laboratory, Katsina state. The areas from which the samples were collected are; Kofar kwaya and also in kwado (sabon Titi) which serve as the distribution points in katsina central, Katsina state, Nigeria.

Samples/Sample Collection

Samples of eight (8) different types of feeds sold in katsina metropolis were collected and these collected samples were coded as LM, GM, LC, BS, BF, GC, BSS and SS. These were

identified as follows:

- Layer Mash- Batch Number-Solvet company 580 (LM)
- Grower Mash- ISB Number- Solvet 9809 (GM)
- Layer Concentrate (LC)
- Cars Company. 1302201808BS-Broiler Starter-Batch Number Animal (BS)
- Broiler Finisher-Batch Number-Olam KM03 (BF)
- Grower Concentrate (GC)
- Broiler Super Starter(BSS)
- Super Starter-Batch Number-Olam KM03 (SS)

Proximate Analysis

Triplicate samples of the feed were assayed for proximate composition by the method of Association of Official Analytical Chemists (AOAC 2005).

Moisture Content Determination

The moisture content determination was carried out by drying 2g of the samples to a constant weight in an oven at 120^{o}C for about three hours. This was done by the difference between the net weight and the weight after drying to a constant weight. The final weight determined after cooling in a desiccator for about 35minutes. AOAC (2005).

Ash Content Determination

The ash content of the samples were determined by drying crucibles in an oven for 24hours. The crucibles were then cooled in a desiccator and their weights taken (W1). 2g of the dried samples (W2) was placed in the crucibles and the crucibles subjected to ashing in a muffle furnace at 550^{o}C, until a constant weight of the ash was obtained. The crucibles were covered with their lids and placed in a desiccator for cooling. The weights (W3) were measured and weights of the ashes obtained by difference. AOAC (2005)

Lipid Content Determination

A dried sample was weighed (3g) into an extraction thimble. The thimble was placed into a soxhlet extractor attached to a 500cm^3 round bottom flask containing 300cm^3 of n – hexane on a heating mantle. Some anti – bumping granules were added into the flask and the refluxing condenser fitted onto the extractor. The sample was extracted under reflux for 6 hours. The heating was discontinued and the thimble was dried at 103^{o}c for 30 minutes and was cooled in a desiccator. The thimble was then weighed. The experiment was repeated using different weights of the sample, and the oil content calculated by difference (AOAC 2005).

Crude Protein Content Determination

1.0g of the dried sample was weighed into a kjeldahl flask containing 20cm^3 of distilled water, 25cm^3 concentrated sulphuric acid, 0.8g of digestion catalyst (0.7g sodium sulphate, 0.06g copper sulphate and 0.04g mercury (II) oxide red) added to the flask. The flask was then placed on the digestion unit and the contents of the flask digested at low heat to prevent frothing. After about 15 – 20 minutes, the heat was gradually raised until the contents of the Kjeldahl flask became clear and coloured pale green. AOAC (2005).

After the digestion process, the flask and content was cooled and 200cm^3 water was added. The flask was swirled for about 2 minutes and the supernatant liquid taken into a distillation flask. 50 cm^3 of water added to the flask content and the water extract transferred to the distillation flask. This was repeated for about 4 times. 150cm^3 of 30% NaOH solution was added slowly along the side of the distillation flask. Ammonia, NH_3 was then distilled into 25cm^3 of boric acid indicator solution contained in conical flask. Distillation was continued until when no more NH_3 was received. The distilled ammonia was then titrated with 0.05M sulphuric acid. AOAC (2005).

Crude Fibre Content Determination

3g of powered dried sample from moisture determination and lipid extracted was subjected to successive treatments with boiling 200cm^3 of 0.1275M sulphuric acid under reflux for about 30 minutes, washed several times with hot water until it is acid free. This treatment was again repeated with 200cm^3 of 0.313M sodium hydroxide solution, washed very well with hot water until it is base free. It was then dried in an oven set at 100^{o}C to a constant weight. Next it was cooled in a desiccator and then weighed. The weighed sample was then incinerated in a muffle furnace at 550^{o}C for 2hours until a constant weight. The crude fibre was then calculated as the loss in weight on ashing, AOAC (2005).

Carbohydrate Content Determination

The carbohydrate content in the samples was determined by difference. Carbohydrate = {100 – (moisture + ash + crude fibre + crude protein + lipid)}. (Bukar and Saeed, 2014)

Statistical Analysis

The data obtained were subjected to one way analysis of variance (ANOVA) ($p<0.05$) to see whether they varied significantly between the sampled feeds. All calculations were performed using excel windows.

RESULT AND DISCUSSION

Table 1: percentage of moisture in the samples of feed

Samples	Moisture Content
LM	4.28 ± 0.25
GM	6.45 ± 0.43
LC	5.48 ± 0.90
BS	5.88 ± 0.18
BF	5.56 ± 2.66
GC	6.30 ± 0.57
BSS	6.60 ± 0.56
SS	6.66 ± 0.77

Table 2: percentage of ash in the samples of feed

Samples	Ash Content
LM	20.50 ± 0.02
GM	12.69 ± 0.29
LC	11.30 ± 0.03
BS	7.85 ± 0..02
BF	33.3 ± 0.04
GC	6.90 ± 0.93
BSS	6.31 ± 0.01
SS	8.45 ± 0.01

Table 3: percentage of crude protein in the samples of feed

Samples	Crude Protein Content
LM	5.78 ± 0.00
GM	8.24 ± 0.02
LC	3.53 ± 0.00
BS	5.13 ± 0.00
BF	3.85 ± 0.02
GC	3.53 ± 0.00
BSS	0.46 ± 0.00
SS	6.09 ± 0.01

Table 4: Percentage of Crude Fibre in the Samples of Feed

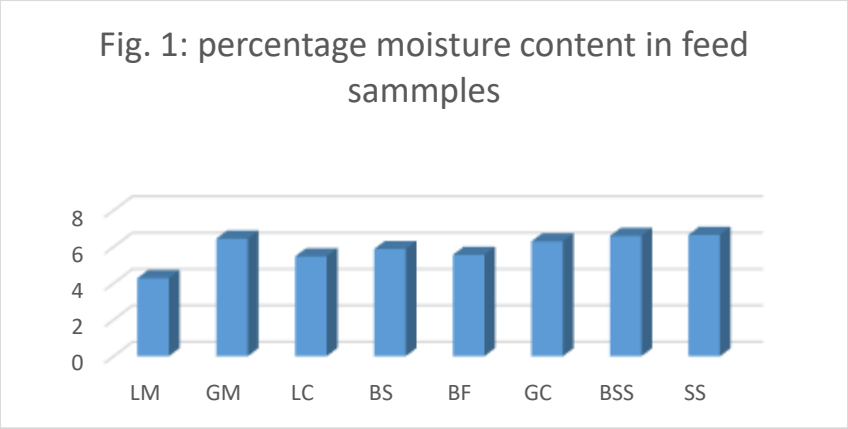
Samples	Crude fibre content
LM	2.90 ± 0.00
GM	2.11 ± 0.00
LC	1.31 ± 0.00
BS	1.30 ± 0.00
BF	3.21 ± 0.00
GC	1.03 ± 0.00
BSS	1.90 ± 0.00
SS	2.01 ± 0.00

Table 5: Percentage of Lipid in the Samples of Feed

Samples	Lipid Content
LM	0.11 ± 0.00
GM	1.27 ± 0.00
LC	1.01 ± 0.00
BS	1.90 ± 0.00
BF	2.30 ± 0.00
GC	1.20 ± 0.00
BSS	1.00 ± 0.10
SS	0.90 ± 0.00

Table 6: percentage of carbohydrate in the samples of feed

Samples	Carbohydrate Content
LM	66.51 ± 0.19
GM	69.41 ± 0.68
LC	77.37 ± 0.93
BS	77.93 ± 0.20
BF	51.78 ± 2.68
GC	81.04 ± 0.64
BSS	83.72 ± 0.57
SS	75.87 ± 0.76



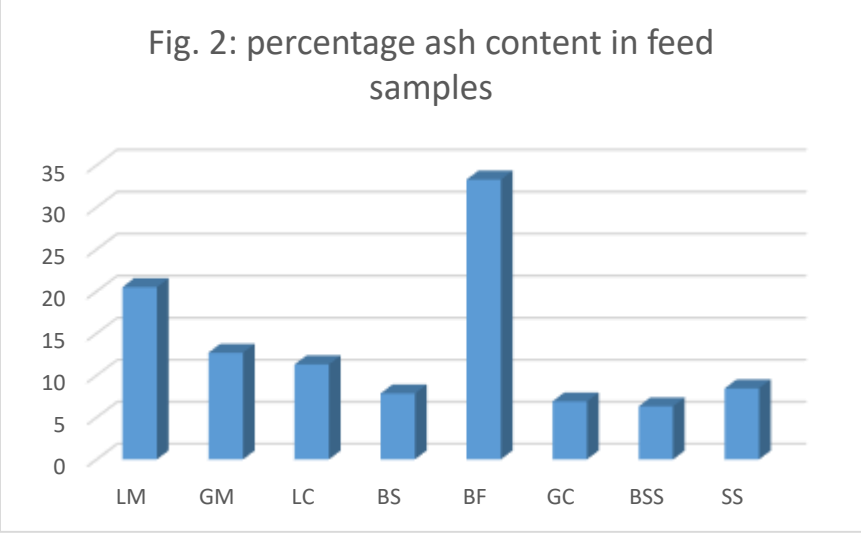


Fig. 3 : percentage crude protein content in feed samples

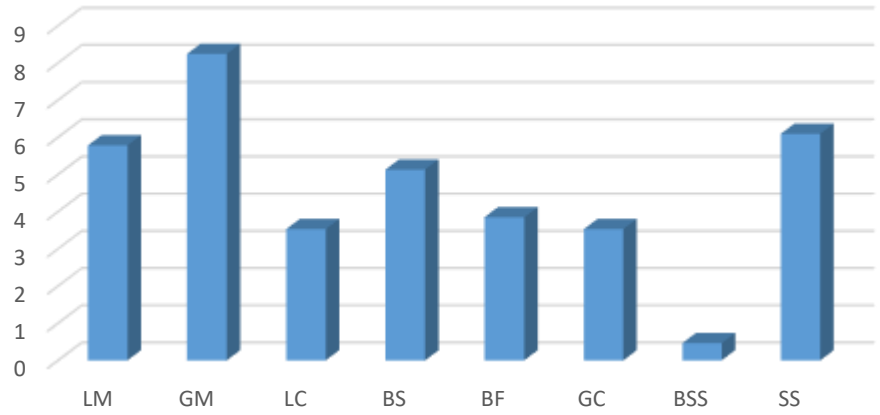
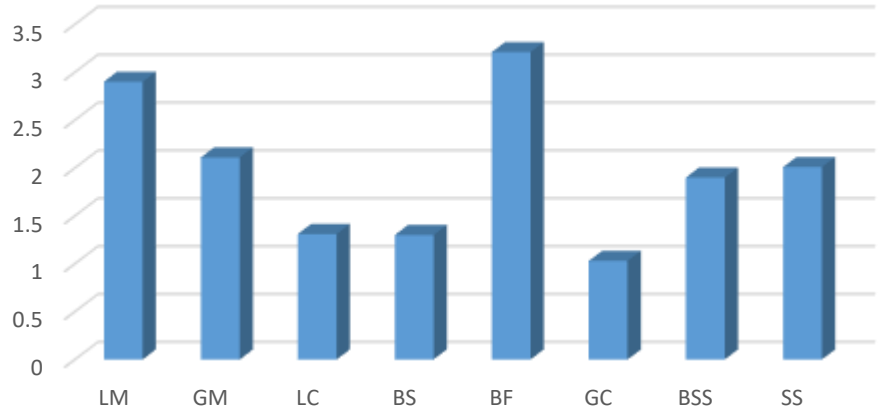
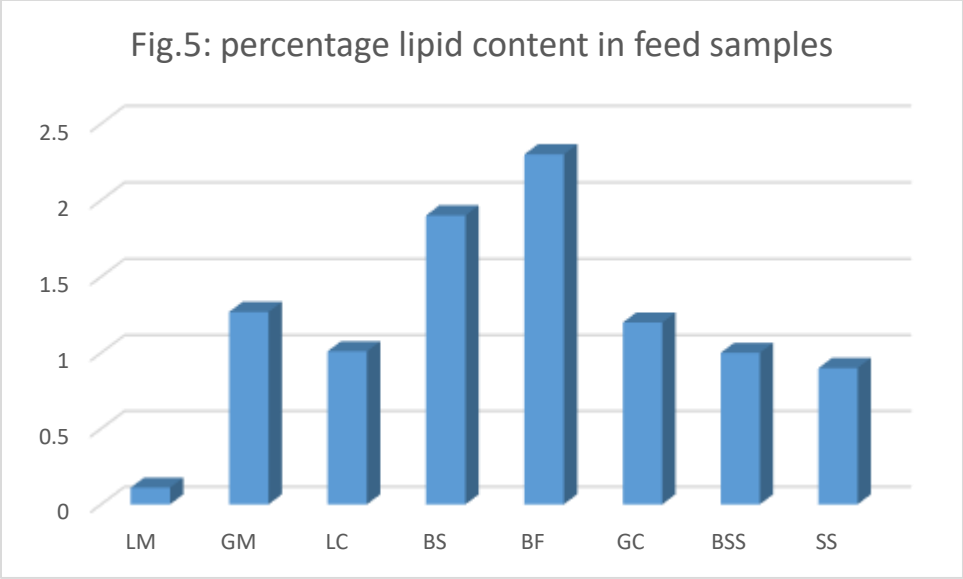
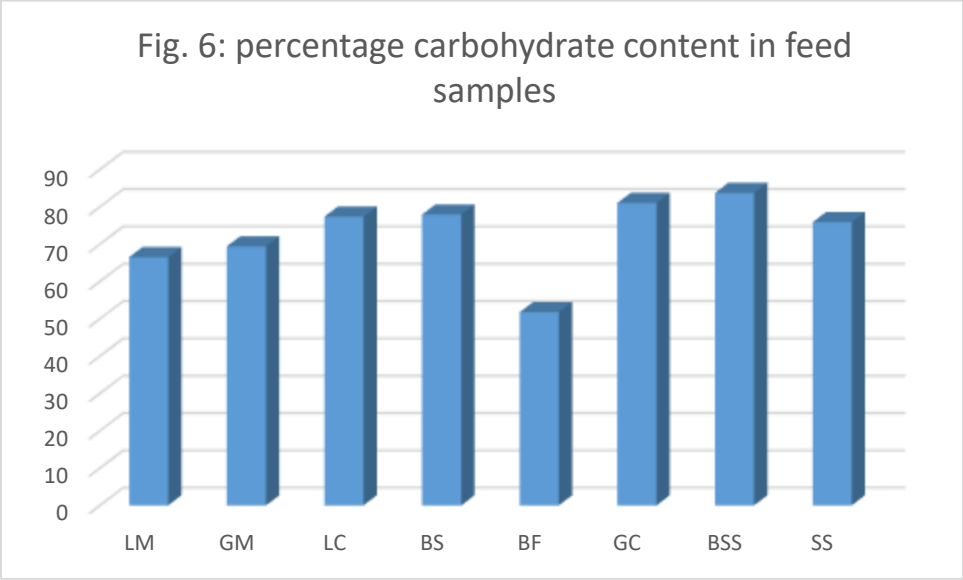


Fig. 4: percentage crude fibre content in feed samples







Proximate analyses of the various poultry feeds as shown in figures above showed similar nutrients composition.

Moisture Content

Table 1 and fig. 1 show the percentage moisture content of the feed samples. The moisture level of feed samples in layer mesh (LM), grower mesh (GM), layer concentrate (LC), broiler starter (BS), broiler finisher (BF), grower concentrate (GC), broiler super starter (BSS), and super starter (SS) ranged from 4.28 ±0.25 to 6.66 ±0.78 percent (SS). The moisture content of layer mesh (LM) was the lowest at 4.28±0.00 percent, while super starter (SS) was the highest at 6.66 ±0.00 percent. The moisture content values in this result are similar to those in Bukar and Saeed's (2014) report (11.23 ± 4.48 – 04.98 ±1.58).

The results in the study indicates minor differences in the quality of chicken feed from various manufacturers. Because the moisture content is within the upper limit of 12 percent advised by the regulatory organizations of NIS and SON, this finding indicates that these feeds will store well and resist fungal attack (2018).

The results obtained from this research effort are near to the SON guidelines of Broiler Feed 9.06 ± 0.20, Layer Feed 9.22 ± 0.30, Starter Feed 7.84 ±0.40, and Grower Feed 10.64 ±0.40, and the findings are recommended. One of the most critical nutrients for broilers is water.

Ash Content

The percentage ash content of the feed samples LM, GM, LC, BS, BF, GC, BSS, and SS was shown in Table 2 and Fig. 2. The percentages varied from 6.31 0.01 to 33.30 0.04 percent. BSS has the lowest proportion of 6.31 percent, whereas BF has the greatest ash content (33.30 percent). The ash content in this study compares favorably to Nworgu (2007)'s prior feed analysis (6.11 ±00–10.10 ±0.97 percent), however the value achieved in BF is slightly higher. The results in the study indicates minor differences in the quality of chicken feed from various

manufacturers. Because the results in this study are greater than the SON guidelines of Broiler Feed 3.77 ±2.12, Layer Feed 6.34 ±0.30, Starter Feed 12.33± 0.40, and Grower Feed 18.85 ±0.40, the poultry may become unbalanced. Minerals are primarily inorganic feed components. Mineral elements, which occur in combination with biological substances, are abundant in the bodies of animals. The mineral content of a chicken's body is around 4%.

Crude Protein Content

Smith (2001) reported that the protein requirement of a bird can be defined as the birds' requirement for the supply of each essential amino acid together with sufficient supply of suitable nitrogenous compounds from which the non-essential amino acids can be synthesized. Amino acids are the basic fundamental structural units of protein, which are required by the birds for growth. Table 3 and fig. 3 show the percentage crude Protein content in LM, GM, LC, BS, BF, GC, BSS, and SS. The crude protein ranged from 0.46 ±0.00 percent to 8.24 ±0.02 percent, with BSS reporting the lowest value of 0.46 percent and GM reporting the highest value of 8.24 percent. The values in this report are lower than those provided by Nigeria's regulatory organizations. For chicken diets, the NIS - SON revised edition recommended a crude protein concentration of 12–22%. (Source: NIS-SON 2018). Growth and for repairing worn out tissues (Smith, 2001). Improvement is highly needed on this part from feed manufacturers.

Crude Fiber Content

The percentage Crude Fiber Content is presented on table 4 and fig. 4. The fiber content ranged from 1.03 ± 0.00%, - 3.21 ± 0.00% with GC having the least fibre content of 1.03%. BF showed the highest fibre content of 3.21%. This range of values compares fairly with earlier work done by Bukar and Saeed (2012) but falls below the regulatory standard of NIS – SON in Nigeria. The standard reported for SON is in the range of 5 -8% (NIS – SON, 2018).

Dietary fiber is thought to provide important protection against some gastrointestinal diseases and to reduce the risk of other chronic diseases as well. Dietary fiber levels have been shown to affect broiler chickens' feed intake.

Lipid Content

The percentage Lipid content of the samples of feeds is presented on table 5 and fig.5. The percentage ranged from 0.11 ± 0.00% - 2.30 ± 0.00. The least lipid was found in LM samples with 0.11% and the highest value in the BF samples with 2.30%. Though the regulatory body in Nigeria recommended a maximum limit of 4 – 5% crude lipid, the minimum was not stated (NIS – SON, 2018).

Carbohydrate Content

Table 6 and fig. 6 show the carbohydrate composition of the feed samples. The samples had values ranging from 51.78 ±2.68 to 83.72 ± 0.57 percent, with BF having the lowest amount at 51.78 ±0.00 percent. With 83.72±0.00 percent of the total, BSS had the most content. The study's data indicates minor differences in the quality of poultry feed from various manufacturers. The results of this study are quite similar to the SON recommendations of Broiler Feed 55.28 ±1.24, Layer Feed 52.56 ±4.62, Starter Feed 48.09 ± 5.37, and Grower Feed 36.67 ±3.32. During maintenance, acquired energy is used to balance the catabolic and anabolic processes and result to no net energy retention in the body (Sakomura, 2014)

CONCLUSION

Some of the feeds did not match the acceptable criteria set by SON and NAFDAC for poultry feeds, according to the findings of this study. To assure quality, strict adherence to established standards must be maintained. Quality poultry feed production and delivery are critical to the profitability of any poultry operation, and this quality must be maintained to avoid chemical and microbiological contamination. If the quality of the feeds is not carefully monitored, microbial infection can readily be passed on to humans who consume chicken products.

RECOMMENDATION

Active feed biotechnology research should be supported in order to offer sufficient and adequate quantities of feed components that improve feed quality. Government and private sector monitoring procedures should be established to verify that all feeds produced adhere to proper quality control methods that assure the safety of poultry products. To improve the nutritional content of chicken feeds, the quantity and quality of additives added to feeds must be increased.

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