

TECHNICAL ASSISTANCE FACILITY

Poultry Feed Sector Assessment

POULTRY FEED REPLICATION

Summary Report

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Summary

This report is based on a scoping visit to Sierra Leone and engagement with the six largest poultry companies in the country. The Sierra Leone poultry industry is positioned to grow rapidly over the next decade. Increasing local and regional demand for chicken and chicken products presents significant investment opportunities, but challenges are faced by the sector. At the input level, there is high demand for day-old chicks, feed, vaccines and vet services. Poor quality locally hatched chicks, lack of local vet expertise and poor availability of vaccines and medication are all factors that need to be addressed.

At the production level, farmers possess limited knowledge of feed formulation and modern poultry husbandry practices. Partnerships with local training institutions, regional consultants, international genetics suppliers and providers of veterinary medicines and services should be explored.

Opportunities also exist in large-scale quality feed production. Inconsistent access to well-formulated and manufactured feed remains a limiting factor to growth. The lack of reliable commercial feed mills has resulted in the proliferation of on-farm feed production, which is inefficient.

The key to providing a stable and consistent feed quality is transitioning away from animal-protein-based diets. Corn- (maize-) and soya-based diets offer stability and predictability, making them far superior to diets based on animal proteins.

Poor on-farm productivity remains a major challenge to growth and must be addressed simultaneously with efforts to improve the feed sector. There is significant evidence of inadequate biosecurity procedures, sub-standard production systems, poor bird and feed management, and feed wastage. In most cases, producers do not achieve the breed's genetic potential.

Adoption of modern production systems and transitioning from floor to cage production will reduce feed consumption by an estimated 15%. This is significant and especially important in a country where feed costs are consistently high. While the cage laying system may pose some ethical questions with regards to bird welfare, a well-managed cage system provides a good environment for poultry, and massive cost and productivity advantages over the traditional floor system.

Exciting opportunities exist to avoid the costly mistakes made in other regions by adopting industry best practices now, while the industry is still in its infancy.

Opportunities

The following opportunities were identified for the poultry sector.

Breeding and hatchery

- Establishing breeding farms for layers and broilers
- Importing and distributing day-old dual-purpose breeds
- Exporting fertilised eggs to neighbouring countries
- Exporting day-old chicks across the region
- Investing in efficient hatcheries
- Transferring knowledge on breeding and hatchery techniques.

Layers

- Raising pullets for sale to farmers
- Raising pullets for farmers in out-grower schemes
- Transferring knowledge on efficient production systems.

Broilers

- Investing in out-grower schemes for year-round production to supply processing companies

- Transferring knowledge on broiler production.

Feed

- Investing in commercial maize and soybean production out-grower schemes
- Investing in efficient feed mills
- Investing in laboratories or test kits to assess feed quality
- Establishing a feed formulation consultancy.

Value addition

- Investing in processing facilities
- Investing in cold chain, storage and transport
- Processing poultry products.

Veterinary services

- Importing and distributing drugs and vaccines
- Providing veterinary and bird health services.



The Sierra Leone feed sector

Assessment of feed combinations being developed by main producers

Nutrition in the poultry context is the combination of feed formulation, water quality and water/feed management. Poultry diets are mostly complete feeds and supply total daily requirements, apart from water. Today's modern breeds of chicken require specially formulated feed to allow their genetic potential to be reached.

Nutrition is the most important factor affecting performance, productivity, and profitability. The improvement of productivity through better nutrition is determined by the availability of nutrients, type of feeding system and the level of feed management. Feed accounts for **65–70%** of the total cost of poultry production.

To keep costs to a minimum, it is important to provide the birds with a balanced diet that meets their nutritional requirements based on age and physiological stage. Any prolonged deficiencies result in loss of condition and production, and can lead to the development of serious nutritional diseases.

The safety and quality of poultry feed is vital in ensuring that no hazardous substances enter the food chain that could potentially affect human health. A major constraint to poultry development in many developing countries is the inadequate quantity and quality of well-formulated feeds.

All the producers visited as part of this assignment kept laying birds and this assessment focuses on layer feed only. Usually, layers progress through four or five phases of feed throughout the rearing and production cycle. In Sierra Leone and many other developing countries, a three-phase diet is common practice. Industry standards are indicated in Table 1.

Pullet starter (chick mash)

Chick mash, also known as starter mash or starter feed, is a high protein feed designed to meet the dietary requirements of newly hatched chicks. The high protein content, usually between 20% and 22%, helps young chicks grow fast and develop strong immunity to common diseases. Starter mash promotes a strong body framework resulting in an early laying point and contains an anti-coccidial to help prevent coccidiosis, an intestinal infection which young birds are vulnerable to.

Pullet grower (growers mash)

This feed is designed to help pullets (growing layers) transition from immature birds into healthy adult laying birds. It is usually fed from eight weeks and is formulated to ensure that sexual maturity is reached. Grower feed also contains an anti-coccidial to help prevent coccidiosis.

Layer (layers mash)

Layer diets are formulated to meet the energy and protein requirements of laying birds throughout production and should promote good health and well-being in the bird, as well as supporting excellent egg production.

In tropical conditions, such as Sierra Leone, regular feed quality monitoring is recommended, as fat oxidation, bacterial load, and mycotoxins are more critical in these conditions.

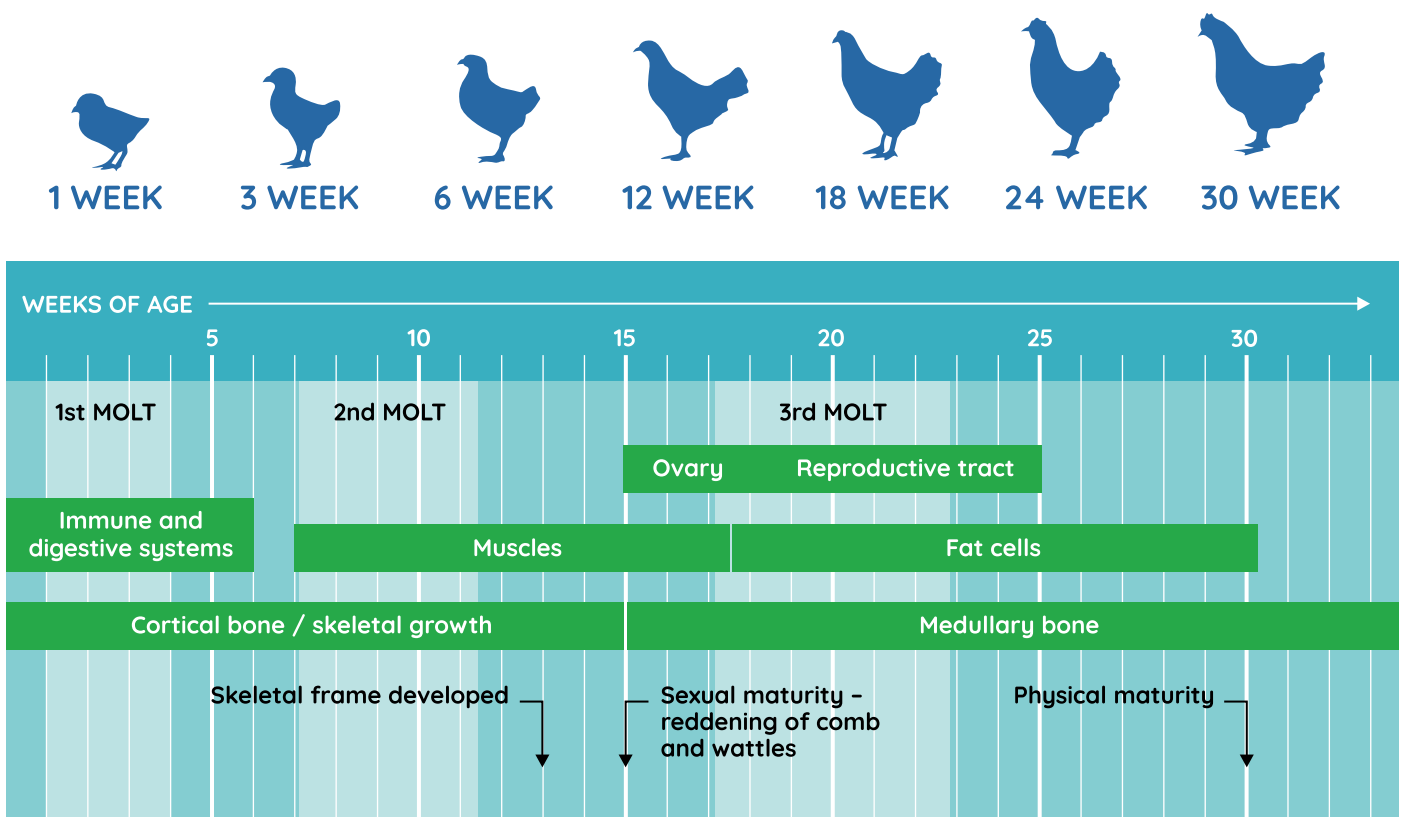
Table 1. Recommended phase feeding

FEED	AGE (WEEKS)	% CRUDE PROTEIN	ENERGY (Kcal)	% CALCIUM
Pullet starter	0–8	19–20	2,870–3,040	1.0
Pullet grower	8–16	17.5	2,800–3,020	2.0
Layer	16–90	16.0–16.5	2,750–3,000	4.2–4.8

During the assessment, companies raised the following feed related issues:

- Inconsistent feed formulation due to seasonal price fluctuations of locally sourced raw materials
- Increased cost of imported concentrates due to current high exchange rate
- Laying production potential not met:
 - Firm A: Laying production rarely exceeds 85%, (5-10% lower than the breed's genetic potential and industry standard)
 - Firm B: Laying production is currently between 75% and 85%. (5-15% lower than the breed's genetic potential and industry standard)
- Firm B : Laying production between 35% and 65%. (35-55% lower than the breed's genetic potential and industry standard)
- Lack of qualified vets to support the industry
- No availability of groundnut or soybean cake
- Issues with excess fatty deposits in birds fed a diet that includes high levels of palm oil cake
- Finance required to scale up successful soybean trials.

Figure 1. Development of a laying bird



Source: Hy-Line Brown Management Guide

Developing feed formulas to regional and international standards

Formulating for success

Feed formulation is a process of quantifying the amounts of feed ingredients that need to be combined to form a single mix or diet for livestock. With regards to poultry, the feed should be formulated to supply the flock with its total nutrient requirement.

Least-cost formulation is the process of matching the nutrient requirements of a class of animals with the nutrient contents of the available ingredients (raw materials) in an economic manner. In order to do this effectively, a nutritionist needs to know the:

- Nutrient requirements of the class of poultry (e.g. egg layers, meat chickens or breeders)
- Feed ingredients in terms of nutrient composition and constraints in terms of nutrition and processing
- Cost and availability of the ingredients.

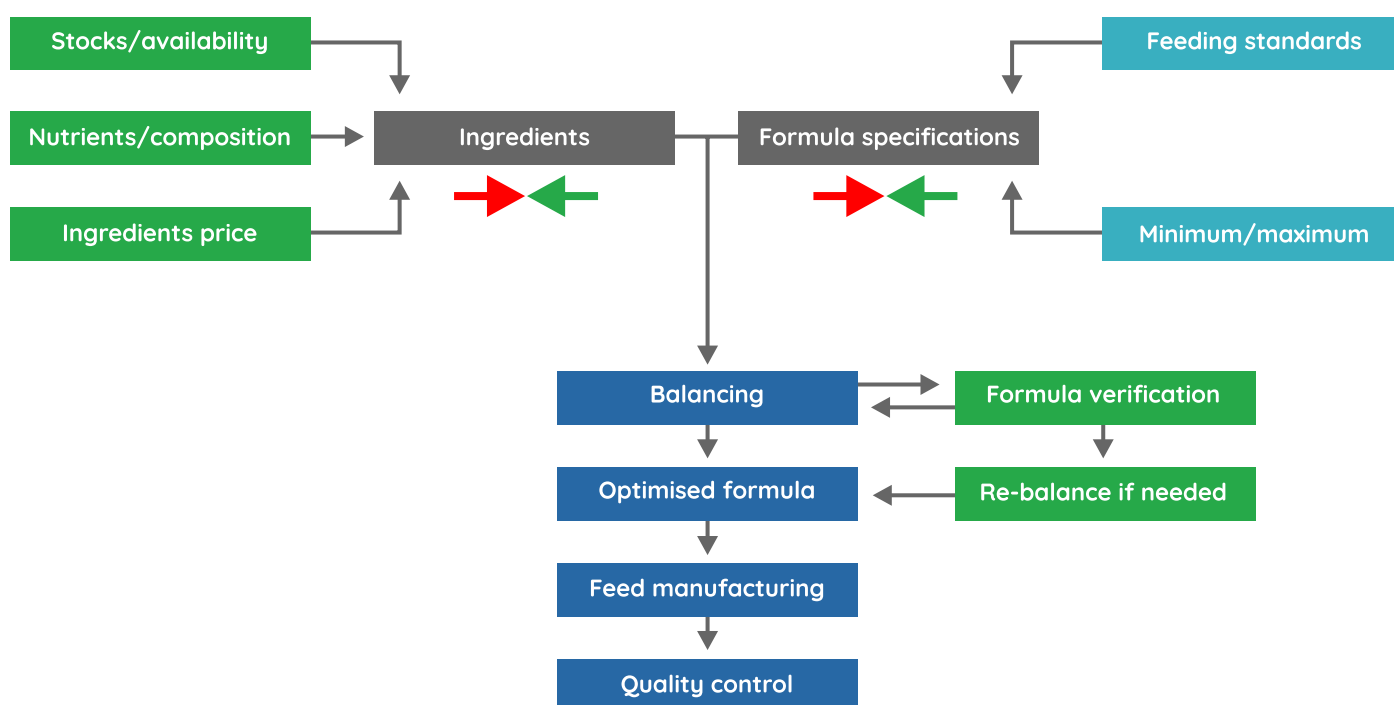
Large commercial farms

Most large commercial poultry farms whether on the African continent or elsewhere, have their own feed mills and employ nutritionists who possess a thorough understanding of the science of feed making. Smaller, medium-sized poultry operations and feed manufacturers usually rely on consultant nutritionists for assistance with formulating a quality feed. Where access to a consultant is impractical due to availability or cost, a medium-sized producer will usually rely on a commercial feed mill for their feed.

Small-holder farmers

Due to the prohibitive cost of feed making equipment, it is usually impractical for small-holder poultry farmers to manufacture their own feed. Many have attempted to make their own feed but due to economies of scale, quickly establish that it is not practical. Furthermore, failure to achieve a high quality of feed can mean severe economic losses from which they may never recover. Most small-scale poultry farmers, therefore, purchase their feed from a commercial feed mill.

Figure 2. Least-cost feed formulation process: Dealing with variables and constraints



Source: Iani Adrian CHIHAIA



Challenges in developing feed formulas in Sierra Leone

Inconsistent feed formulation

Due to the lack of well-established commercial feed mills in Sierra Leone, most producers have been forced to manufacture their own poultry feeds. Almost all formulas currently in use are based on imported concentrates which contain essential vitamins, minerals and additives, in addition to protein. These formulas are designed to complement the concentrate's nutritional value and composition, and provide a balanced final feed when mixing ratio is followed correctly.

As a result of seasonal price fluctuations in the cost of locally sourced raw materials, frequent adjustments are made to the original formulas, not always on a least-cost basis. Challenges with cost and availability of foreign exchange (FOREX) have resulted in concentrate inclusion levels being adjusted downwards, in many cases below recommendations, resulting in a sub-optimum final feed.

Unavailability of local expertise

To successfully modify or alter a formula it is imperative that the feed manufacturer or producer has a good understanding of the nutrient requirements of the particular class of poultry. The nutrient requirements of each of the major poultry breeds can be found online or through other mediums. Of the six local producers engaged during this assignment, only two had access to this information and referred to it when making changes.

Understanding feed ingredients in terms of nutrient composition is an important requirement for poultry feed formulation. Further, constraints in terms of nutrition and processing must also be taken into account. *There are currently no qualified animal feed nutritionists based in the country that could provide this expertise.*

Lack of feed analysis services

Laboratory analysis of feed and raw materials provides the best indication of nutrient availability, allowing the feed to be utilised to its full potential. Reliable nutritional information is vital to the poultry industry.

The lack of proven feed testing facilities in Sierra Leone forces producers to rely on information sourced online, from other farmers, or costly trial and error.

Assessment of what additional steps, ingredients or procedures are needed to improve the quality of poultry feed

Improving ingredient quality

The most commonly used raw materials in the Sierra Leone feed production sector are listed in Table 2.

Table 2. Raw materials for feed production

RAW MATERIAL	CHARACTERISTICS
Maize	Consistent quality, high energy content, easy to grow locally, easy to store, easy to process
Wheat bran	Stable source of fibre, subject to global trade bottlenecks
Rice bran	Stable source of fibre, available locally or in the region
Fishmeal	High protein content, risk of salmonella contamination, expensive if imported, unhygienic when locally sourced
Blood meal	High protein content, risk of salmonella contamination, difficult to store
Concentrate	Stable, high quality, affected by FOREX costs
Soya cake	High protein if expelled, high energy content when extruded, very stable product that is easy to store and process, good digestibility, easy to grow locally
Groundnut cake	High protein, can be unstable if stored incorrectly, high energy content
Palm oil cake	Medium protein content, very high oil content makes it difficult to store and process
Sunflower cake	Good protein levels, can be grown locally, limited by a 10% maximum inclusion level
Limestone powder	Not currently available locally, very stable and easy to handle
Oyster shells	Available locally, high calcium content, require additional cleaning and sterilisation

Efforts should be made to transition away from animal-based protein sources as soon as possible. Animal protein is expensive when imported and unhygienic when locally sourced, which creates the risk of contamination.

Oyster shells offer a good alternative to limestone powder. There are associated risks however, due to the varying degrees of hygiene at the source. Each feed producer should wash and sterilise the shells before introducing them to the feed. This will reduce risk of contamination further along the food chain.

Improving feed formulations

- Create a database of locally and regionally available raw materials
- Send all raw materials to a regional lab for analysis and use results as a baseline for future feed formulation
- Identify a regional/international nutritionist that can provide feed formulation services to the local feed producers in the short to medium term
- Work with local universities and colleges to identify potential candidates to be trained in animal feed nutrition.

Adopting feed mill best practice

Manufactured feed is formulated to meet specific animal nutrition requirements for different species of animals at different life stages. *According to the American Feed Industry Association there are four basic steps:*

1. Receive raw ingredients: Feed mills receive raw ingredients from suppliers. Upon arrival, the ingredients are weighed, tested and analysed for various nutrients and their quality and safety is ensured
2. Create a formula: Nutritionists work with scientists to formulate nutritionally sound and balanced diets for livestock. This is a complex process, as every species has different nutritional requirements
3. Mix ingredients: Once the formula is determined, the mill mixes the ingredients to create a finished product
4. Package and label.

Recommendations for feed producers to improve the quality and performance of feed

- Inspect every batch of raw materials prior to offloading: Rubbish in = Rubbish out
- Implement a first in, first out inventory system
- Store each raw material properly, for example, use wooden pallets to avoid moisture damage
- Place each raw material in a specific part of the feed mill and label for easy identification
- Create the ideal mixing sequence for each formula to increase efficiency
- Treat raw materials that have been stored for extended periods to avoid infestation and subsequent deterioration in quality
- Maintain and clean milling and mixing equipment regularly to reduce downtime and contamination
- Control rodents: *As few as 100 rats can devour more than a tonne of feed in a year*
- Phase out the use of floor mixing, which is unhygienic and produces inconsistent results, and use a mechanised feed mixer.

Annex A . Recommendations

For engagement with the Sierra Leone Standards Bureau and Milton Margai Technical University

Date of meeting: 16 September 2022

Contact person: Mr Osman Bah

In attendance: Alexander Stewart, Consultant for Invest Salone; Avril Pratt, Consultant for Invest Salone

Findings

- There are currently no national feed standards
- There is an Egg Standard in place
- The Economic Community of West African States (ECOWAS) is in the process of creating a regional animal feed standard
- The Sierra Leone Standards Bureau (SLSB) will be a signatory to the new **regional animal feed standards**
- ECOWAS have requested that SLSB provide a draft animal feed standard for Sierra Leone.

Recommendations

National feed standards

National feed standards should be created. These standards should form part of the overall National Livestock Policy and be the formal framework upon which the animal feed industry will develop.

National Livestock Policy

A National Livestock Policy should be created. The aim of the policy is to create the conditions that foster food security and income generation for poverty reduction. In addition, it will promote local production of livestock and livestock products. This policy should be formulated through a consultative and participatory process involving a wide spectrum of key stakeholders in both the public and private sectors, policy-makers, traders, farmer's organisations, academics, civil society, non-governmental organisations and development partners.



For engagement with Milton Margai Technical University

Date of meeting: Saturday 24 September 2022

Location: Goderich Campus – Freetown

Contact person: Dr Sankoh, Research director

The aim of the meeting was to establish whether Milton Margai Technical University (MMTU) has sufficient capability to test and analyse poultry feed locally.

Findings

- Testing equipment is available for crude protein, energy, fibre, fat and calcium
- The lab is certified to test materials for the Food and Agriculture Organization
- Chemicals (reagents) used for testing are not usually in stock but can be arranged with two weeks' notice
- The university is looking for income-generating activities and feed sample analysis could be one of them.

Recommendations

- A trial batch of samples should be submitted for analysis as soon as possible; they should be of the same type as those sent to the lab in South Africa (RSA)
- Results of the local analysis should be compared with the RSA (benchmark)
- Future cooperation with MMTU should be based on the accuracy of the results
- Efforts to identify a lab in the ECOWAS region should be made at the earliest possible opportunity with the aim of providing an alternative to RSA.

Recommendations for a programme of support for feed producers

Phase I: Feed formulation assistance

Identify and engage a consultant with knowledge in feed formulation and manufacturing using locally available materials.

Consultant to:

- Create a database of local and imported raw materials including their nutritional values
- Assist the identified feed producers to create optimum least-cost feed formulations
- Identify operational weakness in the producer's feed mills and make recommendations
- Monitor performance of redesigned formulas.

Phase II: Poultry feeds and nutrition course

Design and offer a poultry feeds and nutrition course.

- Engage a local university to create a poultry feeds and nutrition course designed to inform the identified producers about the main theoretical and practical aspects of feed production
- Identify and engage a consultant to assist the university to create the course
- Arrange a study tour of a feed mill in the region to give participants the opportunity to increase their knowledge and skills in feed manufacturing.

Recommendation of additional training for poultry producers who are purchasing the feed

Feed management training

A basic guide in video and brochure format should be designed in both English and the local dialects. The guide should cover:

- Poultry feed terminology
- Best type of feed for each phase of growth
- How to calculate the expected consumption
- How to transport feed to avoid losses
- How to store feed for maximum shelf life and quality
- How to apply feed while minimising wastage
- How to record and monitor consumption
- How to monitor and record performance
- How to manage water – this has a direct effect on feed consumption
- Basic troubleshooting when things go wrong.

Recommendation of opportunities in scaling the feed operations of the producers and expansion of sales into neighbouring countries

Identified producers are not currently ready for exports into the region. A lot of effort is required to improve the quality and consistency of locally produced feeds. Best practices must first be adopted and implemented to ensure a strong, stable and efficient local feed manufacturing industry prior to any exports taking place.

Once the local feed producers have achieved consistency in supply and quality, a review of their business capabilities and capacity should be undertaken with the aim of creating a roadmap for exports which could include training in legal contracts and intellectual property, freight logistics, supply chain management, and pricing and export finance.



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