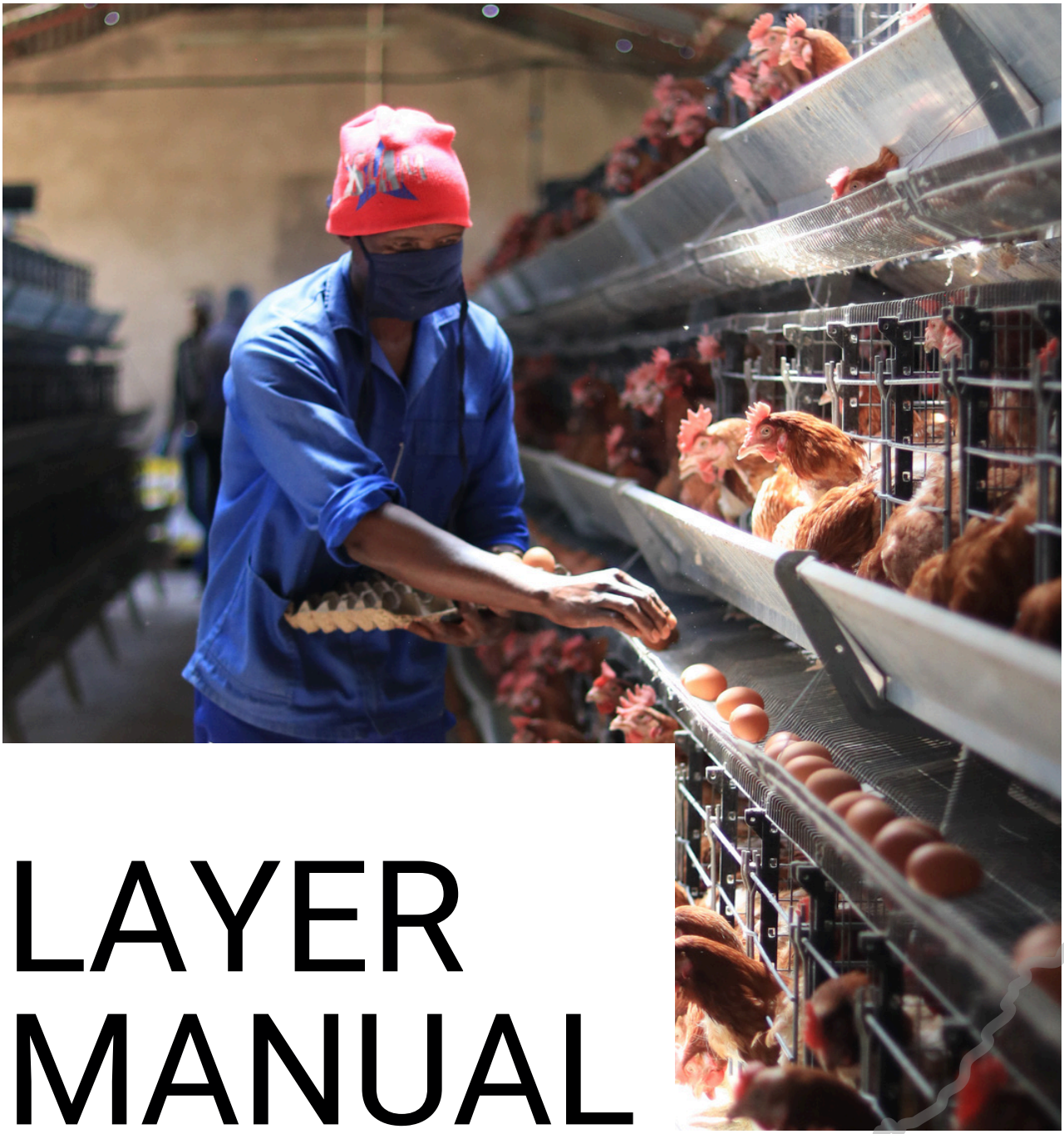
USDA

LAND O'LAKES VENTURE37



LAYER MANUAL

LESOTHO

JUNE 2025

World Poultry Foundation

Rural Self-Help Development Association

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR

KWAZULU-NATAL POULTRY INSTITUTE
POULTRY MANAGEMENT TRAINING CENTRE
SINCE 1991

Disclaimer

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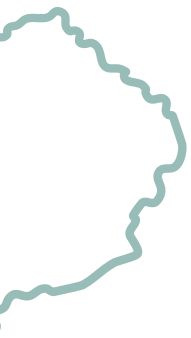


Introduction

‘STEPS’ Project Overview

Venture37 is implementing the United States Department of Agriculture (USDA) Food for Progress-funded Sustainable Transformation of Enterprises in the Poultry Sector (STEPS) in 7 districts in Lesotho (Maseru, Berea, Leribe, Butha-Buthe, Mafeteng, Mohale’s Hoek, and Quthing). STEPS aims to improve productivity and the business enabling environment in the poultry sector of Lesotho by segmenting the complex poultry market, supporting actors regardless of their current capacity, organizing producers in Buyer Hubs to unlock economies of scale, and spurring innovation across the poultry sector to provide inputs and markets to poultry producers.

Venture 37

Land O'Lakes Venture37 (hereafter “Venture37”) is a nonprofit organization committed to helping communities around the world build economies by strengthening local agriculture, helping agribusinesses create jobs, and linking farmers to markets. Since 1981, it has implemented over 315 integrated dairy, livestock, and crop development programs in nearly 80 countries —creating lasting impact by linking farmers, businesses, and the public and private sectors in local and global contexts.

Rural Self-Help Development Association

Rural Self-Help Development Association (RSDA) was established in 1991 as a Lesotho-registered non-governmental organization. Its aim is the eradicate hunger and improve livelihoods of rural Basotho. Their vision is to assist farmers and community organizations to run their own affairs and improve their livelihoods through sustainable agricultural practices. They do so by activating and supporting self-help to then ensure sustainable livelihoods. RSDA is an important partner in the STEPS project, overseeing the growth and development of the dual-purpose value chain in Lesotho, as well as leading farmer training in the field.

World Poultry Foundation

The World Poultry Foundation (WPF) is made up of a team of experts in poultry and sustainable development dedicated to building access to poultry and empowering farmers worldwide. Simply put, we're poultry people helping poultry people—focused on creating long-term impact in rural communities through innovative and sustainable poultry programs.

At the World Poultry Foundation, we envision a world with efficient, self-sustaining poultry value chains, where farmers have access to the resources, knowledge, and support needed for their poultry enterprises to thrive, ultimately leading to improved livelihoods and a brighter future for farming communities.

International Livestock Research Institute (ILRI)

The International Livestock Research Institute (ILRI) was established in 1994 as an international not-for-profit livestock research organization. ILRI works to improve food security and nutrition and reduce poverty in developing countries through research for efficient, safe, and sustainable use of livestock. ILRI is a CGIAR research centre, a global research partnership for a food-secure future. CGIAR science is dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources and ecosystem services.

KZNPI

The KwaZulu-Natal Poultry Institute (a registered, privately-run, non-profit organisation) is a poultry training facility in Pietermaritzburg, South Africa. It was established in 1991 and is dedicated to training and mentoring people across Africa involved in all aspects of poultry farming. They train subsistence farmers, small-scale producers and the staff of large integrated companies as well as technical advisors to the poultry sector.

Curriculum Development Background

As part of the STEPS project, the World Poultry Foundation (WPF) led activities to improve access to relevant, quality poultry information, increase poultry production, and strengthen the capacity of poultry producers to scale up egg and poultry meat production. The WPF facilitated the development of a curriculum tailored to the Lesotho context to improve poultry rearing and production practices across several breed types: layers, broilers, and dual-purpose birds.

To support the curriculum development process, the WPF formed a Working Group (WG) comprised of relevant organizations and government ministries in Lesotho. While the broader WG was comprised of a wide range of relevant parties, there was also a core group to provide detailed feedback on the approach and tailoring of curriculum content. Those core member organizations included:

- Lesotho Agricultural College
- Department of Livestock Services
- National University of Lesotho
- National Curriculum Development Centre
- Department of Marketing

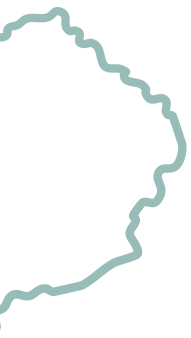
The primary objective of the WPF + STEPS Poultry Curriculum Development Working Group was to collaboratively develop context-specific curricula for poultry farmers in Lesotho. This helped to ensure the curricula aligned with the unique needs and realities of the local poultry sector in Lesotho, supporting farmers in improving their production practices and business outcomes. The WPF is grateful for the time, energy, and input the Working Group provided throughout the development process.

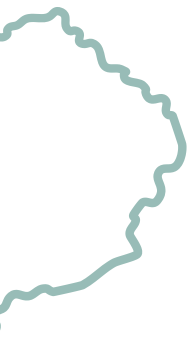
The content of this manual was also reviewed by several external experts for validity and consistency. Content was inspired by and fact-checked through interviews with Basotho farmers. Content is also grounded in the WPF team's knowledge and experience developing Dual-Purpose Poultry value chains across Africa. Finally, this content will be refined and further tailored based on the training pilot with farmers planned for 2025.

Manual Overview

The manual is intended to address the whole process of layer production, from farm to fork, as part of a food system; the network required to ensure food is produced to reach the consumer in an effort to reach zero hunger. The main topic areas covered:

- in this manual include:Introduction to Single-Purpose Layers
- Housing Design and Management of the Environment
- Management of Chicks and Pullet Rearing
- Management of Point of Lay and Egg-Producing Birds
- Bird Health and Biosecurity
- Business Skills for Egg Producers





1. Introduction to Single-Purpose Layers

Introduction to Layers

Poultry bred solely for producing table eggs are referred to as commercial layers (Photo 1.1). These birds have been selectively bred over many years specifically for egg production, making them significantly different from broilers, which are bred for meat. Selection for egg production has resulted in a fine-structured, smaller bird with excellent fertility but poor meat production. Layers are also different from dual-purpose birds, which are used for both meat and egg production. Male chicks from layer breeds grow very slowly and produce little meat; therefore, they are usually culled as day-old chicks. This means layers cannot reproduce on-farm to produce similar offspring. Instead, farmers must purchase day-old chicks to rear or point-of-lay pullets (birds about to start laying) for each production cycle. However, layers outperform dual-purpose breeds in egg production. In Lesotho, there is heavy reliance on South Africa to source new stock, which can pose a risk. At the end of their production cycle, layers can be sold as meat, known as cull hens or spent layers, but their meat yield is low, and their market value is not high.

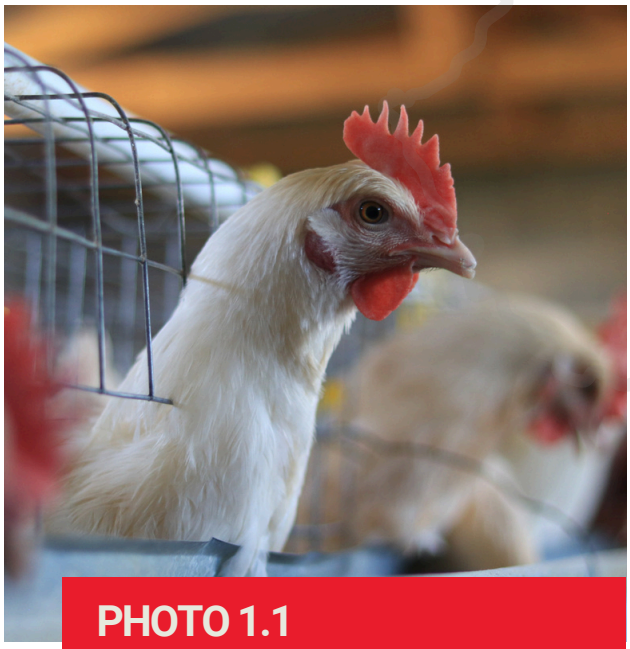


PHOTO 1.1
Layer

Definitions

Layers are hybrid birds selected for the sole purpose of egg production.
Point of Lay Pullets are layers about to reach sexual maturity and begin to lay eggs.
Cull Hens/Spent Layers are those sold for meat at the end of their production cycle.

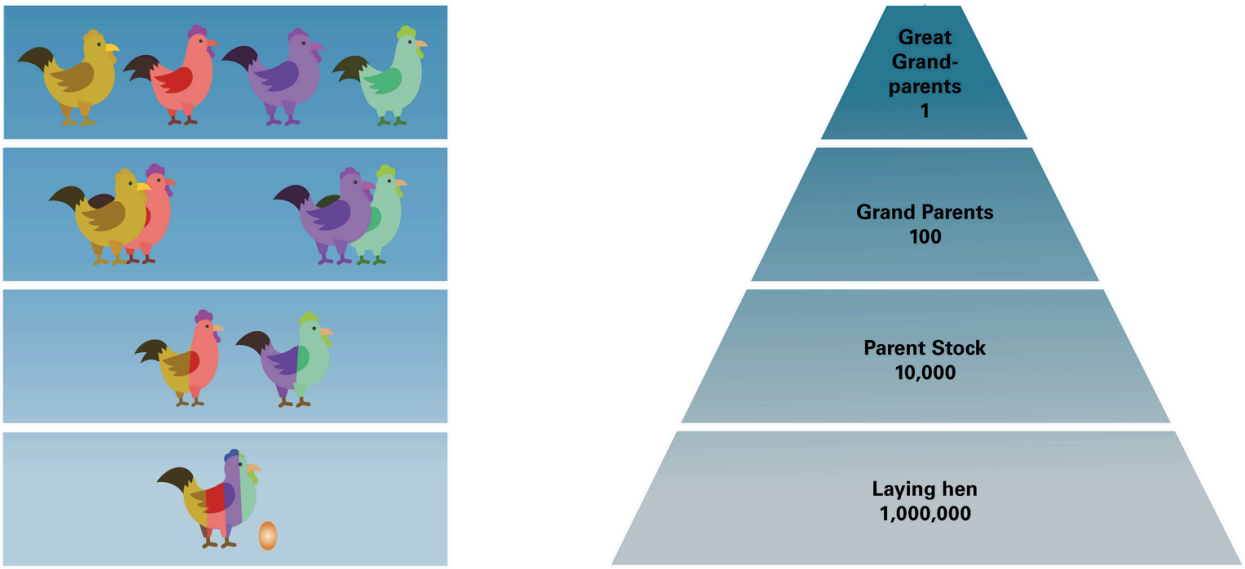


FIGURE 1.1
Breeding Pyramid

Layers are typically chosen for more commercialized production systems, where input costs and risks are higher, but the birds lay well and produce large quantities of eggs. This system relies on the availability of day-old chicks or point-of-lay pullets from producers or distributors. Over the years, genetic progress has been substantial. Provided with optimal environmental conditions and proper management, a layer has the potential to produce up to 370 eggs over 80 weeks.

Breeding and Selection of Single-Purpose Layers

Commercial laying hens originate from specialised breeding stock involving pedigree lines, grandparent, and parent stock. Genetic progress moves through levels of multiplication in a pyramid shaped population structure where the number of birds increases at each level, referred to as a breeding pyramid (Figure 1.1) . At the pedigree and grandparent levels, the best hens and roosters are selected to breed. Breeding programs often maintain separate male and female lines, with each line selected for specific desirable traits. This is essentially a crossbreeding process to produce commercial layers with hybrid vigor—combining the best traits from both lines (Figure 1.2).

For example:

- The male line may carry genes for large egg size.
- The female line may carry genes for high egg numbers.

When crossed, the resulting offspring produce many large eggs. Hybrid vigor causes these offspring to perform better than their parents. However, this also means that commercial layer farmers cannot breed their own replacement stock. Offspring from commercial layers will lose hybrid vigor, resulting in reduced production. Therefore, farmers are dependent on a consistent supply of day-old chicks or point-of-lay pullets for each production cycle. When planning for profit, it is essential to retain funds for purchasing the next flock.

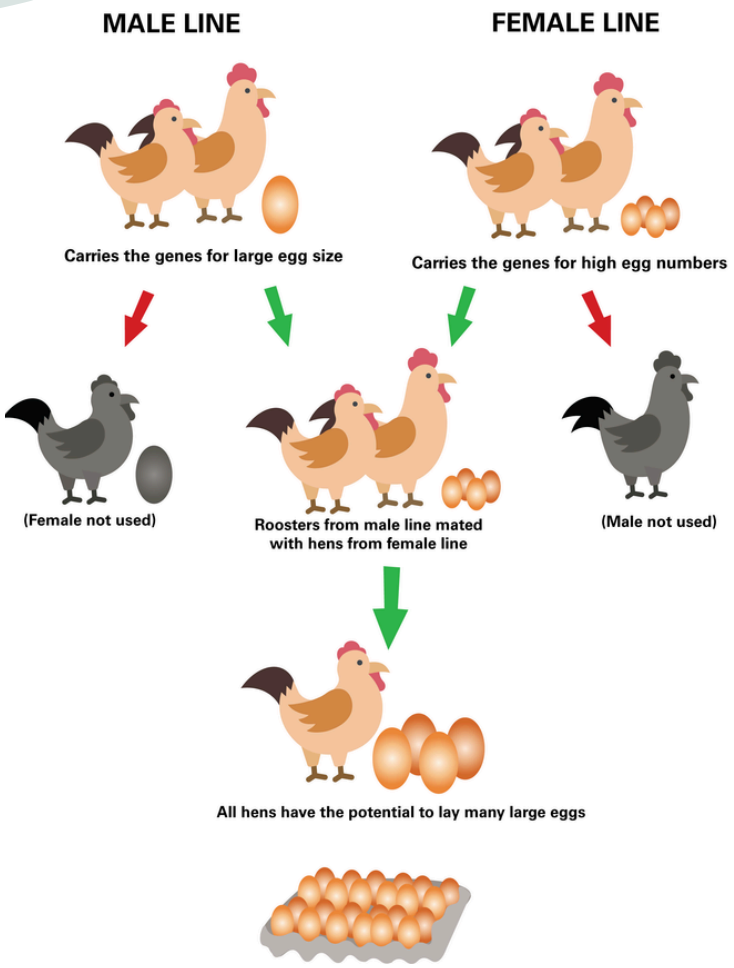


FIGURE 1.2 Crossbreeding

Breeding layer stock is highly specialized. Teams of geneticists, nutritionists, and veterinarians work together in breeding programs, utilizing cutting-edge technology and the latest scientific research to produce high-performing commercial layers. Some large poultry companies are fully integrated, meaning they manage all stages of production, including grandparent and parent farms, hatcheries, pullet rearing, laying farms, and feed mills. This integrated approach reduces costs and ensures a steady supply. However, in Lesotho, most pullet rearers and layer farmers are independent, relying on external suppliers for chicks and feed.

Breeds available in Lesotho, mainly sourced from South Africa, include Hy-Line Silver Brown, Lohmann Brown Lite, and Amberlink (Figure 1.3). These breeds all lay brown-shelled eggs, which are preferred in most African markets. However, the shell color does not affect the egg's nutritional value—it is simply a matter of consumer preference.

Common Layer Breeds in South Africa and Lesotho:

- Hy-Line Silver Brown
- Lohmann Brown Lite
- Amberlink

Hy-Line Silver Brown

Lohmann Brown Lite

Amberlink

FIGURE 1.3
Common Layer Breeds in South Africa and Lesotho
Image: Management Guides

Benefits of Layer Production in Lesotho

PHOTO 1.2
Single-Purpose Layers can provide income and food security for Lesotho farmers.

1 Useful By-Products

Layer manure is a valuable by-product that can be used as fertilizer for vegetable or crop production. This can reduce the cost of chemical fertilizers and support more sustainable, climate-smart agriculture and diversified farming systems.

2 Long Laying Cycle

Commercial layers have a long production cycle, laying well until 80 to 90 weeks of age. However, egg production declines as the birds age, so it is important to cull the flock when it is no longer profitable to keep them. Grading eggs can extend the flock's value, as older birds tend to produce larger eggs, which can be sold at higher prices.

3 Income Generation

Eggs are an affordable protein source, and there is usually a reliable market for them. Farmers can generate income from egg production, although profit margins per bird are typically low. Larger flock sizes generally result in better income potential, and this can also create job opportunities. It is important to reserve part of the income for purchasing a new flock at the end of each cycle. Additionally, farmers can earn some income from selling spent layers at the end of the production cycle.

4 Food Security

Eggs are an excellent source of protein and can be stored for weeks without refrigeration. This contributes to household food security and broader food security in Lesotho when eggs are sold.

Factors to Consider When Choosing Layers

The performance of commercial layers depends heavily on environmental conditions, nutrition, and management—all of which require more investment than raising indigenous or dual-purpose breeds. Access to finance and markets can also be limited in parts of Lesotho. Layers can be kept in various production systems, including cages, barns (floor systems), or free-range setups. However, they require quality feed and are not well-suited to foraging or scavenging. Proper management and nutrition are crucial to achieving optimal egg production and farm profitability.

PHOTO 1.3
Layer's require proper management and nutrition for optimal profitability.

Different Production Systems for Layers

Layers are quite adaptable and can perform well in both cage and cage-free environments.

Conventional cages have been banned in many states and countries around the world, driven by growing concerns about hen welfare from consumers and other stakeholders. However, there are currently no laws regarding this in Africa, and the use of cages remains widespread, as it is generally more economically viable. Cages allow for a high stocking density per unit area, and both eggs and hens are at reduced risk of disease transmission. This is because the birds are not in contact with floor-borne pathogens or disease-carrying vectors from outside the poultry house (Photo 1.4).

A **barn** production system refers to the use of a closed house where hens are not confined to cages but also do not have access to the outdoors. In Lesotho, this system is often referred to as a deep litter system, even when the litter is removed after each production cycle. Technically, a deep litter system involves adding fresh litter on top of the old litter between cycles, without cleaning it out for several cycles. For the purposes of this document, the term "**barn production system**" will be used. In this system, hens are free to move around inside the house and lay eggs in nest boxes provided for that purpose (Photo 1.5). Because hens in barns are more active than those in cages, they expend more energy and, as a result, have higher feed requirements.

In a **free-range** system, hens are housed in a barn structure but also have access to the outdoors. While hens still require access to proper nutrition, they are able to go outside if they choose. While this system promotes better hen welfare, it also exposes the birds to additional risks, such as predation and increased contact with diseases and parasites. Nest boxes are also provided in this system, but hens may sometimes lay eggs outside, making egg collection more time-consuming and increasing the risk of eggs being contaminated with Salmonella bacteria. Although production costs in free-range systems are typically higher, these costs can be offset by premium prices if there is sufficient consumer demand for free-range eggs.

PHOTO 1.4
Caged Birds in a House

PHOTO 1.5
Hens in a Barn System

2. Housing Design and Environmental Management

Housing is crucial in layer production, as hens perform best when they are in a comfortable environment with proper temperatures and ventilation. Housing provides protection from predators and theft while also reducing exposure to disease-causing agents. Even in a free-range system, some form of housing is necessary for shelter, feeding, and nesting boxes.

Lesotho experiences temperature extremes, with cold winters and hot summers, making appropriate housing design essential. Poultry houses can be open-sided with natural ventilation or fully environmentally controlled with fans for forced ventilation. Most layer houses in Lesotho are open-sided because they are cheaper to construct. These houses have open sides with panels to allow light and air movement, while end walls are closed. Mesh is used on the open sides to keep out predators and wild birds (Photo 2.1).

PHOTO 2.1
Example of a layer house from the outside.

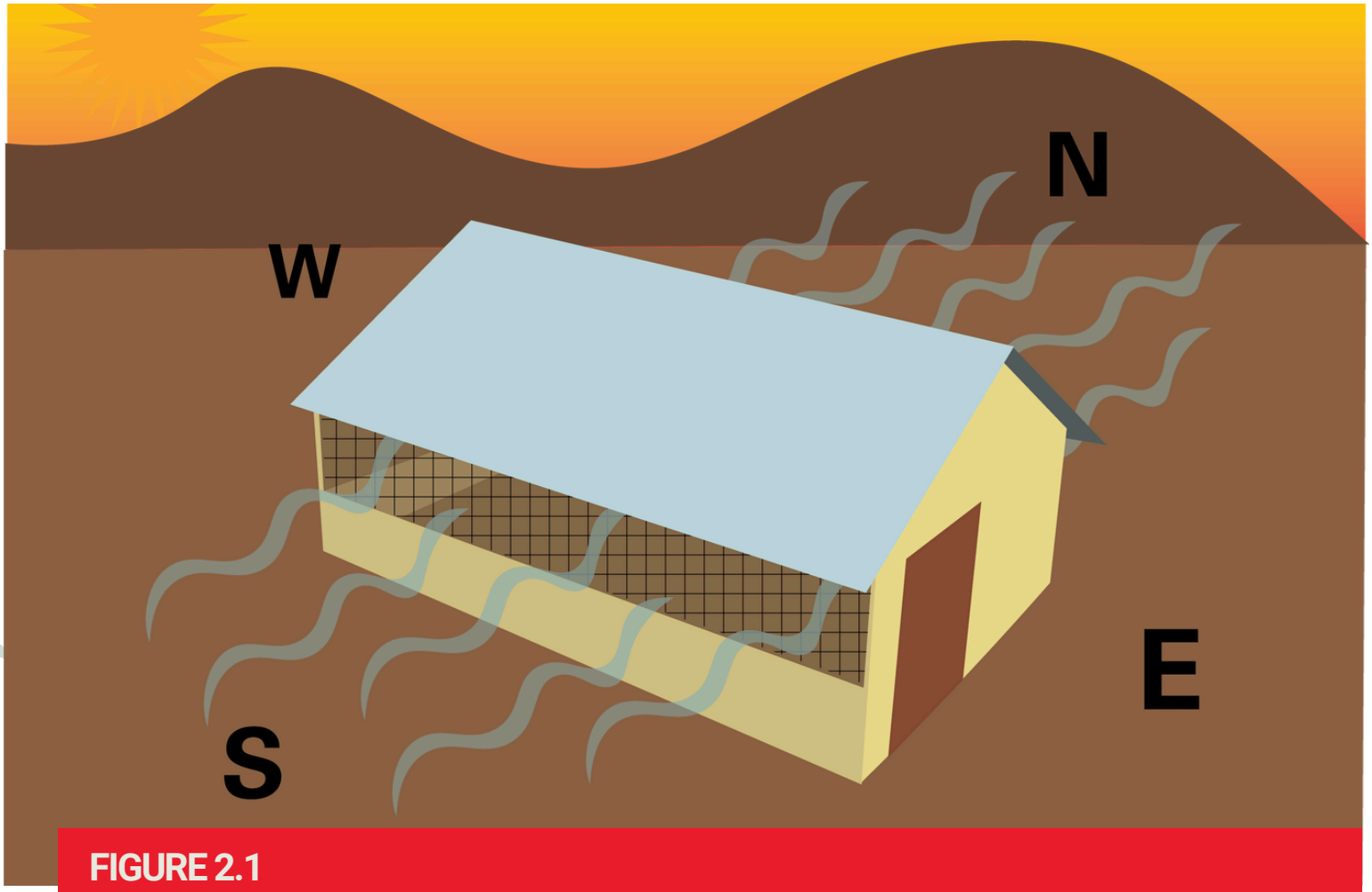


FIGURE 2.1
Poultry House on East-West Axis

Selecting the Site

Before building a poultry house, selecting an appropriate site is essential. Ideally, poultry houses should be located far from other poultry farms to minimize the risk of airborne diseases, which can spread through the air, people, wild birds, and vehicles. When constructing multiple houses, they should be at least 20 meters apart. A slight slope is preferred for drainage, and the soil should be well-drained to prevent dampness, which can promote disease and fly breeding. Sandy soil is ideal; clay soil should be reinforced with stones.

Good air circulation is necessary, with breezes more common on higher ground. The prevailing wind should blow through the open sides of the house rather than against the end wall. However, Lesotho's highlands are known for strong winds, requiring a balance between summer ventilation and winter heat retention. Good insulation can reduce heat loss during winter. Natural obstacles, such as mountains and forests, may block wind, affecting airflow.

Ideally, houses should be built along an east-west axis to stay cooler in summer and warmer in winter (Figure 2.1). In summer, the sun is overhead; in winter, it shines into the north-facing open side. Houses can be slightly tilted from this orientation to reduce wind exposure in particularly windy areas.

Extreme temperatures affect feed intake and egg production. If hens are too hot, they reduce feed intake, impacting egg production and weight. If they are too cold, they eat more to generate heat, reducing feed efficiency. For every 1°C drop below 20°C, hens consume an additional 1.5g of feed per day.

Access to water is critical. Farms must be near a reliable water supply for drinking and cleaning. Plan for 400ml per hen per day (e.g. 200 liters per day for 500 hens).

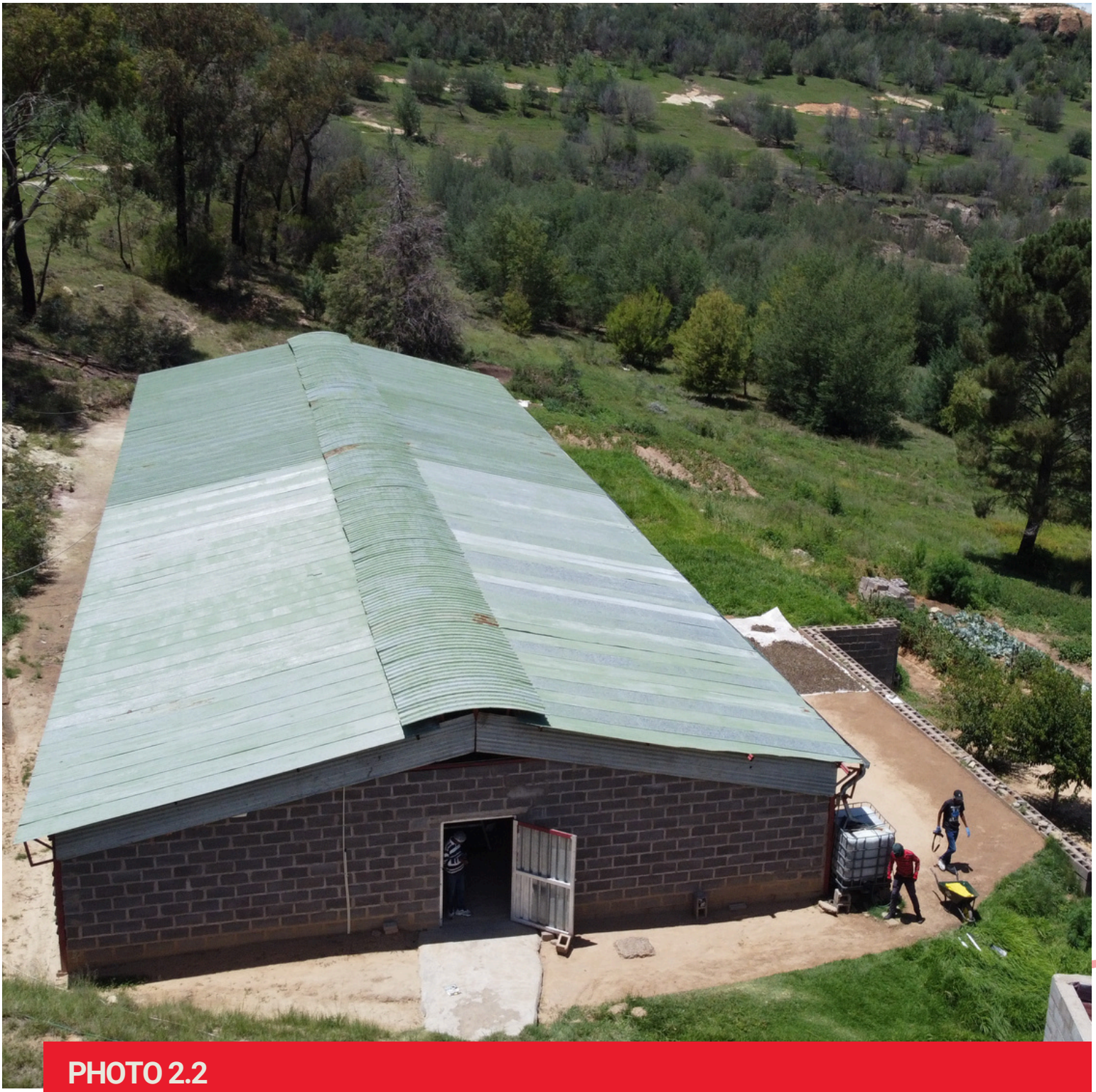


PHOTO 2.2
Selecting an appropriate site for building the poultry house is essential when rearing layers.

Structure of the House

Layer houses can be fully enclosed with no windows, using fans and artificial lighting to precisely control the environment. These environmentally-controlled houses are expensive but allow for higher stocking densities and better egg production due to stable conditions.

Alternatively, open-sided, naturally ventilated houses are more affordable and rely on air movement through mesh-covered openings. Some designs feature roof openings to let hot air escape.

Key Construction Requirements:

1 Size

There is no limit on the **length** of the house, but the **maximum width should not exceed 12 meters** to ensure sufficient air movement for proper ventilation. The **height** from the floor to the bottom edge of the roof should be **2.5 to 3 meters.**

2 Foundations

Solid, **above-ground foundations** are essential for stability and to prevent water entry. A **depth of 600 mm** is recommended.

3 Floors and Doors

Floors should ideally be **smooth concrete**, as this allows for more effective cleaning. **Cracked floors can harbor pests and disease**. The floor should be **slightly elevated** above ground level and **sloped toward the door** for proper drainage. Doors must **close securely**, be **lockable**, and be **wide enough to accommodate wheelbarrows and other equipment.**

4 Walls and Curtains

- Low walls (no higher than ½ meter) along each length of the house allow for proper air circulation (barn system).
- No side walls but a side panel which allows a gap and the top and bottom to ensure air movement to dry manure below cages (cage system)
- Wire mesh is necessary to keep out wild birds and pests.
- Heavy-duty tarpaulin curtains should be adjustable, opening from the top and dropping down.
- End walls can be constructed from materials such as corrugated iron, bricks, or concrete blocks.

Important note:

Farmers often respond to the cold Lesotho winters by building very high walls with only small openings. This is not ideal as it results in poor ventilation.

5 Roof

The roof should be **2.5 to 3 meters high**, pitched at **25–33 degrees**, with a 1-meter (3-foot) overhang. Feeders and drinkers should be able to be suspended from the roof. Materials such as **thatch or corrugated iron** can be used, but it is important to **insulate a corrugated iron roof** with polyurethane spray foam, IsoBoard, or even polystyrene (Photos 2.3, 2.4, and 2.5).

PHOTO 2.3
Thatch

PHOTO 2.4
Corrugated Iron

PHOTO 2.5
Foam Spray Insulation for Roof

6 Exterior

A **1-meter-wide cement apron** around the building is recommended, as it helps control long grass and keeps pests away. For **good biosecurity** (see Section 5), a **20-meter perimeter fence** should surround the farm, with a **"No Entry" sign**.

Adequate floor space for the number of birds is important and will vary for cages and barn systems. If birds are overcrowded and there is too much competition for feed and water they can peck at each other. If the skin is broken and starts bleeding this causes birds to continually peck and damage the other bird or causes death (cannibalism). Ventilation is not as effective in removing heat if birds are overcrowded, so if ventilation is poor, stocking density will need to be reduced.

How to Calculate the Number of Birds that Can be Placed:

Cages

The number of birds per cage will depend on the size of the cage. If there are too many birds per cage there will be competition for space, feed and water which can negatively affect performance.

- Each bird requires at least 450cm² of space, with cages tall enough for hens to stand freely.
  - Measure the cage's length and width (e.g. 30 cm x 45 cm)
  - Multiply length x width to find the area. (e.g. 30 cm x 45 cm = 1350 cm²)
  - Divide by 450 to determine the number of hens per cage. (e.g. 1350/450 = 3 hens)
  - Round up to the nearest whole number.
- The stocking density of the house will then depend how many cages fit in the house. Multiply the number of cages by the birds/cage to get the house capacity.

Barns

The recommendation for stocking density in a barn system is 6 to 10 hens/m² (this can be increased if there is adequate perching space). The number of hens that can be housed can be calculated by measuring the floor area.

- Stocking density is 6 to 10 hens/m²
  - Measure the area of the house length and width (e.g. 8 m x 25 m)
  - Multiply length x width to find the area. (e.g. 8 m x 25 m = 200 m²)
  - Multiply this by 6 hens/m² . (e.g. 200 x 6 = 1200 hens)

Maintaining Clean Poultry Houses

The Layer Cycle Consists of Three Phases:

1. **Production Period** – Hens are in the house.
2. **Cleanout Period** – House is cleaned and disinfected.
3. **Resting Period** – House remains empty for 10 to 14 days.

All birds should be of the same age, and thorough cleaning between batches is essential to prevent disease.

Steps for Cleaning a Poultry House After the Production Period:Production Period –

1. **Remove all equipment**, such as feeders and brooders.
2. **Remove bedding and manure –**
    a. Bag and **dispose of waste away from the poultry house** to prevent disease transmission.
    b. Manure can be composted or **spread on crops**.
3. **Turn off the electricity supply** and cover electrical outlets with plastic.
4. **Dry clean the house –**
    a. Sweep and dust to remove bedding, feathers, manure, old feed, dust, and insects.
    b. **Disinfectants do not work effectively if organic matter is present.**
    c. Clean from r**oof to floor**, back to front (Figure – cleaning the house).
5. **Rinse the building to remove dust.**
6. **Flush water lines and tanks** in cage systems.
7. **Wash with detergent** to remove grease and dirt, then rinse again.
8. **Apply disinfectant –**
    a. Follow l**abel mixing instructions** for proper dilution (e.g., a **1:100 dilution rate** means **1 liter of disinfectant per 100 liters of water**).
    b. **Wear PPE** as specified on the label.
9. Allow a 10-14 day rest period for any surviving viruses to die off

How to Mix Disinfectant:

- **Find the dilution rate** on the disinfectant label (e.g., **1:100**, meaning **1 liter of disinfectant per 100 liters of water**).
- Determine the size of your mixing container (e.g., 20 liters).
- Calculate the amount of disinfectant needed:
    - Divide the container size by the water amount in the ratio: **20L ÷ 100L = 0.2**
    - Multiply by the disinfectant amount in the ratio: **0.2 × 1L = 0.2L (200mL) of disinfectant**
    - **Final mixture:** Add **200mL of disinfectant to 20L of water.**

PHOTO 2.6
Rest periods between flocks is essential for maintaining biosecurity.

Rest Period and Biosecurity

The rest period is essential, as any remaining viruses that survive disinfection will die naturally. Using a planning calendar ensures compliance with the 10–14 day rest period and allows time for ordering new chicks.

During the rest period:

- Complete necessary repairs to maintain the house.
- Prevent contamination by avoiding carrying dirt back inside.

Before the next flock arrives, the house must be fully prepared with all cleaned and maintained equipment in place.

Equipment in the Poultry House

Equipment will vary depending on the production system used and whether the facility is for pullet rearing or a laying facility.

Equipment will vary depending on the production system used and whether the facility is for pullet rearing or a laying facility.

For Rearing/Laying on the Floor:

Chick feeders (Photos 2.7 and 2.8) –

- Young chicks cannot reach regular feeders, so feed should be provided in scratch pans or bulk chick feeders during the first week to encourage scratching and feeding habits.
- Grills prevent feed wastage.
- Paper bedding with sprinkled feed can further encourage feeding behavior.
- 3 feeders per 100 birds is recommended.

Tube –

- Chick feeding pans should be replaced with tube feeders as birds grow.
- 3 feeders per 100 birds is recommended.

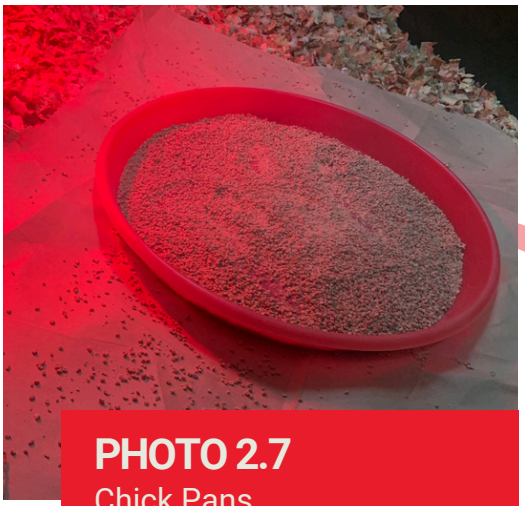


PHOTO 2.7
Chick Pans

PHOTO 2.8
Chick Fonts and Feeders

PHOTO 2.9
Tube Feeder

There are different drinking systems available to ensure birds have continual access to clean water:

- **Manual drinking systems –** Fonts that require daily manual filling (3 per 100 birds) (Photos 2.8 and 2.9)
    - **Chick fonts** ensure easy drinking access but must be cleaned frequently to prevent contamination (Photos 2.8)
- **Bell Drinker Systems** - connected to the water supply, but require cleaning during cycle (3 per 100 birds) (Photo 2.10)
- **Nipple drinking systems –** Connected to the water supply and don't require cleaning during the cycle (12 birds per nipple in barn system or 2 per cage) (Photo 2.11).

PHOTO 2.10
Manual Drinking System

PHOTO 2.11
Nipple Drinking System

- **Hooks and chains –** For suspending feeders and drinkers from the roof.
- **Brooders & brooder guards –**
  - Various brooders can be used to heat the environment for chicks, including: Gas brooders (Photo 2.12), paraffin heaters, charcoal heaters (Photo 2.13), infrared lamps.
  - To ensure chick safety and comfort, a brooder guard should be placed around the heat source. Typically made from a 30 cm-high Masonite board, the guard is formed into a circle to keep chicks close to the brooder while preventing them from crowding into corners and suffocating. Additionally, brooder guards help reduce drafts, creating a more stable and comfortable environment for the chicks (Photo 2.14)
- **Nest boxes –** Essential to prevent floor eggs and ease collection.

PHOTO 2.12
Gas Brooder

PHOTO 2.13
Charcoal Heater

PHOTO 2.14 Brooder Guard

For Rearing/Laying in Cages:

Cages are required to house birds. While banned in some countries due to welfare concerns, cages are still an option in Lesotho. Configurations include A-frame (angled backs, plastic sheets to prevent manure falling) (Photo 2.15) and stacked cages (scraper or belt system for manure removal, manual or automated) (Photo 2.16).

Stocking density guidelines:

- During rear chicks can be in cages at a **stocking density of 150 cm² per bird (0–6 weeks)** to enable a smaller brooding area.
- They are then spaced out to 300 cm² per bird (7–18 weeks) until transfer where there should be 450 cm² per bird in lay (until January 2039; thereafter 550 cm² per bird required).
- Newly installed cage systems: 550 cm² per bird, with 8.5 cm feed space per bird.

Cages are usually associated with a trough feeding system and nipple drinkers.

- 0–6 weeks: 2.25 cm feeder space, 15 birds per nipple
- 7–18 weeks: 4.5 cm feeder space, 8 birds per nipple
- Lay: 8.5 cm feeder space, 2 nipples per bird

PHOTO 2.15
A-frame Cages

PHOTO 2.16
Stacked Cages

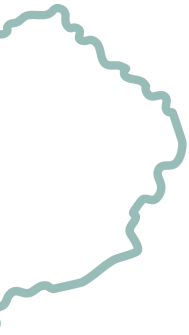
General Equipment for any Production System:

- **Lighting –**
  - Appropriate lighting helps chicks explore their surroundings and eat more.
  - Solar power can be harnessed to reduce electricity costs (Photo 2.17).

PHOTO 2.17 Use of Solar Power

- **Pressure Washer –** For deep cleaning.
- **Ventilation System –** in an environmentally-controlled house.
- **Scale –**
  - Used to weigh birds (Photo 2.18) to check if birds are at target body weight.
- **Thermometer –**
  - A thermometer placed at chick height is useful to ensure the heating is adequate, although chick behavior will also inform this.
- **Medical Ear Thermometer –**
  - Measures chick vent temperature upon arrival.
- **Knapsack sprayer** – Administers aerosol vaccines.
- **Fridge –** For vaccine storage.

PHOTO 2.18
Farmer improvising by using a plastic bag to weigh a layer hen.



3. Management of Chicks and Pullet Rearing

Preparing the House Before Chick Arrival

Before the chicks arrive, the following should be prepared in the layer house:

- Order and deliver feed.
- Prepare the footbath with disinfectant.
- In a barn system, place a 5–10 cm layer of bedding material on the floor. This should be clean, dry, and absorbent. Different materials can be used (Photos 3.1 and 3.2). Pine shavings are ideal but may be difficult to source in Lesotho. Alternative options include dried grass/hay, cereal straw, and recycled shredded paper (though shredded paper tends to cake). Sand is another option—it is reusable but does not retain heat well in cold conditions and must be kept dry. In a cage system, paper should be placed on the bottom of the cage for chicks
- Place feeders (chick feeding pans) and drinkers (chick fonts).
- Set up brooders and position brooder guards.
- Fill the feeders.
- Turn on the brooders about 24 hours before the chicks arrive. This is crucial to warming up not only the room but also the floors.

PHOTO 3.1
Shredded Paper Bedding

PHOTO 3.2
Pine Shavings Bedding

Transportation of Chicks

PHOTO 3.3
Good Transportation Method

Transportation plays a vital role in chick quality. The sooner chicks are placed after hatching, the better. When planning chick orders, minimizing transport time and distance is essential. If chicks are arriving from South Africa by road, consider border control wait times. Ideally, chicks should be transported in environmentally controlled vehicles where the temperature can be adjusted to maintain a chick vent temperature of 39.4–40.5°C. The relative humidity should be at least 50%, with proper ventilation or air conditioning (Photo 3.3). However, this is not always the case.

Chick vent temperature can be measured upon arrival using a medical ear thermometer (Photo 3.4). If chicks are sourced from distributors, measuring vent temperature on arrival provides insight into transport conditions. Overheated chicks may arrive dehydrated and stressed, and this feedback can be shared with suppliers to improve transport conditions.

PHOTO 3.4
Vent Temperature Measurement

If environmentally controlled vehicles are unavailable, transport should be planned for early mornings or late afternoons. To keep chicks hydrated, a hydrogel supplement, cucumber, or watermelon can be added to the chick boxes. Additionally, an electrolyte or stress pack can be added to the water in the chick fonts to support chicks after stressful transport.

Pullet Rearing

Pullet rearing can be split into phases, with the first 5 weeks being highly important and highly correlated to production later on. Brooding is important in the first few weeks and, in all phases, growth should be according to the target, as it is designed to coincide with growth of various body systems. If body weight is behind target, change feeds at the required body weight rather than age. Uniformity is essential and management of feeder and drinker space, phase feeding according to body weight, management of the environment including temperature and ventilation, and development of immunity through a good vaccination programme all play a role in achieving a good point-of-lay pullet, which will be discussed.

PHOTO 3.5
Proper management and care during the chicks first weeks of life is essential.

Placing Chicks in the House

Brooding refers to the period when chicks require an external heat source and optimal care. In nature, a mother hen provides warmth to her chicks, as they cannot regulate their body temperature. In a broiler house, this is achieved using artificial heaters. The first few weeks of a chick's life are critical, and proper management during this period significantly impacts performance.

Definition:

Brooding refers to the time period immediately after hatch when the chick requires optimal care.

1 Zone of Comfort

The zone of comfort is a localized area within the poultry house that provides optimal conditions for chick growth and well-being. This means the temperature is within an ideal range, so chicks are neither too hot nor too cold. As birds grow, the temperature required for the zone of comfort gradually decreases. If this zone is not provided, birds will become less efficient. Factors such as temperature, wind speed, housing conditions, and feeding levels all affect the zone of comfort.

2 Chick Arrival and Placement

When the chicks arrive, follow these steps:

1. Verify the delivery – Count the number of boxes while the driver is present to confirm the correct order.

2. Handle with care – Carry the boxes carefully into the house and ensure air circulation around them (avoid stacking too high). Do not leave chicks in direct sunlight.

3. Weigh the boxes – It is good practice to weigh all chick boxes.

4. Check vaccination records – Ask for documentation of any vaccinations given at the hatchery. Chicks should arrive already vaccinated for Newcastle Disease and Infectious Bronchitis.

5. Assess chick health – Gently remove the chicks and inspect them for quality. Do not place any deformed or sick chicks. Count the number of dead chicks and report it to the hatchery/distributor.

6. Ensure accurate chick count – Count the chicks into another box before placing them in the brooder area. This makes recounting possible if needed.

Assessing Chick Quality

The quality of day-old chicks significantly impacts their growth. A **healthy chick** should have:

- Clear, bright eyes.
- Dry, soft, and well-covered down (yellow fluff).
- Strong, yellow, fully-fleshed legs with no deformities.
- Healthy skin on the legs with no sores.
- A firm body without signs of edema (fluid buildup).
- A **sealed, clean, and dry navel** (where the yolk sac was attached). Unhealed navels can lead to bacterial infections, resulting in "mushy chick disease."
- A chick should be alert (wide awake) and active (moving around). If a chick is panting or gasping for water and has a dry, shriveled body, instead of being plump, it is a sign of dehydration (a lack of water).A quick **righting reflex** – If placed on its back, a healthy chick should turn itself over within **two seconds.**

A newly hatched chick should weigh a minimum of 36 grams. Smaller chicks will need extra care in order to survive and thrive. The weight of the chick is a good indicator of chick quality, but can depend on the age of the parent stock. Younger parents lay smaller eggs which result in smaller chicks.

How to Weigh Chicks:

- Weigh the full box with chicks inside (e.g., 8808g).
- Remove the chicks and weigh the empty box (e.g., 1160g).
- Count the total number of chicks in the box (e.g., 200).
- Subtract the weight of the empty box from the full box (e.g., 8808g – 1160g = 7648g).
- Divide the total chick weight by the number of chicks to determine the average weight (e.g., 7648g ÷ 200 = 38.2g).

Stockmanship

Stockmanship is an important aspect of the management of broilers. This means that the flock should be carefully observed using all senses to monitor behaviour, health and environmental conditions. Being aware of bird behaviour and conditions in the house can help indicate when there are problems to troubleshoot.

Hearing – listen to vocalisation, breathing and respiratory sounds as well as mechanical sounds in the house

Sight – observe bird behaviour and the environment

Smell – notice the air quality, such as ammonia levels

Taste – check the water and feed quality

Touch – handle birds to assess crop fill in young chicks and general condition of older birds, and sense the environmental conditions

3

Encouraging Feed and Water Intake

After placing the chicks, they should be encouraged to eat and drink (Photo 3.6). One effective method is to place the chicks directly on the feeders. For the first few days, spreading some feed on paper laid over the bedding can also help, as chicks naturally peck at objects on the ground. Additionally, tapping on the feeders and drinkers can attract their curiosity and encourage them to start eating and drinking.

Although day-old chicks still have some yolk in their abdomen that can sustain them for a short time, it is crucial to get them eating starter crumbles as soon as possible. This early feeding helps develop their digestive system. If chicks do not eat within the first day, their digestive systems may shut down, leading to starvation, a condition known as "starve-out."

To check if a chick has eaten, feel its crop, which is located below the neck and above the wing (Photo 3.6). The crop temporarily stores feed and mixes it with water to soften it. By 24 hours after placement, most chicks should have food and water in their crop. If a chick's crop is empty, it can be encouraged to eat by placing it near the feed.

Ensuring chicks can access water is equally important. Chicks drink by lowering their heads to take in water and then tipping them back to swallow. If any chicks appear weak or are not drinking, they can be taught by gently dipping their beaks in water.

PHOTO 3.6
Checking Crop Fill

1

Lighting

During the first week, provide 20 hours of light if possible. Long days with bright lights help chicks adjust to their new environment and encourage feed and water intake. After the first week, gradually reduce the length of light exposure each week until the birds are receiving 12 hours of light per day by 7 weeks of age. This schedule may not be possible if natural day length is longer than the recommended lighting programme. In such cases, never allow the amount of light to increase during the rearing period. If natural daylight is increasing, reduce the artificial light to ensure the total light exposure does not exceed the maximum the birds will experience before 17 weeks of age (check your local sunrise and sunset times using a weather app). The appropriate light adjustments will depend on the season during rearing.

The key principle is to ensure a period of decreasing light, followed by constant light, and then a final increase to stimulate egg production (see Figure 3.1). Different lighting schedules can influence when birds begin laying. If birds reach sexual maturity too early, they may experience prolapses (a condition where the reproductive tract is pushed out through the vent). This risk is why rearing is often carried out in light-tight houses, where the lighting programme can be carefully controlled.

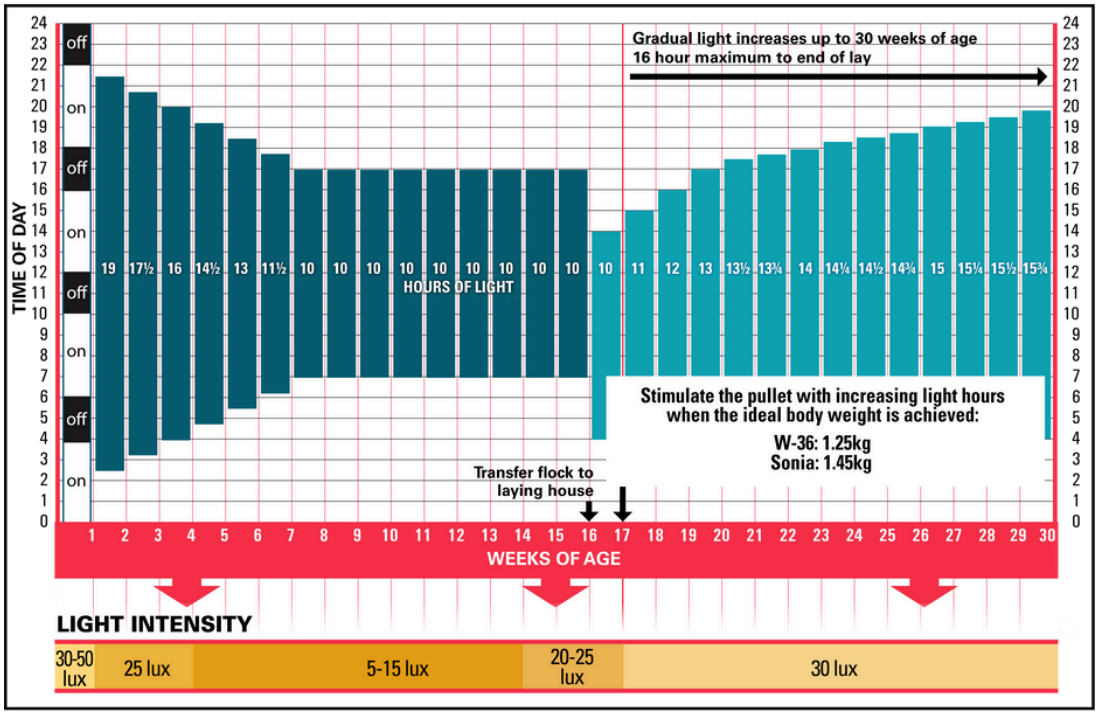


FIGURE 3.1
Commercial Lighting Program Guide
Credit: Hy-Line Silver Brown Management Guide

2 Brooder Temperature

- **Gradually decrease brooder temperature** as the chicks grow, following a general temperature guide (see Table 3.1)
- **Refer to breeder-specific recommendations** for more accurate temperature settings based on breed and whether chicks are being reared in cages or on the floor.
- **Brooding in cages requires constant temperature checks** because chicks cannot move to find a more comfortable area, unlike those reared on the floor.
- **As chicks grow in a cage system, reduce stocking density** by moving them to other cages to prevent overcrowding.
- **When rearing on the floor, expand the brooder guard area** gradually to provide more space as the chicks grow and get bigger.

TABLE 3.1
Brooding Temperature Guide for Rearing Layer Chicks

Age (d)	Temperature (celcius)
1-3	34
4-7	33
8-14	31
15-21	29
22-28	26
29-35	23
36+	21

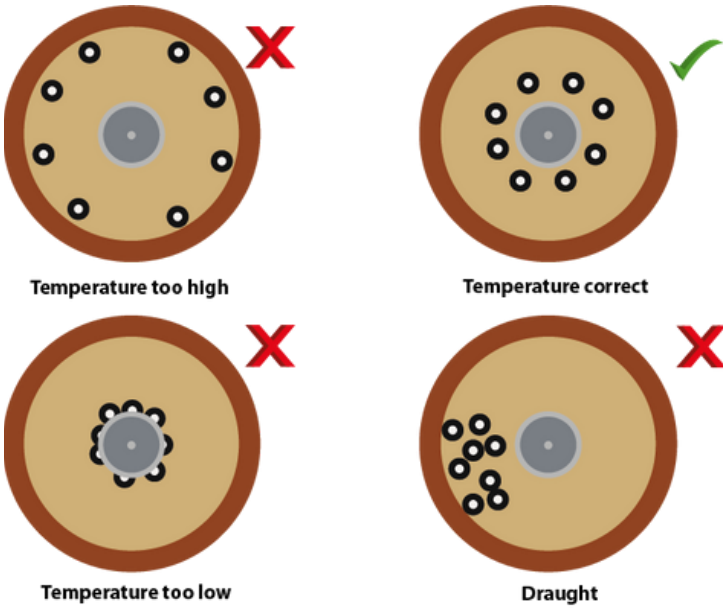


FIGURE 3.2
Monitoring Chick Behavior

Brooding temperature can be measured with a thermometer, but monitoring chick behaviour is the best way to determine their comfort (this is much easier to assess in chicks on the floor). If chicks are huddling together under the brooder they are too cold. If they move away from the brooder it is too hot. If there is a draught they huddle together in one corner (Figure 3.2). Pasty vents indicate that the temperature is too hot. Also, birds that are too quiet or making distress calls can indicate incorrect temperatures.

Monitoring chick behavior

- Huddling under the brooder → Too cold
- Moving away from the brooder → Too hot
- Huddling in one corner → Draft present

PHOTO 3.7
Proper ventilation is an essential aspect in the brooding, rearing and production phases of layers.

3 Ventilation

During brooding, it is essential to maintain some air movement through the house. Carbon dioxide can build up and must be replaced with fresh oxygen. Proper air circulation also helps keep the litter dry. Even in very cold conditions, there should be a small opening to allow fresh air into the house. In houses with fans, only small fans should be used at low speeds or cycled on and off as needed, a practice known as minimum ventilation.

Ventilation is crucial for maintaining good air quality and ensuring bird health. In winter, when temperatures are low, many farmers tend to close the house as much as possible, but this can lead to the build-up of harmful gases. While heating costs may rise when cold air enters the house, ventilation remains necessary. Insulating the roof and walls can help retain heat while still allowing for proper airflow.

Proper ventilation is essential during brooding:

- Air circulation prevents carbon dioxide buildup and introduces fresh oxygen
- Ventilation helps dry litter, reducing moisture-related health risks
- In cold weather, minimal ventilation should be maintained to prevent gas buildup
- In high-altitude areas, like Lesotho, lower oxygen levels make ventilation even more critical

Because parts of Lesotho are at a high altitude, oxygen levels in the air are lower than in lower-altitude regions, making proper ventilation even more critical. Without sufficient oxygen, birds are at risk of developing ascites, commonly known as "water belly," a condition where fluid accumulates in the abdominal cavity.

PHOTO 3.8
Management of temperature, humidity and ventilation are linked and Important to provide a good environment.

4 Relative Humidity

Relative humidity can be measured with a hygrometer and plays a crucial role in how chicks perceive temperature. When relative humidity is high, chicks feel the air temperature as hotter than it actually is. Since they come from an incubator environment with high humidity, they can be prone to dehydration if conditions become too dry. During the first few days, relative humidity should be maintained at 60–70%. In Lesotho, where relative humidity is generally low, a portable backpack sprayer can be used to mist the walls of the house with water. Additionally, if humidity is low, the temperature settings recommended in Table 3.1 should be increased slightly. If a hygrometer is unavailable, chick behavior can provide insight into whether conditions are within their comfort zone. If humidity is too high, litter quality deteriorates because excess moisture cannot evaporate, leading to wet bedding.

Proper humidity is essential during brooding:

- Ideal relative humidity: 45–65%
- High humidity: Reduces litter quality, increases ammonia levels, and leads to respiratory infections
- Low humidity: Can cause dehydration
- If necessary, a portable backpack sprayer can be used to mist water onto house walls
- Monitor chick behavior as an indicator of humidity comfort

The ideal relative humidity for poultry is between 45% and 65%. If the air is too dry and dusty, birds become more susceptible to respiratory infections. On the other hand, if the air inside the building is too moist, manure does not dry properly, resulting in wet litter. This can lead to high levels of ammonia, breast blisters, sore feet, and coccidiosis. Proper ventilation, especially when humidity is high, is essential for maintaining good litter quality. Wet and caked litter should be removed from the house regularly, but litter should also not be excessively dry and dusty.

Ventilation plays a vital role in creating a healthy environment for poultry. In open houses, curtains should be adjusted as needed to regulate airflow. Incoming cool air must mix properly with the hot, stale air inside to prevent cold spots within the house.

Management of Feeds, Feeding, and Water

Poultry feed is a mixture of ingredients known as raw materials. Feed mills purchase these raw materials and use specific formulas for different species and ages of birds. The ingredients are blended in precise proportions to create a balanced feed that meets the birds' requirements for maintenance (staying alive) and growth. Rations are designed for a specific type of bird and age, meaning broiler rations and layer mash are formulated differently. It is essential to use the recommended feed from a reputable supplier. Do not use pullet or layer mash or breeder pellets for broilers.

1 Feed Form

Poultry feed is produced as mash (meal), crumbles and pellets (Photos: 3.9, 3.10., and 3.11). Layers are normally fed mash because it is cheaper and the hens are able to consume enough in a day to meet their requirements.

Feed Forms & Their Uses

- **Mash**: Common for layers; economical but takes longer to consume
- **Crumbles**: Small pellets ideal for young broilers. moisture-related health risks
- **Pellets**: Best for broilers; promotes fast consumption and growth

PHOTO 3.9
Mash

PHOTO 3.10
Crumbles

PHOTO 3.11
Pellets

2 Feed Management

Feed is the most significant expense in poultry production, accounting for approximately 70% of total costs. Other expenses include the cost of day-old chicks, heating, electricity, water, bedding (shavings), vaccinations, cleaning supplies, and labor.

Since feed is expensive, minimizing waste is critical. Spilled feed or feed consumed by rats and wild birds reduces farm profitability. Do not overfill feeders, as birds tend to flick their heads and spill feed onto the floor. Feed purchases should also be planned carefully to ensure feed is used within three months and not stored for long periods.

3 Height of Feeders

For pullets reared on the floor, ensure that feeders are set at the correct height for the birds (Figure 3.3). If feeders are too high, the birds will be unable to eat properly. If they are too low, feed may spill onto the floor because birds must lower their heads to eat, causing them to flick feed around. Additionally, feathers and droppings (manure) can contaminate the feed when they get into the feeders.

For birds in cages using trough feeders, ensure the ends are securely closed to prevent feed spillage and waste. Also, confirm that the minimum feeder space per bird is provided.

Feeder Height Guidelines

- Adjust feeders to be at back height of the birds
- Avoid placing them too low to prevent contamination and waste
- Regularly check and adjust as birds grow

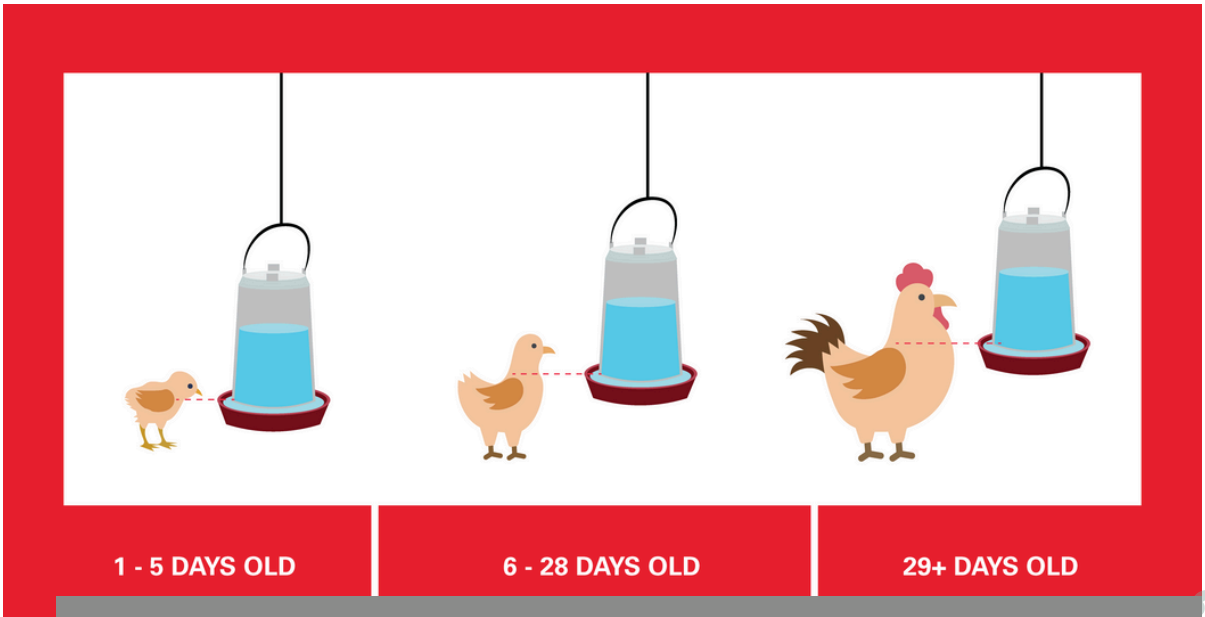


FIGURE 3.3
Appropriate Height for Drinkers and Feeders

4 Feed Availability

Ensure feed is available for pullets at all times. Layers are not as food-driven as broilers, and it is important that they reach their target growth curves. Feed should not be restricted unless the birds are overweight according to growth targets.

For pullets in cages, a daily routine should include turning the feed in the trough by hand. This helps mix the fines with the other ingredients in the mash. The fines contain essential vitamins and minerals that are important for the hen's health. Turning the feed also stimulates the birds' interest, encouraging them to eat.

5 Mold Prevention

Wet feed encourages mold growth, making it unpalatable and potentially toxic. Any moldy feed must be discarded. Prevent mold by ensuring there are no leaking water pipes or nipples near feed storage areas. While some wetting of feed by the birds' saliva is unavoidable, daily checks should be conducted to remove lumps of wet feed from tube or pan feeders.

6 Feeding Out of the Bag

For optimal growth, broiler feed should be the sole dietary source. Adding vegetables, grass, or other foodstuffs creates an unbalanced diet, which slows growth. Broiler feed is specifically formulated with all necessary nutrients in the correct proportions, eliminating the need for supplemental feeding.

Tip:

There is no need to supplement a commercial layer feed from a reputable supplier, and diluting with e.g. maize will make the feed unbalanced.

7 Feed Storage

Feed purchased in bags should be stored in a dry shed on top of pallets. The storage room must be free of windows, cracks, or leaks to keep feed dry and protected from sunlight, as both mold and UV exposure can destroy essential vitamins. Stacking sacks on wooden pallets (Photo 3.12) away from cold floors and walls, prevents condensation and sweating. If feed is purchased in bulk, it should be stored in a sealed, rainproof bulk tank.

Proper Feed Storage :

- Store feed in a dry, well-ventilated area
- Use wooden pallets to keep sacks off the ground
- Keep feed away from direct sunlight to prevent vitamin degradation
- Check for leaks or condensation that could lead to mold growth

PHOTO 3.12
Stacked Feed on Wooden Pallets

8 Rodent and Wild Bird Control

Rats and wild birds should not have access to feed storage areas, as they carry diseases that can contaminate the feed and infect poultry. Rat bait stations should be strategically placed around the farm to control rodent populations. Any spilled feed should be cleaned up immediately to prevent attracting wild birds, which can also carry diseases (see section on Biosecurity).

9 Pullet Rearing Rations

There are a number of feeding phases in the rearing period, and these can also depend on what is available. Generally, there will be 1 or 2 starter rations, a grower, developer, and pre-lay diet.

Rations:

- Starter Rations - high in protein and energy
- Grower - slightly less protein and energy
- Developer - slightly less protein and energy
- Pre-Lay - increase in protein and calcium

Water Management

Chicks cannot survive without water. Water helps regulate their body temperature, aids in digestion, and keeps the mucous membranes (the lining of the mouth and lungs) moist, preventing pathogens (disease-causing organisms) from entering the body. If chicks do not drink water, their droppings become dry, and within a few hours, they stop eating, leading to a complete halt in droppings. Water is essential for daily survival, as it makes up 80% of a chick's body and 65% of an adult bird's body.

If birds are deprived of water, serious physiological changes begin within hours, leading to reduced weight gain. A bird that loses 20% of its water content will die. Poultry can survive much longer without feed than without water.

Water from natural sources like rivers, dams, and boreholes is often contaminated with pathogens such as E. coli, particularly if exposed to manure. These sources may also contain microscopic plant and insect life, as well as sand. Municipal water is generally safe for both human and poultry consumption.

Before using water for drinking, it should be:

- Filtered to remove sediment
- Treated with chlorine to kill pathogens. This can be done by:
  - Placing chlorine tablets in the header tank
  - Adding one teaspoon of bleach per 20 liters of water

Water may also contain harmful levels of dissolved minerals such as calcium, salt, fluorine, and iron. These can clog water pipes and nipples in poultry houses or cause rust. If using a nipple drinker system, regularly flush the pipes with descaler when cleaning out the poultry house. Fine filters or water softeners can help prevent mineral buildup on a daily basis.

Water quality should be tested regularly (add local testing contact). Collect clean containers from the local water authority, fill them with water samples, and return them for analysis. Samples should be taken at the point of consumption—from the nipple drinkers, not an outside tap—since the header tank or water lines may be contaminated. (Example of a standard poultry water test is shown in Appendix II.)

Key Water Quality Management Steps:

- Filter to remove sediment
- Disinfect with chlorine (tablets or bleach solution)
- Test water regularly at the point of consumption
- Flush pipes with descaler if using nipple drinkers

1 Managing the Water System

Chick fonts should be cleaned daily until chicks are moved to bell drinkers at about 7 to 10 days of age. Bell drinkers should be cleaned about twice a week. Use a clean cloth to wipe the inside lip of the drinker and tip out the dirty water. This helps prevent the buildup of harmful microorganisms.

Chick fonts should be cleaned daily until chicks are moved to bell drinkers at about 7 to 10 days of age. Bell drinkers should be cleaned about twice a week. Use a clean cloth to wipe the inside lip of the drinker and tip out the dirty water. This helps prevent the buildup of harmful microorganisms (Photos 3.13 and 3.14).

PHOTO 3.13
Clean Bell Drinkers

PHOTO 3.14
Chick fonts need to be cleaned regularly.

2 Cleaning the Water Lines

During production cycles, lime, scale deposits, rust, dirt, and algae accumulate in water lines, reducing water flow and fostering bacterial growth. Broilers drinking from contaminated lines ingest these pathogens, which can lead to health issues.

Between production cycles, the water lines should be "shocked" (thoroughly cleaned) by:

1. **Flushing** lines with high-pressure water to remove debris.
2. **Filling** lines with a cleaning solution and letting it sit for **3–6 hours**.
3. **Flushing again** with clean water before reuse.

3 Feed and Water Intake

Birds drink approximately twice as much water as the amount of feed they consume. For example, if they eat about 110 grams of feed per day, they will drink roughly 220 ml of water. Water consumption increases in hot weather. Installing a water meter outside the house can help detect problems early if monitored regularly.

If hens are deprived of water, they will stop eating. Dry feed cannot move through the digestive system. When the digestive system becomes backed up with undigested feed, the satiety center in the brain triggers a feeling of fullness, suppressing feed intake.

Cool, clean, and fresh water must be available to the birds at all times. The optimal water temperature is between 10°C and 13°C (50°F to 55°F). During hot weather, drinker lines should be flushed regularly to provide fresh, cool water.

Feed & Water Consumption Tips

- Birds drink twice as much as they eat
- Always provide cool, clean, fresh water
- Daily water checks prevent dehydration and growth issues
- Water meters help track abnormal consumption patterns

PHOTO 3.15
Consistent supply of water is essential for rearing poultry.

Management of Birds

1 Beak Trimming

Beak trimming is important for birds that will be moved to open-sided houses, where bright light intensity may encourage feather pecking and cannibalism. When purchasing chicks from the hatchery, ensure they have been beak-trimmed. This procedure is typically done using an infrared beam.

2 Pullet Development and Weight

Weekly or biweekly weighing of a sample of birds is necessary, with weights compared against the target provided by the breeding company (see Figure 3.4 for example). Feed changes should be based on bird weights. For example, if birds are slightly underweight, they can remain on starter mash for an extra week.

Flock uniformity is crucial, as it influences the birds' response to light stimulation and affects the peak rate of lay. If uniformity is poor, heavier birds will begin laying eggs earlier than lighter birds. Uniformity can be maintained by ensuring:

- **Adequate feeder and drinker space**: Sufficient feed trough access and enough nipples or drinkers per bird.
- **Good ventilation**: Promotes a healthy environment.
- **Proper lighting program**: Supports synchronized development.
- **Good sanitation and effective vaccination**: Reduces disease risk.

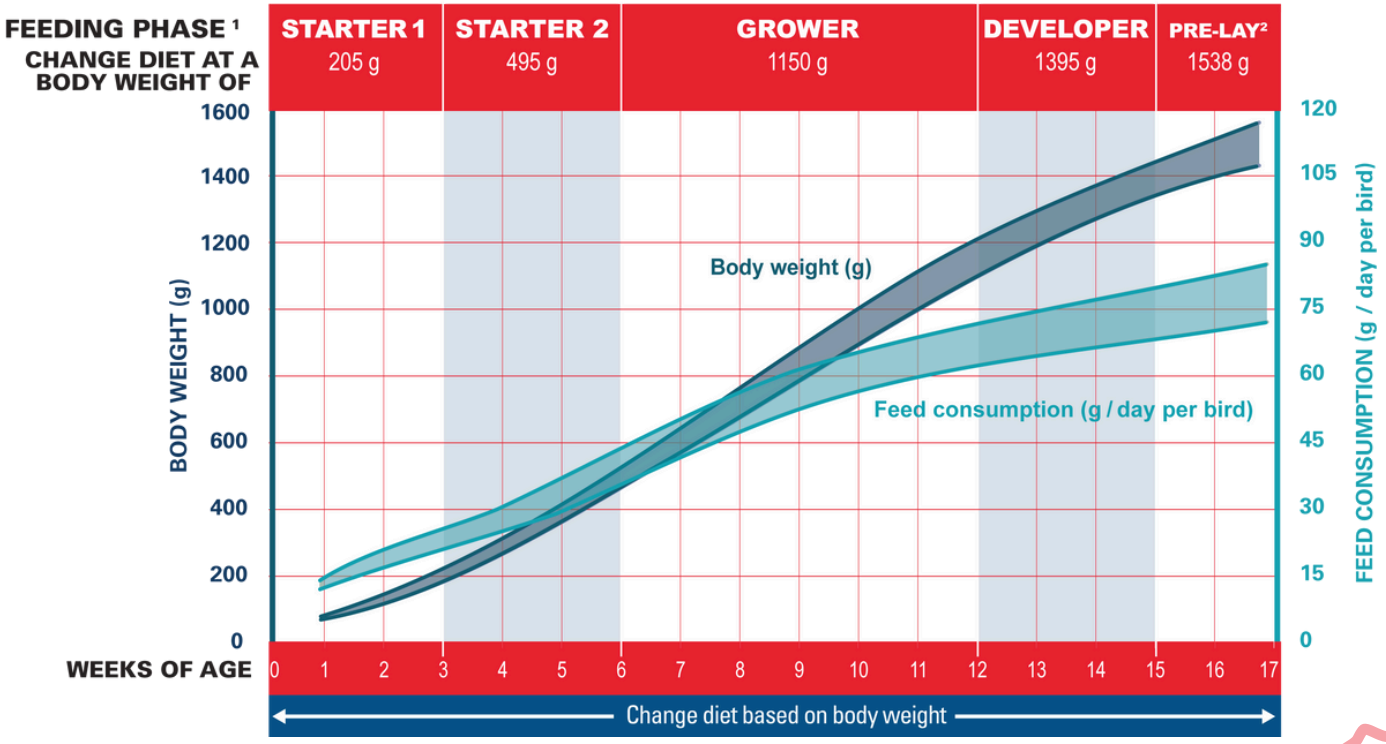
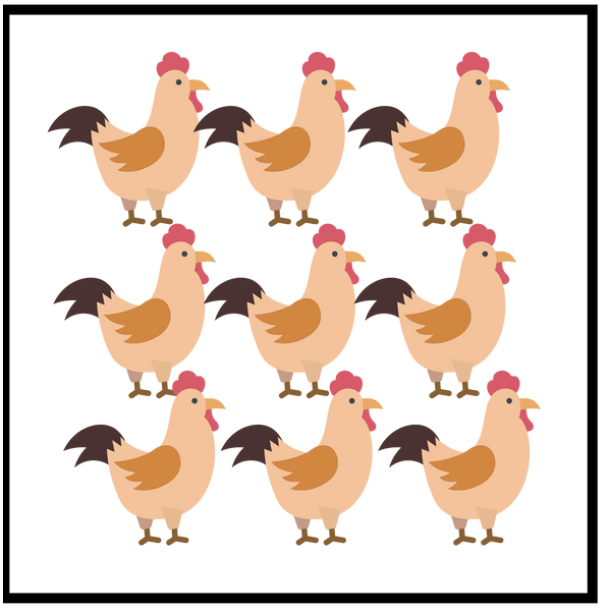
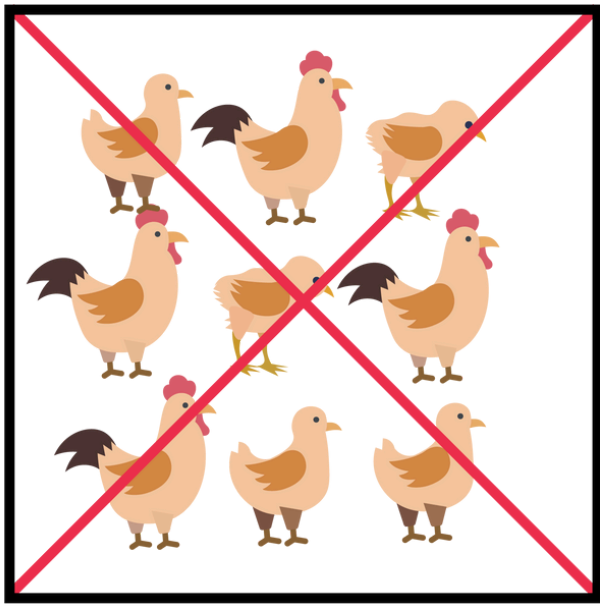


FIGURE 3.4
Example of Feed Change Based on Body Weight (adapted from Hy-Line)



House 1: Good Uniformity



House 2: Poor Uniformity

FIGURE 3.5
Flock Uniformity

While observing the flock can provide a rough estimate of uniformity (Figure 3.5), accurately assessing uniformity requires weighing a sample of individual birds. The goal is for uniformity to be 80% or higher, meaning 80% of the flock falls within 10% above or below the mean flock weight.

How to Calculate Uniformity:

1. Weigh a sample of birds.
2. Calculate the mean weight. (Example: Mean = 1.2 kg)
3. Determine 10% above and below the mean:
    - 1.2 kg - 0.12 kg = 1.08 kg
    - 1.2 kg + 0.12 kg = 1.32 kg
    - The acceptable range is 1.08 kg to 1.32 kg.
4. Count the number of birds within this range.
5. Calculate the percentage of birds within this range out of the total sample.
    - Example: If 40 out of 50 sampled birds fall within this range, uniformity is 80%.

Factors That Support Uniformity:

- ✔ Adequate feeder and drinker space
- ✔ Good ventilation
- ✔ Correct lighting program
- ✔ Sanitation and vaccination

CHECKLIST 3.1
Preparing the House for Layer Chicks

	Task	Done	Date	Person
1	Fill the foot bath with disinfectant			
2	Spread shavings on the floor, 5-10 cm deep			
3	Put the feeders and drinkers in the house at the correct height for day-old chicks			
4	Put the brooders in place and at the correct height			
5	Hang thermometers at the edge of the brooders, at the level of the chicks			
6	Place the brooder guards around the brooders			
7	Fill the drinkers with clean water			
8	Fill the feeders with broiler starter crumbles			
9	Turn heating on 24 hours before the chicks arrive			
10	Read the temperature of the air near the brooders			
11	Make sure the lights are working, and set timer if you have for 23 hours light			

CHECKLIST 3.2
Placing and Brooding Layer Chicks

	Task	Done	Date	Person
1	Carefully carry the boxes to the poultry house			
2	Check that chicks have been beak trimmed and vaccinated at the hatchery			
3	Count the number of boxes			
4	Weigh a sample of boxes			
5	Take the temperature of a sample of chicks from different boxes			
6	Take the chicks out of the boxes and place them inside the brooder guards			
7	Handle the chicks carefully to avoid breaking wing and leg bones			
8	Count the dead chicks			
9	Remove the sick or deformed birds			
10	Put paper with feed on it on top of the shavings			
11	Watch the chicks to see if they are eating. Put any chicks that do not eat close to the feeders			
12	Feel the crops for feed content			
13	Watch the chicks to see if they are drinking. Dip the beaks of any chicks that do not drink in the water			
14	Watch the behavior of the chicks to see if they are comfortable with the temperature			
15	Change the brooder temperature if it is too hot or too cold			

CHECKLIST 3.3
Managing Pullet Rearing

	Task	Done	Date	Person
1	Turn the litter to dry it underneath. Remove wet patches of shavings			
2	Notice whether there is a smell of ammonia in the house			
3	See which direction the wind is blowing from			
4	Raise or lower the curtains to ventilate the house, according to the weather			
5	Look at the birds to see if they are heat stressed or huddling because of the cold			
6	Clean out the drinkers and fill with fresh water			
7	Set drinkers at the correct height for the birds			
8	Set feeders at the correct height for the birds			
9	Fill the feeders with the correct broiler ration			
10	Check the light time switch			
11	Weigh a sample of the layers (weekly). Record the average weight			
12	Remove dead birds (daily). Record the number of mortalities. Put them in the mortality pit			
13	Ensure vacccination program is being followed and record each vaccination			
14	Adjust the lighting programme based on natural light hours when they reach POL			
15	Check the rat poison in the bait station			

CHECKLIST 3.4
Managing A Flock of Laying Hens

	Task	Done	Date	Person
1	Observe the Hens Eating			
2	Wash Hands with soap. Collect eggs on trays and pack them into boxes			
3	Collect the cracked and dirty eggs separately			
4	Look at a handful of the feed and smell it			
5	Put feed in the feed troughs to a depth of 5cm			
6	Turn the feed in the troughs with your hand to mix in the fines. Remove wet or mouldy lumps			
7	Check the water nipples for leaks. Check to see if any nipples are blocked. Clean bell drinkers			
8	Look at the manure under the cages. See if it is too wet or too dry. Check the litter quality in a barn system			
9	Smell the air in the poultry house. Notice if there is an ammonia smell			
10	Remove dead birds and record the number on the record sheet			
11	Check the rat poison in the bait station			
12	Look to see if the hens are panting to lose heat. Spray the roof with water if needed			
13	Check the lights are working and that hens are getting 16 hours of light			

PHOTO 4.1
Proper management of egg-producing birds is essential for maximizing financial investment.

4. Management of Point of Lay and Egg-Producing Birds

1 Transportation of Point-of-Lay (POL) Pullets

Transport and handling of point-of-lay pullets is the critical first step in successfully managing a laying flock. Each young hen represents a significant financial investment, making it crucial to avoid unnecessary mortalities and maximize performance.

Although pullets are well-feathered and generally robust, they can still experience transport stress. To minimize this, transport should occur as quickly as possible and during the cooler parts of the day

Pullets should be transported at least 14 days before the expected start of egg production, typically before 16 weeks of age.

2 Handling on Arrival

Careful handling upon arrival at the farm is essential. Pullets are approaching the onset of lay, and their reproductive systems are still developing. Rough handling, bruising, or injury can delay egg production and result in financial losses.

Key handling practices:

- Hold birds by both wings or both legs.
- Avoid holding more than three birds in one hand.
- Handle gently to prevent bruising, broken bones, or torn skin.

Upon arrival, pullets should be transferred swiftly from the vehicle to the layer house. Avoid leaving birds in the sun without water and minimize loud noises. When removing birds from crates, hold one at a time by both legs. Any injuries, such as broken bones or torn skin, can delay the start of egg production until the hen has recovered.

Key Handling Tips:

- ✔ Hold by both wings or both legs
- ✔ Max 3 birds in one hand
- ✔ Avoid rough handling
- ✔ Move quickly to shade and water

3 Acclimatization to a New Environment

Some stress during transfer is unavoidable due to transportation, water deprivation, a new environment, and establishing a pecking order. This stress activates the adrenal gland, releasing cortisol, which suppresses the immune system. Pullets are still developing immunity from vaccinations received during rearing, making disease prevention especially important.

During this adjustment period:

- Birds may “pile” together, especially if housed on the floor. If this occurs, leave lights on for the first two to three nights.
- Lowering the temperature can encourage feed intake.
- Provide immediate access to fresh feed and clean water.
- Ensure sufficient lighting to help birds familiarize themselves with their new surroundings.
- Nest boxes should be in place before laying begins, so birds are accustomed to them.

Environmental control follows the same principles as during rearing. Layers tolerate cold if dry, but proper ventilation prevents humidity buildup. Moisture makes birds more susceptible to cold stress. In winter, heating and artificial lighting may be necessary to maintain a 15 to 16-hour photoperiod.

4 Feeds and Feeding

During the laying cycle, hens' nutritional needs change as egg production peaks and then declines. Ideally, feed should follow three to four phase-specific diets, with protein and energy levels gradually reduced as production decreases.

If only one feed type is practical, select a mid-phase ration:

- Younger hens may be slightly underfed.
- Older hens may be slightly overfed.

Phase Feeding Plan:

- Pre-lay / Early Lay – High protein and calcium
- Peak Production – Balanced protein and energy
- Post-peak / Late Lay – Reduced protein and energy

5 Egg Collection and Storage

Pullets come into lay at about 18 weeks of age. Young hens lay an egg a day, usually in the morning, for a long period. As they age they start to lay fewer eggs, with more pause days (day with no egg). This means the rate of lay peaks at about 30 weeks of age and then starts to decline.

Egg size will increase as the hen ages. This means that although the hen is laying fewer eggs they are bigger. If the bigger eggs can be marketed for a higher price it compensates for the drop in egg production. However, if eggs are not graded income will start to decline. The decision of when to cull should be when the cost of feeding exceeds the income from egg sales. This is usually around 80 – 90 weeks of age, but will be different for individual farmers.

PHOTO 4.2
Pullets lay from about 18 weeks and rate of lay peaks at about 30 weeks.

Unproductive hens can be removed from the flock during the cycle. Some birds never come into lay or stop laying early. These birds are noticeable because they have small, pale wattles and combs and yellow skin on their shanks. Hens in lay have bright red, fleshy wattles and combs and pale skin on their shanks. The width of the pelvic bones should be the width of 3 fingers if a hen is laying.

Because eggs are a perishable foodstuff it is important that good hygiene is maintained and that eggs are handled carefully to avoid cracks. Eggs should be collected regularly (at least once per day) and placed in clean and dry trays. Plastic or pulp trays may be used for egg collection in the poultry house. Plastic trays can be washed and kept clean, but pulp trays seem to cause fewer breakages amongst jumbo eggs. The cages should be kept clean in a cage system and the nest boxes and nest material be cleaned regularly in a barn system.

Eggs with cracked shells cannot be sold as first grade, which affects the farm profit. The eggs should be placed blunt end up for ease of picking up by the suction cups of the grading machine. Avoid stacking the trays too high.

Cracked and dirty eggs should be collected separately. Cracked eggs with intact membranes may be used for making liquid egg for bakeries. Leakers (cracks with torn membranes) and eggs with very dirty shells should not be sold for human consumption. Any shells with odd shapes, wrinkles, abnormal pigmentation, fly spots, and blood or faecal stains should be removed on the farm.

Key collection and storage practices:

- Collect eggs at least once daily
- Handle carefully to prevent cracks
- Store eggs blunt end up in clean, dry trays (plastic or pulp)
- Cracked or dirty eggs should be collected separately
- Store eggs in a cool room (59–64°F or 15–18°C) with 75% humidity
- Avoid strong-smelling foods during storage (e.g., onions, fish)

PHOTO 4.3
Good quality eggs are determined by yolk color, albumen height, and shell quality.

6

Egg Quality and Food Safety

Key quality indicators:

- **Yolk Color:** Determined by natural pigments from feed (e.g., yellow maize, soya). Free-range hens often have darker yolks due to grass consumption. Consumers generally prefer a darker yolk.
- **Albumen Height**: Fresh eggs have thick albumen; older eggs have watery albumen that spreads in the pan.
- **Shell Quality:** Shell texture, color, cleanliness, and strength affect consumer perception. Panting in hot weather can cause thin shells. Other factors such as age, stress, nutritional deficiencies and certain diseases (e.g., Newcastle Disease, Infectious Bronchitis, Egg Drop Syndrome) can cause eggs with thin shells or even shell-less eggs

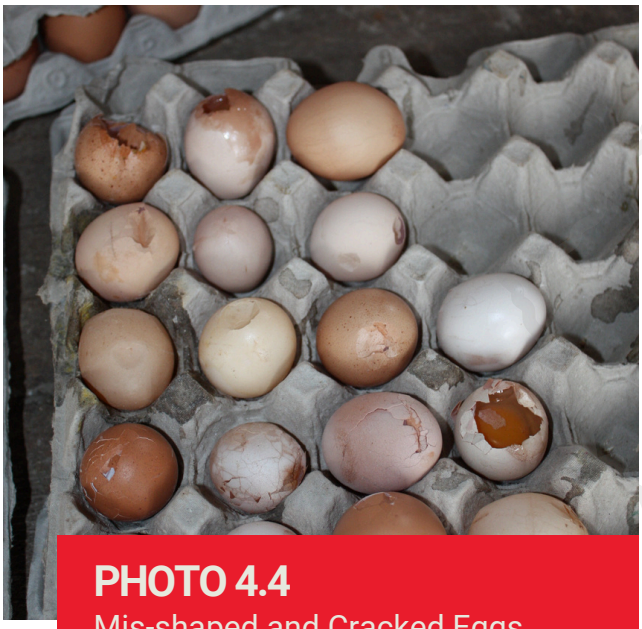


PHOTO 4.4
Mis-shaped and Cracked Eggs

Freshness check: Older eggs lose moisture, causing the air cell to enlarge. Fresh eggs sink in water; older eggs float.

Eggs should be stored in a coolroom, at 15-18°C and 75% relative humidity. If there is no coolroom eggs kept at room temperature in summer lose internal quality very quickly. The egg white becomes watery and when broken open in a pan, the egg will be flat and spreading. Low humidity in the coolroom (very dry air) causes the eggs to lose water by evaporation. High humidity, on the other hand, encourages mould growth on the egg shells. This means that eggs need to be marketed quickly.

At home, eggs should be placed in the fridge. The shelf life of eggs is about three weeks from the day they were laid, as long as they are kept at low temperatures. Avoid storing eggs with strong-smelling food like onions, oranges and fish. Eggs are able to absorb smells through their shells.

Egg washing is not common because it removes the protective cuticle, allowing bacteria to penetrate the shell. Clean hands are vital when collecting eggs to prevent contamination, especially with Salmonella, which can lead to flock culling.

The staff collecting the eggs must have clean hands. One of the main problems with layers is a bacterium called Salmonella, which causes food poisoning in humans. The bacteria are found on the hands of people who do not wash their hands properly after using the toilet. If the bacteria invade the body of the hen all her eggs will be contaminated. If this happens the whole flock may have to be culled (removed from the house and killed).

Because eggs are a food for human consumption, egg producers need to be aware of food safety laws and requirements of customers that may insist on certain safety standards, which will include audits of farms and pack stations to be certified.

PHOTO 4.5
Egg graders separate eggs by weight into different grades.

Eggs may be sold ungraded or graded by size:

- **Super Jumbo:** 72.1g+
- **Jumbo:** 66.1–72g
- **Extra Large:** 59.1–66g
- **Large:** 51.1–59g
- **Medium:** 43.1–51g

Grading involves candling under bright light to detect cracks (Photo 4.4) and dirt, followed by weighing (Photo 4.5). Manual grading is possible but time-consuming. Size categories command different market prices.

In South Africa, egg grading and packaging are regulated under the Agricultural Product Standards Act. The South African standard is a useful reference for grading in Lesotho

PHOTO 5.1
Prevention of disease is crucial to the profitability of any poultry farm.

5. Bird Health and Biosecurity

Prevention of disease is critical, and good biosecurity and farm management practices play a key role in reducing the risk of disease exposure. If birds are exposed to disease, it is important to quickly identify that they are sick and take appropriate action.

1 Biosecurity

Biosecurity refers to keeping poultry safe by preventing the spread of disease-causing agents (viruses, bacteria, fungi, and protozoa). These microorganisms are everywhere, and it is impossible to eliminate them all. However, with good biosecurity, birds have the least exposure to pathogens and the best chance to remain healthy. Many pathogens are killed by sunlight, as well as through proper cleaning and disinfection of the house (as described earlier). Vaccinations give birds immunity, and reducing stress by maintaining proper environmental conditions further strengthens their resistance to disease.

2 Vaccination

The vaccination program for laying hens is intensive, as they have a long production cycle and need to remain healthy throughout. This is particularly true during the rearing phase; during the laying phase, hens receive booster vaccinations for Newcastle disease. A vaccination program should always be provided by a local veterinarian who is aware of endemic diseases and local conditions. An example of a vaccination program in Lesotho is given in Appendix iii.

When birds are vaccinated for a disease, they receive a weakened (attenuated) form of the virus causing the disease. The birds may feel mildly ill for a short time. Their immune systems produce antibodies to fight and kill the virus. When the birds later come into contact with the virulent (strong) form of the virus, their immune systems will recognize it and the antibodies will attack and kill the virus before the birds become ill.

All vaccines must be stored in a refrigerator at 2–8°C (35–46°F) and must not be exposed to sunlight (which contains ultraviolet light). Containers used for mixing vaccines, as well as the equipment used to apply vaccines, should not contain any chemicals that could destroy the vaccine. Vaccines should be used immediately after mixing.

Key Vaccine Storage Tips:

- ✔ Store at 2–8°C (35–46°F)
- ✔ Protect from sunlight
- ✔ Use immediately after mixing

3 Methods of Vaccinating

Vaccines can be administered to birds using the following methods:

- Aerosol spray
- Injection (in the muscle, under the skin, or in the wing web)
- Drinking water
- Eye drop

Vaccine Given by Aerosol Spray

Laying hens are commonly vaccinated for Newcastle Disease and Infectious Bronchitis by aerosol spray. The procedure is as follows:

1. Wash hands with soap and put on protective clothing, especially a face mask.
2. Use distilled water. Ensure it has not expired. Check the date on the bottle.
3. Pour 2 liters of distilled water into a clean jug.
4. Open the vaccine bottle under the water. Stir with a plastic spoon.
5. Pour the mixture into a knapsack sprayer or plastic spray bottle. Shake and adjust the nozzle to produce a wide, fine spray.
6. In a closed house, turn off fans and close doors. In an open house, close curtains and wait until there is no wind.
7. Walk slowly through the house, spraying each hen until its head is properly wet. Spray from about 1 meter away.
8. Rinse equipment with cold water.
9. Wash hands.

CHECKLIST 5.1
Spray Vaccination

	Task	Done	Date	Person
1	Wash hands thoroughly with soap			
2	Put on protective clothing (overalls, gumboots, paper face mask)			
3	Check distilled water (less than 6 weeks old) and vaccine expiry date			
4	Mixing vaccine: Put 2 litres distilled water in jug. Add La Sota vaccine by putting bottle under water before opening. Stir to dissolve			
5	Pour vaccine into knapsack spray. Shake. Set nozzle to make a wide, fine spray			
6	Closed house: Switch off ventilation fans, close doors Open house: Make sure there is no wind blowing			
7	Walk slowly, spraying each bird thoroughly until damp, from a distance of 1 meter			
8	Wash hands and rinse equipment in cold water			

CHECKLIST 5.2
Vaccine in Drinking Water

	Task	Done	Date	Person
1	Turn off the water supply for 30 min - 1 hour			
2	Clean and empty the drinkers			
3	Fill a clean, 12-litre plastic bucket with tap water			
4	Add skimmed milk powder (to neutralize the chlorine and protect the virus). Wait for 30 minutes			
5	Open the vaccine bottle under water in the bucket. Stir with a clean plastic spoon			
6	Pour equal volumes of water into the drinkers. Put the drinkers back in the house			
7	Allow the birds 2-3 hours to drink the water containing the vaccine			
8	Watch the birds drinking			
9	Wash the drinkers and fill them with clean tap water			

Vaccines in Drinking Water

The procedure for administering vaccines in drinking water is as follows:

1. Turn off the water or remove drinkers for 30 minutes to 1 hour. On hot days, do not withhold water for more than 30 minutes.
2. Empty and clean drinkers with tap water. Do not use chemicals.
3. Wash hands.
4. Fill a clean, 12-liter plastic bucket with tap water. The volume of water depends on the number of hens in the house.
    - Use 1,000 doses in as many liters as the age of the birds in days, to a maximum of 40 liters.
    - For 1,000 birds at 10 days old, use 10 liters.
    - For 2,000 birds at 10 days old, use 20 liters.
5. Add 2 grams of skim milk powder per liter of water and wait for 30 minutes (e.g., 20 grams for 10 liters, or 40 grams for 20 liters). Milk powder neutralizes chlorine in the water and protects the vaccine.
6. Open the vaccine bottle under the water in the bucket. Stir with a clean plastic spoon.
7. Pour the mixture into the drinkers in equal amounts. Return drinkers to the house.
8. Let birds drink for 2–3 hours. Watch to ensure they drink. Move among the birds to encourage drinking.
9. Rinse drinkers and refill with clean tap water.

PHOTO 5.2
Injectable Vaccine

PHOTO 5.3
Vaccines should be stored in a refrigerator for proper storage.

4

Mixing and Storing Vaccines

Proper storage and mixing are vital for vaccine effectiveness. Vaccines must always be kept in a refrigerator at 2–8°C (35–46°F). Transport vaccines from the supplier to the farm in a closed, insulated cooler box with an ice brick and a thermometer. Maintaining the cold chain is essential from purchase to administration. If the cold chain is broken, the antigen in the vaccine may be destroyed, resulting in poor immunity.

Check the expiry date before use and record the batch number in case of later issues. Only vaccinate healthy, stress-free birds.

Cold Chain Essentials:

- Use a cooler box with ice bricks
- Check temperature throughout transport
- Record batch numbers

5 Carriers of Disease

FIGURE 5.1
Potential Routes of Disease Exposure

Ways to reduce carriers of disease from affecting broilers:

- Clean and disinfect the house between flocks (as described earlier).
- Restrict access to casual visitors by fencing the property, locking the broiler house, and posting "No Entry" signs.
- Minimize contact between buyers and birds.
- Require personal protective equipment (PPE) for all visitors—clean overalls and boots. Disposable options or plastic sandals that can be easily washed are also effective.
- Place footbaths and hand sanitizers outside each shed.
- Use disinfectant wipes on cell phones if taken into the poultry house.
- When moving between houses, visit the youngest flocks first, then older flocks.
- Keep grass around the house short and remove any rubbish to deter pests.
- Prevent wild birds and rodents from entering the house by installing wire mesh over gaps.
- Implement fly control measures.
- Use rat bait stations regularly.
- Remove dead birds promptly and dispose of them in a mortality pit with lime or by burning.
- Remove litter after each cycle and compost it far from the poultry house.
- Restrict vehicle access to essential traffic only.
- Disinfect tools used in and around the house.
- Discard old or moldy feed and clean up feed spills promptly.
- Test water regularly.

6 Farm Management Aspects

A clean and healthy environment is also crucial for disease prevention. Attention to the following details inside the poultry house can help maintain flock health:

- Adjust feeders and drinkers to the correct height as birds grow.
- Ensure there are enough feeders and drinkers for the number of birds. Overcrowding can lead to pecking injuries.
- Check that feed is fresh (smell and taste to confirm) and that water is clean (it should be drinkable by human standards).
- Provide adequate ventilation to remove dust, hot air, and ammonia. High ammonia levels can cause respiratory issues.
- Turn litter regularly and remove wet patches to prevent ammonia buildup.
- Maintain appropriate stocking density. Overcrowded birds may peck at each other.
- Monitor flock uniformity—uneven growth can signal disease or poor conditions.
- Control the fly population within the house.
- Avoid sudden loud noises that could stress the birds.

Key Daily House Management Checks:

- ✔ Feed and water availability and quality
- ✔ Feeder and drinker height adjustments
- ✔ Ventilation and ammonia levels
- ✔ Litter condition
- ✔ Bird behavior and uniformity

PHOTO 5.4
Rat Bait Station

PHOTO 5.5
Fly Trap

1 Identification of Sick Birds

Daily observation is essential to recognize healthy birds and detect early signs of illness. Knowing what is normal helps identify problems quickly. When walking through the flock, use the checklist in Figure 5.2 to confirm birds are healthy.

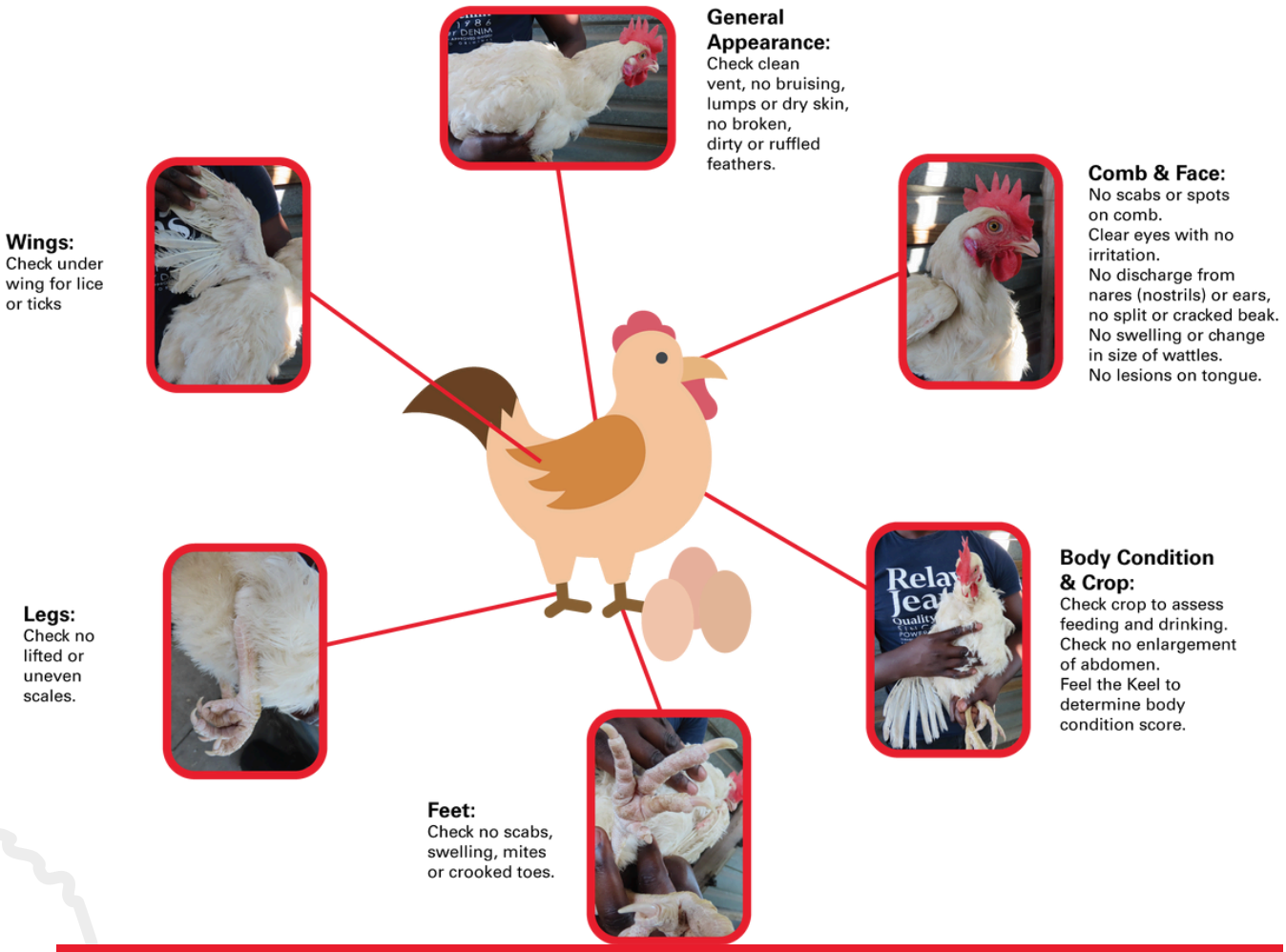


FIGURE 5.2
Signs of a Healthy Bird

Floor-raised birds are more prone to certain diseases like Infectious Bursal Disease and Coccidiosis, as they are in contact with droppings. Skin and feathers are the first barrier against disease. Rough handling can lead to scratches and tears, creating entry points for bacteria.

If a bird appears sick, isolate her immediately in a separate cage or a cardboard box with mesh over the top. Provide water (with a little sugar, if available).

Common Signs of Disease

- Loss of appetite
- Diarrhea
- Drop in egg production
- Deformed eggs (e.g., soft-shelled, misshapen, wrinkled shells)
- Change in eggshell color
- Hunched posture, ruffled feathers, drooping wings
- Breathing difficulty (e.g., tail bobbing), wheezing, coughing, sneezing, clicking sounds
- Lethargy
- Swelling of the head, eyes, comb, wattles, or hocks
- Discharge from nostrils or eyes
- Discoloration of comb, wattles, or legs

If possible, take sick or dead birds to the nearest veterinary laboratory for a post-mortem examination and disease diagnosis. Alternatively, contact your local extension officer. Farmers should not diagnose diseases themselves; veterinary professionals should confirm the diagnosis and recommend treatment.

Immediate Action for Sick Birds:

- ✔ Isolate immediately
- ✔ Provide water (add sugar if possible)
- ✔ Contact a vet or extension officer

PHOTO 5.6
Isolating sick birds and contacting a vet or extension officer can help keep the rest of the flock healthy.

2 Common Diseases

It is always important to consult a veterinarian for an accurate disease diagnosis and appropriate treatment recommendations (insert link to contact information). However, the signs of the most common diseases affecting poultry are described below:

Newcastle Disease

- Caused by a virus.
- Can result in 100% mortality in unvaccinated flocks.
- Prevention through vaccination:
  - Hitchner B1 and La Sota vaccines: administered via aerosol spray, drinking water, or eye drop.
  - Oil-based vaccine: administered as an intramuscular injection.
- Nervous symptoms: drooping wings, lack of coordination, falling over, twisted necks.
- Respiratory symptoms: birds struggle to breathe.
- Birds stop eating and drinking.
- No treatment available.

PHOTO 5.7
Layer with Newcastle Disease
Photo Credit: Hendrix Genetics

Infectious Bronchitis

- Caused by a rapidly spreading virus.
- Respiratory symptoms: snicking, sneezing, gasping, watery eyes, head shaking, nasal discharge.
- Increased mortality.
- Birds may recover within 1-2 weeks if no other pathogens are present.
- Secondary bacterial infections, commonly E. coli, often occur.
- Live vaccines are commonly used for prevention.

Coryza

- Caused by a bacterium
- Acute onset, incubation period 2-3 days
- Spreads rapidly in a flock
- Symptoms are like the common cold in humans: swelling around eyes and nose, discharge
- Can vaccinate layers and breeders
- Treat with antibiotics.

PHOTO 5.8
Layer with Coryza
Photo Credit: Hendrix Genetics

PHOTO 5.9
A layer infected with Gumboro demonstrating extreme listlessness, ruffled feathers, and crouched stance.
Photo Credit: Hendrix Genetics

Gumboro (Infectious Bursal Disease; IBD)

- Caused by a persistent virus that is difficult to kill with disinfectants.
- Often affects young broilers.
- Sudden (acute) onset.
- Damages the immune system by attacking the bursa of Fabricius.
- Symptoms: sudden increase in mortality, loss of appetite, stunted growth, depression, huddling, ruffled feathers, vent pecking, diarrhea, trembling, lack of coordination.
- Prevention through vaccination via drinking water.
- Secondary bacterial infections can be treated with antibiotics.

Fowl pox

- Caused by a virus
- Cutaneous form causes lesions on the skin, mortality usually low
- Diphtheritic form can also affect the upper gastrointestinal tract and the respiratory tract and mortality rates are higher with this form
- he birds take a long time to recover and egg production will drop can vaccinate

PHOTO 5.10
Layer with Fowl Pox
Photo Credit: Hendrix Genetics

Egg peritonitis

- In the process of egg formation, sometimes the yolk ends up in the body of the hen instead of in the reproductive tract
- This can cause inflammation of the peritoneum (lining of abdomen)
- The yolk is an excellent source of food for bacteria, which causes infection but usually antibiotics don't help
- Avoid increasing light if pullets are underweight as this makes them prone to egg peritonitis

Vent pecking

- Not an infectious disease but may cause problems in a flock
- Gentle pecking is a normal social interaction
- Becomes abnormal when it becomes severe and causes injury
- Often associated with poor environmental conditions and stress in hens such as lights too bright or overcrowding
- Can be due to pecking at parasites

Parasites

While parasites may not necessarily transfer a disease, they can cause anaemia and irritation to the bird. Hens are susceptible to internal parasites (worms/nematodes) and external parasites (mites and lice).

Hens in free-range systems are more prone to nematode infestations (helminthiasis) and may need to be dewormed.

External parasites bite and suck blood from birds, causing itching and discomfort. Heavy infestations can lead to blood loss and anemia. Birds may peck at their own feathers, damaging their skin.

Red mites are more common when hens are on the floor. The mites spend the day hiding in dark cracks and corners of the house. At night they become active and feed on the birds. Northern fowl mites live on the birds and are often concentrated around the vent area.

Parasite Management Tips:

- ✔ Check under feathers, wings, and around the vent
- ✔ Treat with powder (e.g., Karbadust) on birds and bedding
- ✔ Provide a dust bath area
- ✔ Clean and disinfect the house thoroughly before introducing a new batch of birds

3 Notifiable Diseases

A notifiable disease is one that MUST be reported to government authorities by law. These diseases can spread rapidly, leading to mass chicken deaths, human health risks, and disruption to the poultry industry. Reporting helps authorities control and prevent outbreaks.

The notifiable diseases in chickens in Lesotho are:

1. Newcastle Disease
2. Avian Influenza (Bird Flu)
3. Salmonellosis

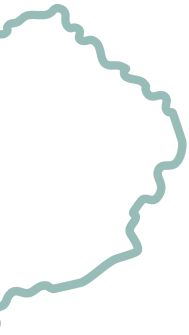
Steps to Report a Notifiable Disease

1. **Recognize Signs:**
   - Sudden deaths.
   - Severe coughing, sneezing, or breathing issues.
   - Swelling of the head or face.
   - Purple or bluish discoloration on legs or comb.
   - Bloody diarrhea or unusual behavior.
2. **Separate Sick Birds:**
   - Isolate symptomatic birds from the healthy flock.
3. **Contact Local Veterinary Authority:**
   - Report the situation to the District Veterinary Officer.
   - Provide details on symptoms, the number of sick birds, and recent events.
4. **Follow Instructions from Authorities:**
   - Officials may inspect the farm and test samples.
   - Eggs, meat, or live chickens may be restricted from sale.
5. **Cooperate with Disease Control Efforts:**
   - Quarantine may be imposed.
   - Infected or exposed birds may need to be culled.
   - The farm may require disinfection.
6. **Report New Cases:**
   - Continue notifying authorities of any new illnesses or deaths during the investigation.

CHECKLIST 5.3
Bird Health

	Task	Done	Date	Person
1	Ensure birds have feed, water and good environmental conditions			
2	Ensure biosecurity measures are being followed			
3	Look at the color and quality of the egg shells			
4	Make sure there is no smell of ammonia or too much dust in the air			
5	Contact your local resource centre if you suspect any disease			
6	Look for parasites on the hens			
7	Check vaccine boosters are given			

PHOTO 5.11
Maintaining a clean and healthy environment is crucial for disease prevention.



6. Business Skills for Egg Producers

Before starting a layer business, it is important to determine the feasibility of the project. To do this, you can forecast the income expected from egg sales. This might involve checking the price of eggs in stores or asking neighbors about the current cost of eggs in the informal market. Most breeding companies publish performance objectives on their websites, which can help predict egg production under optimal conditions. Performance in Lesotho can be expected to be slightly below these targets, especially in open-sided, naturally ventilated houses.

If you have not yet started a business, there are important aspects to consider:

Define Your Business:

- Have a clear idea of what your business entails, e.g., selling 10 boxes of eggs per week.

Understand Your Product:

- Eggs have a shelf life and are the result of well-managed layers. Ensure you have the knowledge and capability to manage this successfully.

Choose the Right Location:

- If you already have a farm/poultry house, think about the location of sales. If you are still planning, consider factors like distance from other poultry houses, water and electricity supply, and proximity to markets (people and roads).

Research Your Market:

- There is no point in starting a business if there is no market. Engage potential customers to understand what they are willing to pay. Gather information from suppliers regarding chicks, feed, equipment, etc.

Study Your Competitors:

- How many eggs does your neighbor produce? What is their selling price? Does demand vary seasonally?

Identify Your Competitive Edge:

- Do customers want something unique that could give you a competitive edge, such as graded eggs or taxi pack trays?

Record Keeping

It is vital to keep records to calculate actual profit or loss and make informed management decisions. Keeping records up to date allows you to detect problems early and take corrective action. Comparing your performance to breed standards can help benchmark your business.

1 Financial Records

If layers are being run as a business, it is important that records are kept to be able to calculate profit or loss. One of the essential financial records is the budget. A budget is a financial tool used to plan for future expenses and help make decisions about affordability. It involves listing all costs incurred over a specific period. For a new farmer, a budget can help identify set-up expenses such as equipment and housing. For an established farmer, it would include fixed and variable costs such as those shown in Table 6.1. When used effectively, a budget can help farmers make informed decisions about their birds before placing them on the farm, minimizing the risk of losses.

TABLE 6.1 Projected Expenses for Layers

Expense	Price per unit	Number of units	Total Price
Bedding			
Point-of-lay pullets			
Feed			
Heating Costs			
Medication/Vaccination			
Electricity and Water			
Cleaning Materials and Disinfectants			
Rat Bait			
Transport Costs			
Phone Costs			
Office Supplies and Stationary			
Salaries			
Protective Clothing			
Bank Charges			
Loan Repayment			
Repairs and Maintenance			
Egg trays/packaging costs			

Basic Definitions

Fixed Costs - Costs that do not change with the number of birds.
Examples: Housing, equipment, licenses, salaries.

Variable Costs - Costs that change per bird.
Examples: Feed, vaccines, transport per bird.

Break-even price - The minimum price you must charge per bird so that your total income covers all costs.

The break-even is the point where expenses equal sales, meaning there is neither a profit nor a loss. A farmer should aim for sales that exceed this point to generate profit. Knowing the break-even point helps to set a minimum price to sell eggs. It also shows how changes in costs or production scale can affect pricing. It is essential for profit planning and sustainability of the poultry business.

Generating the break-even point requires calculating both fixed and variable costs. Fixed costs include expenses that remain constant, such as salaries, while variable costs fluctuate based on the number of birds and include feed and chicks. The formula that can be used to calculate the break-even point is as follows:

How to Calculate Break-Even Point:

Break-even price per egg = (Fixed Costs ÷ Number of Eggs Sold) + Variable Cost per Egg Sold

This formula helps determine the minimum price you need to sell each bird for in order to cover both your fixed and variable costs.

Example:
Let us say you are have 1000 layers producing at an average of 80% rate of lay. This would mean 288 000 eggs in a year
Fixed Costs (housing, lighting, equipment depreciation, etc.) = 19,000
Variable Cost per Saleable Bird (feed, medicine, transport) = 1
Now, let's plug in the numbers:
Break-even price per egg = 19,000 ÷ 288,000 + 1
=0.07+1
= 1.07 per egg

What This Means:
You must sell each egg for at least 1.07 just to break even.

- If you sell an egg for 2, you earn a profit of .93 profit per egg
- If you sell for 1, you lose .07 per egg.

Common Financial Mistakes that Cause Losses in Layer Businesses

a. Keeping some income back for house maintenance and replacing equipment is necessary
It is important to bear in mind that housing requires maintenance and equipment will become worn out and need replacing, so this will require funds held back from the profit.

b. The rate of lay will decrease through the production cycle.
Because the rate of lay decreases, the number of eggs available to sell each month will reduce. Because eggs are getting bigger, graded eggs can help offset this as there will be greater income from larger eggs, even if there are less to sell. A lot of farmers get good income in the first month of production and think it will continue throughout production. Knowing that income will likely drop each month is useful for effective cash flow planning.

c. Income from one cycle is required to pay for costs for the next cycle
A farmer must remember that the input costs to start a new cycle of production are high as point of lay pullets are expensive and enough money must be kept aside throughout the previous production cycle to be able to start the next cycle.

d. Poor management practices increase production costs.
Issues such as poor ventilation, extreme temperatures, overcrowding, inadequate nutrition, and disease can negatively affect bird health and productivity. If egg production is not at the target, this can affect overall profitability, especially if there are added costs for vets and medication.

e. Poor record keeping leads to uninformed decision-making
Keeping accurate records is essential for monitoring both the financial and production aspects of a poultry business. When farmers do not track inputs, sales, egg production rates, and expenses, they cannot properly evaluate performance or identify areas of loss. Good record keeping enables timely and informed decisions that help reduce losses, improve efficiency, and support the long-term sustainability of the business.

2 Production Records

Production records are essential for assessing performance (Figure 6.1). Major breeding companies provide performance objectives, including target egg production curves. Comparing your flock's performance against these targets helps identify areas for improvement.

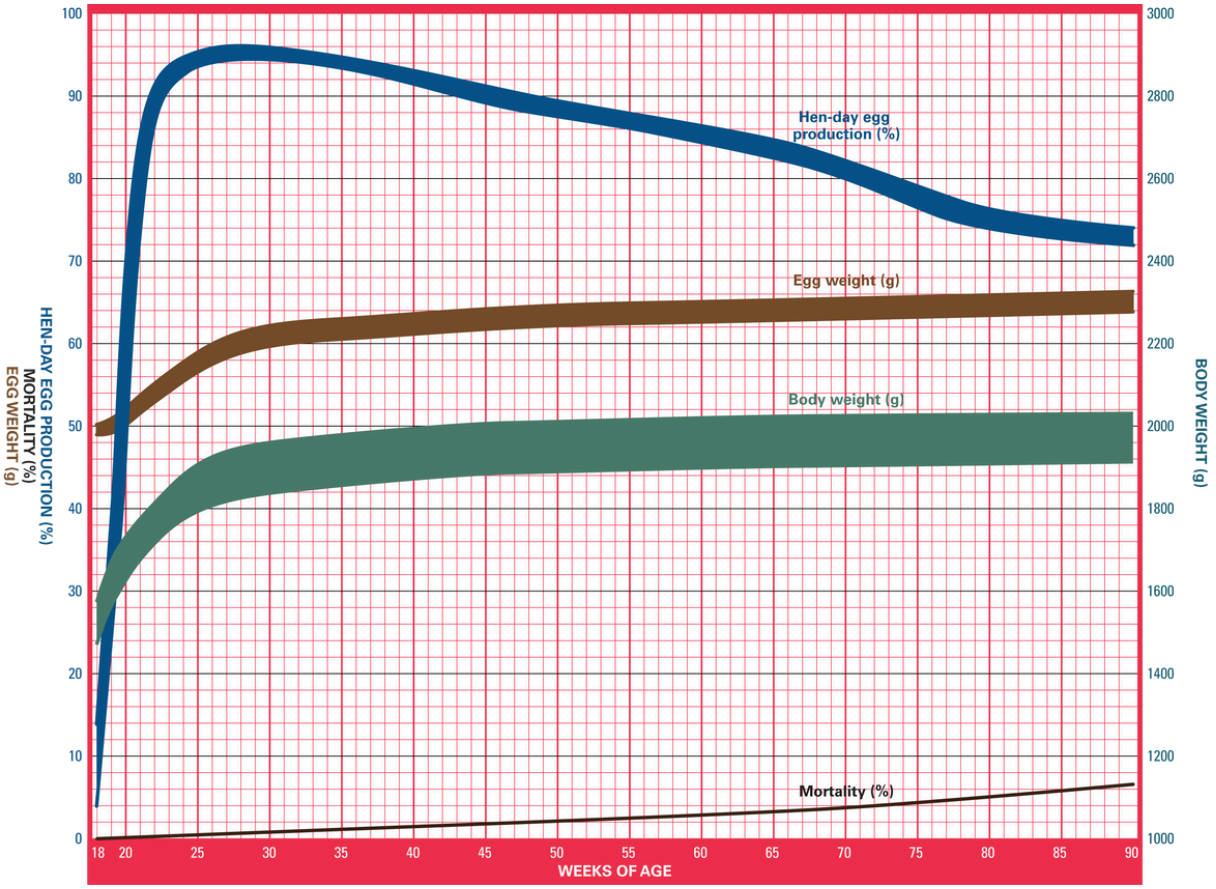


FIGURE 6.1
Target Egg Production Curve (adapted from Hy-Line)

It is helpful to compare your performance and assess if your flock is performing to target and if not, how you could improve.

Keeping accurate records also helps to be able to identify any problems. For example, if rate of lay was not as high as expected but you don't have feed intake records you won't be able to determine if there was a reduced feed intake that caused the drop, or that the feed intake was normal but the quality of the feed was poor.

Recording things such as feed intake also helps to be able to plan and budget for the future. It also helps to pick up theft issues or missing feed.

Examples of Production Records (see Appendix v):

- Hatch date and date housed
- Number of hens housed
- Breed
- Daily mortality
- Daily number of eggs
- Number of cracked and dirty eggs
- Egg weight
- Feed purchases
- Feed closing stock (weekly)
- Body weights (monthly)
- Ambient temperature
- Water consumption
- Lighting program
- Vaccination program
- Batch numbers and expiry dates of vaccines
- Blood test results
- Visitors to the farm

Checklist Before Starting a Layer Business

- ✔ Do you know your market?
- ✔ Have you researched input costs?
- ✔ Is your location suitable?
- ✔ Do you understand broiler production and care?

Forward planning is crucial in any poultry operation. A housing and depopulation schedule (placement and culling) is one of the most important tools. Orders for day-old chicks or point-of-lay pullets must be placed months (or even a year) in advance, so knowing when your houses will be ready is essential. Avoid the biosecurity risk of depopulating and re-housing a poultry shed in the same week.

Vaccination schedules, weighing programs, lighting schedules, and blood sampling plans also help streamline daily and weekly tasks, making farm management more efficient.

PHOTO 6.1
Mainting accurate records helps measure profitability.

Accurate records allow you to calculate key performance indicators, such as rate of lay, mortality, egg weight, feed intake, and feed conversion efficiency. Examples of these calculations are summarized in Table 6.2.

TABLE 6.2
Useful Calculations for Measures of Performance of Layers

Calculation	Unit	Formula	Example	Answer
Rate of Lay	%	(No.eggs / no.hendays) x 100	452 hens lay 2819 eggs in one week.	(2819 / (452x7)) x 100 = 89.1%
Weekly Mortality	%	(No.dead / opening stock of hens) x 100	At the start of the week there were 452 hens. 4 hens died.	(4 / 452) x 100 = 0.88%
Cummulative Mortality	%	(Total no.dead / no. housed) x 100	6000 hens were housed. During the first 10 weeks of lay, 137 birds died.	(137 / 6000) x 100 = 2.28%
Eggs/Hen Housed	eggs	Total no.eggs / no.hens housed	13500 hens were housed. At the end of the cycle 12799 birds remained. A total of 4239115 eggs were laid.	4239115 / 13500 = 314.0 eggs
Egg Weight	g/egg	(kg eggs x 1000) / no. eggs weighed	A sample of 120 eggs (four trays) was weighed. The weight (minus tray weight) was 7.34 kg.	(7.34 x 1000) / 120 = 61.2 g/egg
Feed Intake	g/hd	(kg feed consumed x 1000) / no.hendays	8203 hens ate 6550 kg layer mash in one week	(6550 x 1000) / (8203 x 7) = 114.1 g/hd
Feed Conversion	kg/doz	kg feed / dozen eggs	8203 hens lay 48406 eggs and consume 6550 kg of feed in one week	6550 / (48406/12) = 1.62 kg/doz

* Hendays = (no.hens * no.days)

Hendays for a week = (opening stock hens + closing stock hens)/2 x 7

Marketing

If layers are reared as a business, excellent husbandry and quality products alone will not guarantee profit. Marketing is essential. Eggs have a limited shelf life, and unsold stock results in financial loss.

SWOT Analysis (Strengths, Weaknesses, Opportunities, Threats)
Conducting a SWOT analysis is a useful tool to evaluate factors affecting your business. It helps you anticipate potential problems, develop solutions, and identify opportunities for growth.

Example SWOT Analysis:

- **Strengths**: Eggs are widely accepted and highly nutritious.
- **Weaknesses**: Rural areas may have limited infrastructure, distribution challenges, and inadequate storage.
- **Opportunities**: Opportunities: Local restaurants or nearby buyers may offer stable demand.
- **Threats**: Disease outbreaks can significantly impact production and sales.

Questions to Reflect on During SWOT Analysis:

- What strengths can I build upon?
- What weaknesses need to be addressed?
- What opportunities can I leverage?
- What threats should I prepare for?

1 Marketing Fundamentals

Marketing encompasses advertising, selling, and distributing products to customers. It is essential to continuously evaluate your marketing approach by asking:

- **What am I marketing? –** Know your product and consider ways to improve or add value.
- **Who am I marketing to? –** Understand your customers and their preferences.
- **Why am I marketing? –** For profit and sustainability!
- **When am I marketing? –** Always! Building and maintaining a good reputation is ongoing.
- **How should I market? –** Tailor your approach to your customer base.

There are four tools used in developing an effective marketing strategy, known as the 4P's—Product, Place, Price, and Promotion (or communication).

Product:

The product refers to the eggs, which must meet consumer needs in terms of size and look in terms of quality, freshness, packaging, and size. This may include offering different eggs graded and packaged differently and considering factors like free-range production.

Price:

The price is set based on factors like production costs, competition, and consumer demand. In egg marketing, pricing strategies may include competitive pricing (setting prices similar to competitors), penetration pricing (setting lower prices to attract customers), or premium pricing (for high-quality or value-added products). Price must balance profitability for producers and affordability for consumers.

Place:

The place refers to the distribution channels through which eggs reach consumers. This can include supermarkets, local shops, farmers' markets, or direct-to-consumer sales. Efficient logistics, refrigeration, and timely delivery are crucial in the egg market to maintain product freshness and minimize wastage. Bumpy roads can lead to cracked eggs if travelling long distances.

Promotion:

Promotion involves communicating the benefits of the broiler product to the target audience. This could be through advertising (TV, social media, print), in-store promotions, special discounts, or communicating directly with customers on e.g. whatsapp groups. Promotional strategies may also highlight aspects like quality assurance, sustainability, and animal welfare, which are increasingly important to consumers.

PHOTO 6.2
Marketing is essential for a profitable business.

2 Marketing Channels in Lesotho

The market in Lesotho is broadly divided into the formal and informal markets. There are varying levels of food safety regulations in this sector. There is also a possibility of distribution through a aggregation centre. There will be extra costs associated with egg storage and packaging. It can be difficult to break into the bigger players of the retail market, however many of them may have a mandate to source locally produced eggs and integrate smaller scale producers. The selling price might not be high, but there is reliability in income.

Formal Market:

- Includes large retailers, wholesalers, and supermarkets
- Typically requires contracts specifying product expectations and pricing
- May offer consistent income but often lower prices due to rebates and bulk sales
- Larger retailers may prioritize sourcing from local producers, creating opportunities for small-scale farmers

The informal market is made up of small wholesalers, trading stores, spaza shops and street vendors. There are not usually contracts and therefore not much loyalty and consistency with orders. Building a relationship and good reputation are important to keep loyalty. Keep a list of customers and create a whatsapp group to inform them of availability and prices of eggs to sell.

Informal Market:

- Comprises small wholesalers, trading stores, spaza shops, and street vendors
- No formal contracts, resulting in less reliability but potentially higher profit margins
- Customer relationships and reputation are critical for success
- Communication tools like WhatsApp groups can help keep customers informed about availability and pricing

The informal market often offers higher selling prices but lacks guaranteed sales. Transport hubs or community gathering points can be strategic sales spots. However, frequent visitors to the farm can compromise biosecurity.

The Department of Marketing in Lesotho arranges events such as roundtables and trade fairs to connect buyers and sellers. Contact them for details.

Acknowledgment

We would like to express our sincere gratitude to all those who contributed to the creation of this manual.

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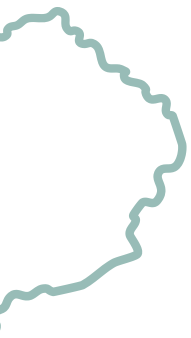
Our heartfelt thanks go to the farmers who graciously consented to be featured in the photos, allowing us to showcase best practices throughout this manual.

Lastly, we extend our appreciation to everyone involved in the creation of this resource. Your efforts have been invaluable.



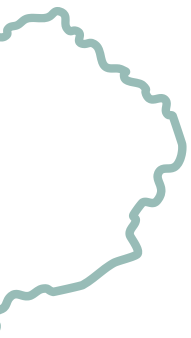
Appendices

i Water Test Example

ii Vaccination Program Example

iii Layer Budget Example

iv Layer Record Sheet



Appendix i

Water Test Example

Methods	Determinands	Units	0105053/24 Water Sample from Poultry drinker Line 09.05.2024
Chemicals			
93	Dissolved Calcium	mg Ca/ℓ	8.24
93	Dissolved Magnesium	mg Mg/ℓ	2.60
93	Sodium	mg Na/ℓ	4.63
94	Dissolved Copper	µg Cu/ℓ	13.9
94	Dissolved Iron	µg Fe/ℓ	43
94	Dissolved Lead	µg Pb/ℓ	<10
94	Dissolved Zinc	µg Zn/ℓ	<10
16G	Dissolved Chloride	mg Cl/ℓ	7.91
65Gc	Dissolved Nitrate	mg N/ℓ	3.32
65Gb	Dissolved Nitrite	mg N/ℓ	.06
1B	pH at 25°C	pH units	7.7
67G	Sulphate	mg SO_4/ℓ	<2.5
Calc.	Total Hardness	mg $CaCO_3$/ℓ	31
Microbiological			
32	Total Coliforms	MPN/100mℓ	5
31	Standard Plate Count	colonies/mℓ	>1000

Acceptable Limits

Reported Determinands	Limits	Reported Determinands	Limits
Dissolved Calcium	**≤60 mg/ℓ (≤60000µg/ℓ)**	**Nitrate**	**≤10 mg/ℓ (≤10000µg/ℓ)**
Chloride	**≤14 mg/ℓ**	**Dissolved Lead**	**≤0 mg/ℓ (≤0µg/ℓ)**
Total Chlorine	**≤0 mg/ℓ**	**pH at 25°C**	**≥6.8 to ≤7.5**
Dissolved Copper	**≤0.002 mg/ℓ (≤2µg/ℓ)**	**Sulphate**	**≤125 mg/ℓ (≤125000µg/ℓ)**
Dissolved Iron	**≤0.2 mg/ℓ (≤200µg/ℓ)**	**Standard Plate Count**	**≤0 Count/1mℓ**
Total Hardness	**≥60 to ≤180**	**Total Coliforms**	**≤0 Count/100mℓ (≤0 MPN/100mℓ**
Dissolved Magnesium	**≤14 mg/ℓ (≤14000µg/ℓ)**	**Dissolved Zinc**	**≤1500µg/ℓ (≤1.5 mg/ℓ)**
Sodium	**≤32 mg/ℓ (≤32000µg/ℓ)**		

Nitrate toxicity depresses growth rate and can cause poor coordination
High sulphates can combine with other salts to have a laxative effect on birds and cause wet litter
High levels of sodium or chloride will cause an increase in water consumption and lead to wet litter
High iron can be conducive to bacterial growth leading to diarrhoea
High pH can cause an unpleasant taste resulting in low water intake
Bacterial contamination can cause disease and affect bird health

Appendix ii

Example of Vaccination Program

(please consult your vet for any updates to your area)

Age	Disease	Method
1 day	Marek's NCD	Subcutaneous Injection Spray
12 days	Gumboro/IBD	Drinking water
2 weeks	NCD	Drinking water/ spray/ eye drop
3 weeks	Gumboro/IBD	Drinking water
4 weeks	IB	Drinking water
6 weeks	ILT	Eye drop
7 weeks	NCD	Drinking water/ spray/ eye drop
8 weeks	AE + Fowl Pox	Wing web
10 weeks	IB	Drinking Water
13 weeks	EDS + Coryza	Subcutaneous Injection
15 weeks	NCD	Drinking water/ spray/ eye drop
18 weeks	Gumboro/IBD IB	Drinking Water Drinking Water
40 weeks	NCD	Spray

Newcastle disease (NCD); Infectious bronchitis (IB); Gumboro/Infectious bursal disease (IBD); Avian encephalomyelitis (AE); Infectious laryngotracheitis (ILT); Egg drop syndrome (EDS)

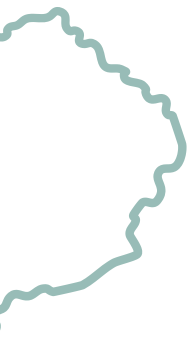
1. Spray Virukill (disinfectant) prior to chick placement, over chicks and as a weekly mist spray over birds, walls and litter.

2. Vitamins for stress must be given on the arrival of chicks, after vaccination &; when necessary in unusual conditions.

3. Fosbac T (broad spectrum antibiotic) must be administrated week 1 and 5.

4. Bedgen 40 (liver supplement) must administrated week 1, 4 and 13.

NB: new castle disease – fine spray every 3 - 4 months during the laying & growing period



Appendix iii

Example of Layer Profit and Loss

	Item	Detail	Quantity	Cost/Price	Total	Fill in your total here
Revenue	Eggs	1000 at 80% lay rate for 1 year	288,000	2.00	576,000	
Revenue	Other sales	Manure & Spent Hens	900	60	54,000	
Total Sales					**630,000**	
Variable	Pullets	Point of lay	1,000	65	65,000	
Variable	Feed	Layer meal (50 kg)	202	864	174,528	
Variable	Packaging	Egg Trays	64	150	9,600	
Variable					-	
Variable					-	
Variable	Water	All purpose	60	12	720	
Variable	Processing (if applicable)	Slaughter & packaging	475	7	3,325	
Variable	Medication	Antibiotic- Lasoda (bottle)	24	65	1,560	
Variable		Multivitamin (packet)	24	25	600	
Variable			50	2	100	
Variable	Transport of sales	Van	150	13	1,950	
Variable	Sales Taxes	If Applicable				
Total Variable Costs					257,383	
Gross Margin (Sales - Variable Costs)					**372,617**	
Semi Variable	Lighting	Electricity 50units@105	105	36	3,780	
Semi Variable	Cleaning material	Detergent 2kg	70	6	420	
Semi Variable		Disinfectants 200ml madubula	18	12	216	
Semi Variable	Rat bait	Superkill 100g	130	12	1,560	
Fixed	Protective clothing	Overall/gumboots	950	1	950	
Fixed	Labour	Permanent labour	500	12	6,000	
Fixed	Repairs and Maintenance	Lines, equipment etc	1,000	6	6,000	
Total Overheads Costs (fixed and semi variable costs)					**18,926**	
Earnings before Interest, taxes or depreciation* (Gross Margin - Fixed costs)					**353,691**	
	Depreciation	Equipment and housing				
	Depreciation	Birds				
	Interest	E.G 15% ARP on loan				
	Non-sales related taxes					
Total						
Net Profit					**353,691**	

Please note that this is just an example and figures will change based on different situations.

Cost per sales unit

A		Total Sales	630,000
B		Sales Volume	288,000
C		Sales Price	2
D		Variable Costs	257,383
E		Fixed Costs	18,926
F		Interest, taxes and depreciation	-
G	A-D	Gross Margin	342,000
H	G-E	EBITDA	323,074
I	H-F	Net Profits	323,074
Break Even Price (Fixed volume)			
L	B/D	Variable Cost	0.89
M	((E+F)/B)+L	Break Even Sales price	0.96
Break Even Volume (fixed Price)			
N	C-L	Contribution	1.11
O	(E+F)/N	Break Even Volume	17,107.34

Gross margin is the difference between a company's revenue and its cost of goods sold (COGS) or total variable costs. It represents the income a company retains after incurring the direct costs associated with producing the goods and services it sells.

EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) is a financial metric that shows a company's profitability before deducting interest expenses, taxes, depreciation,

Net profit (also called net income or bottom line) is the total profit of a company after all expenses have been deducted from total revenue. This includes operating expenses, interest, taxes, depreciation, and amortization.

Interest is the cost incurred by a business for borrowed funds. It is the expense paid on any loans or credit facilities the company uses.

Depreciation is the systematic allocation of the cost of a tangible fixed asset (like machinery, buildings, vehicles) over its useful life. It represents the reduction in the value of assets due to usage, wear and tear, or obsolescence.

Appendix iv

Layer Record Sheet

Shed _____ Breed _____ Date Housed _____ Hatch Date _____ No. housed _____

		Hen Numbers				Egg Production				Feed			Vaccination			
Age	Date	Mort	No. Layers	Mort. (%)	Cum. Mort. %	Total Eggs	%hd prod.	Eggs/ hh	Egg Weight	Cons. (kg)	Hendays	g/hd	Date	Type	Batch No	Exp. Date
18																
19																
20																
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		Hen Numbers				Egg Production				Feed			Vaccination			
Age	Date	Mort	No. Layers	Mort. (%)	Cum. Mort. %	Total Eggs	%hd prod.	Eggs/ hh	Egg Weight	Cons. (kg)	Hendays	g/hd	Date	Type	Batch No	Exp. Date
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		Hen Numbers				Egg Production				Feed			Vaccination			
Age	Date	Mort	No. Layers	Mort. (%)	Cum. Mort. %	Total Eggs	%hd prod.	Eggs/ hh	Egg Weight	Cons. (kg)	Hendays	g/hd	Date	Type	Batch No	Exp. Date
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		Hen Numbers				Egg Production				Feed			Vaccination			
Age	Date	Mort	No. Layers	Mort. (%)	Cum. Mort. %	Total Eggs	%hd prod.	Eggs/ hh	Egg Weight	Cons. (kg)	Hendays	g/hd	Date	Type	Batch No	Exp. Date
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