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SOLID  
BROILER  
MANAGEMENT  
TRAINING  
MANUAL



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Content Authors: Dr. Sumith Atapattu and

Andrew Baker

Design/Layout: Renu Warnasuriya

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# BROILER MANAGEMENT TRAINING MANUAL

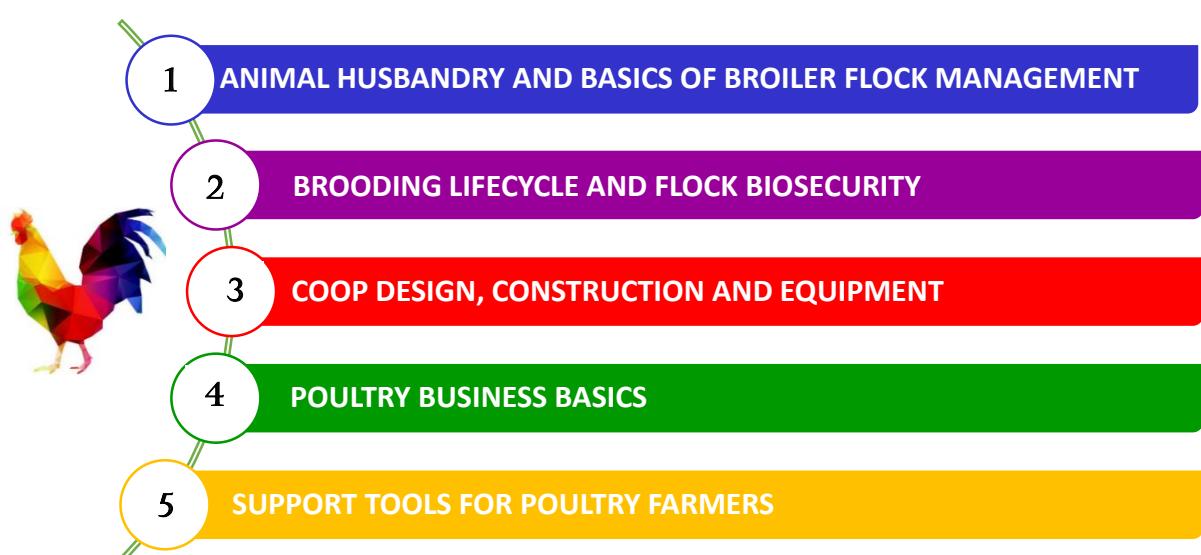
## OVERVIEW

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Supporting Opportunities in Livelihoods Development (SOLID) is a project funded by the United States Agency for International Development. The project is designed to strengthen the livelihoods of vulnerable populations in selected areas of Sri Lanka. SOLID project activities complement the economic development efforts of the Government of Sri Lanka by creating and enhancing economic opportunities for women, youth and vulnerable populations in the country. SOLID's Broiler Management Training Program, supports current and new poultry farmers with caged broiler production. The objective of the SOLID Broiler Management Training Program is to provide livelihood support to new and current producers by conducting a formal training course on raising broilers poultry for commercial gains.

## TRAINING MODULES

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# IMPORTANT DEFINITIONS

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<b>Broilers</b>	Chickens that have especially been raised for meat production.
<b>Broiler/ poultry farming</b>	Domestic or commercial raising of chickens, turkeys, ducks, quails and other selected bird types for meat and eggs, either on a small or large scale.
<b>Caged broiler production</b>	Superior to a free range system in terms of profitability and predictability but comes with its own set of risks
<b>Free range system</b>	A poultry management system where birds are allowed to roam freely and find their own food.
<b>Coop/cage system</b>	A poultry management system where birds are raised in coops or cages.
<b>Animal husbandry</b>	The management and care of farm animals by humans for profit.

# **1: MODULE ONE: ANIMAL HUSBANDRY AND BASICS OF BROILER FLOCK MANAGEMENT**

Module one will provide an overview of animal husbandry practices and techniques and give readers an insight into what is required to achieve optimum performance levels of a flock of broiler chickens. Successful broiler management requires the careful consideration of a combination of several factors and neglecting even one factor could compromise the overall performance of the flock. A broiler farmer must always remember that well cared for birds are more likely to meet production targets and thus improve profits.

## 1A. BACKGROUND TO BROILER PRODUCTION

### Why Broiler?

Broilers are specifically bread to achieve very fast growth, reaching their market weight (2.2 kg) in 38 to 40 days. Broiler production is an ideal income generating activity since it allows for the rotation and growth of revenue in a very short period of time.

### Broiler Production Vs Layer Production:

In broiler production chickens are raised to be sold as meat

Broiler production:

- ✓ Generates income in a much shorter time.
- ✓ If managed properly under a caged system it takes 38 – 40 days to raise a set of chickens to be sold as broilers.
- ✓ The big risk with raising broiler chickens is that it is essential to sell the chicken as soon as it reaches its market weight. The farmer must have a buyer lined up to ensure a sale at the correct time.
- ✓ Each day that passes after a broiler has reached its market weight is an additional cost to the farmer who has to continue to feed and care for the bird.

In layer production chickens are raised to produce and sell eggs

Layer production:

- ✓ Takes a longer time to generate an income.
- ✓ It takes around 16 – 24 weeks (4–6 months) before a chicken is mature enough to lay its first egg. Within this time a broiler producer can raise almost three cycles of birds.

## Cage/Coop System Vs Free Range Broiler Production:

**Free Range System:** In a free range system the weight gain of a flock is dependent on land size and on the natural availability of food for the birds. As such, the timing of weight gain is unpredictable and can fluctuate, making it difficult for farmers to time the sale. In general, birds in a free range system only reach market weight after 40 days. While the inputs required for a free range system are minimal it is difficult for farmers to produce large flocks of chickens at the correct weight, at predictable times. Birds raised under a free range system are also more susceptible to disease.

**Cage/Coop System:** A poultry farmer maintains more control over the flock in a cage or coop system. The farmer is able to ensure better health, control the birds' diet and ability to gain weight, and control the timing of the sale. In a well-managed caged system birds are better protected from pests and diseases. While a cage/coop system requires more inputs it also brings better returns, and is more consistent and predictable. A cage/coop poultry operation can be run as a business and a farmer can time his/her need for inputs, management of capital and sales.

Under a cage/coop system a farmer can raise a flock of 10,000 plus birds – reaching a market weight between 2 to 2.5 kg – within a limited space, in approximately 40 days. If properly managed, a farmer can calculate the feed/input requirement, plan a date of sale and project the potential income.

It is important to remember however, that a cage/coop system requires discipline and good management. A farmer must have the ability to:

- ✓ Provide timely and adequate feed and water
- ✓ Construct a proper coop
- ✓ Find a suitable buyer
- ✓ Be disciplined with funds.

Farmers must adopt a business approach and understand the cost of inputs in line with the potential profits from a well-managed operation.

The table below provides a basic picture of the gross costs and projected returns of a broiler business.

## Cost of production

Fixed	Variable	Returns
<ul style="list-style-type: none"><li>▪ Housing</li><li>▪ Tools and equipment</li><li>▪ Land use</li><li>▪ Depreciation</li></ul>	<ul style="list-style-type: none"><li>▪ Feed</li><li>▪ Day-old chicks</li><li>▪ Medicines and vaccinations</li><li>▪ Electricity /fuel</li><li>▪ Litter</li><li>▪ Transportation</li></ul>	<ul style="list-style-type: none"><li>▪ Live chicken sales</li><li>▪ Litter as fertilizer</li><li>▪ Feed sacks</li></ul>

## Problems associated with caged broiler production

- Profitability of small scale broiler production
- Outbreak of diseases
- High price of feed
- High price of day old chicks
- Poor weight gain
- Environmental concerns and natural calamities
- Poor power supply
- Limited availability of clean water
- Lack of knowledge and training
- Lack of funds and credit facilities
- Poor veterinary services
- Fluctuating market price for live chickens
- Late payments
- Time sensitivity (losses if not birds are not sold in time)
- Predator attacks
- Thieves

## **1B. GETTING STARTED**

### **Requirements Needed to Run a Successful Cage Broiler Operation**

#### **1. Land and suitable location**

Selecting a suitable land area is the first important step in establishing a poultry operation. A farmer should have at least 10 perches of land available to build a broiler coop. In selecting the location, the following factors should be taken into consideration:

- ✓ The selected location should have enough space to house the poultry coop. For a 100 bird flock the dimension of the coop are 12 feet X 14 feet (3.65 x 4.26 meters).
- ✓ The land should be in the East – West direction.
- ✓ The coop should be located away from drinking water sources, toilets, kitchens and neighbouring houses.
- ✓ It should be a quiet area with plenty of fresh air and ventilation. Locating the coop in an environment which is closed off, with limited access to fresh air and ventilation will increase the amount of heat and stress among the birds and negatively impact weight gain.
- ✓ The location should, as much as possible, be secure from natural disasters. Farmers should avoid selecting locations that are susceptible to floods and other disasters.

#### **2. Electricity for lighting and heating**

Lighting is an essential element of a broiler operation. While electrically powered light is ideal, farmers who do not have electricity must find an alternative light and heat source. Light control is important throughout the production process as it encourages healthy weight gain since birds need to be awake and able to see in order to eat. Heat is also important, particularly during the brooding stages. Alternative lighting options include LED bulbs for light and possibly kerosene/Petromax lamps for heat.

### **3. Clean water**

A poultry farmer should have access to clean water throughout the year. The quality of the water should be equal to home drinking water. A flock of 100 chickens requires 700 litres of water per cycle.

### **4. Time, dedication and sense of responsibility**

Managing livestock is a time consuming activity that involves many responsibilities including feeding, medicating, cleaning, providing water, buying supplies observing the cage environment, and observing bird health conditions. Farmers interested in taking on poultry operations should first calculate their time availability based on family needs and other livelihood activities and consider whether or not they have the time to take on these activities. If a farmer does not have the time to take care of his/her coop consistently and responsibly he/she should not engage in broiler production.

### **5. Ability to keep the coop clean**

Anyone interested in poultry farming must be comfortable working with animals. A poultry farmer must be able to handle chickens without fear and in a calm and gentle manner. He/she must be comfortable handling waste, specifically bird droppings and be able to keep the coop clean.

### **6. Availability of litter**

A farmer should have access to paddy husks or wood shavings since each batch of birds may need up to ten bags of paddy husks.

### **7. Approval from local authorities/ regulatory bodies:**

Poultry farmers are required to obtain relevant approvals from local authorities, specifically the District Secretariat and the Central Environment Authority, in order to engage in poultry production.

### **8. Separating/ getting rid of other animals:**

A poultry farmer should not have other animals roaming on the premises or near the coop. Having backyard chicken, pigeons and other birds is a risk because they can carry disease that may causes big losses to the flock.

## 1C. UNDERSTANDING ANIMAL HUSBANDRY

### Introduction to Animal Husbandry

Animal husbandry is the management and care of farm animals by humans for profit.

Animal husbandry draws from the five freedoms for animal welfare:

1. **Freedom from hunger or thirst** by ready access to fresh water and a diet to maintain full health and vigour.
2. **Freedom from discomfort** by providing an appropriate environment including shelter and a comfortable resting area.
3. **Freedom from pain, injury or disease** by prevention or rapid diagnosis and treatment.
4. **Freedom to express (most) normal behaviour** by providing sufficient space, proper facilities and company of the animal's own kind.
5. **Freedom from fear and distress** by ensuring conditions and treatment which avoid mental suffering.



Just because the chickens will be eventually sold and slaughtered it does not mean that they should be treated badly. It is important to remember that a happy flock is a profitable flock.

To meet the five freedoms of animal welfare and raise a happy, healthy and profitable flock a farmer must attend to several key requirements. In a cage poultry system the performance of the birds is almost entirely dependent on the attitude of the farmer. It is the farmer's responsibility to maximize bird performance by attending to the birds' needs and by providing the necessary conditions. A farmer's attention to detail has a major impact on the performance of the flock and thereby the profitability of the business.

## The Role of ‘Stock Sense’ in Poultry Farming

A good poultry farmer is constantly aware of the welfare, health and environment of his flock. A farmer must closely observe the conditions within the coop and he/she must know how to spot any unusual behaviour. To monitor his flock a farmer can use ‘stock sense,’ which relies on the following senses:

- ❖ **Hearing:** The sounds made by the birds is a good indication of what they are feeling.



- The chirpiness of the birds and their vocalization could indicate if they are hungry or cold.
- Respiratory sounds could mean the birds are suffering from an ailment.
- If a knocking noise is heard when the birds are pecking at the feeders, it could mean that the containers are empty.
- A sudden excitable noise from the coop could signal a predator attack or other cause of stress among the birds.

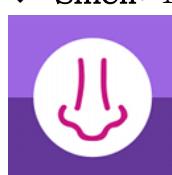
- ❖ **Sight:** Watching bird behaviour can help a farmer identify problems in the coop.



- Bird distribution: The way the birds are gathered in coop is important.
  - If the birds are huddling together or are confined to a certain area it could mean there is a cold draft in the coop.
  - If they are huddled under brooder it means it is too cold.
  - If they are standing away from the brooder lamp it means it is too hot.
  - If they are crowded on to one side of the coop it could be too sunny.
- Bird respiration: If the birds are panting or breathing abnormally it could be suggestive of heat stress or a respiratory disease.
- Bird behaviour: When behaving normally birds divide their time between feeding, drinking and resting. Anything outside this can be seen as abnormal behaviour.
- Litter conditions: Farmers should look out for:
  - Water spillage from drinkers, spilled feed, and other problems in the coop.
  - It is also important to observe the nature of faeces. Faeces tinged with blood or undigested feed particles or unusual in nature (melena, diarrhoea, bile) should be a cause for concern.

- A farmer should check if feeders and drinkers are empty, if the quality of the feed is normal, if the equipment is clean with no fungal residues or leakages. It is also important to ensure that feeders and drinkers are at the correct height.

- ❖ **Smell:** The odours from the coop can be a telling sign of the conditions within.



- The feed should smell fresh and not have a strong rancid smell or smell of mildew.
- A smell of ammonia in the coop could be due to diarrhoea or water spillage in the coop.
- Dead birds must be collected and taken out of the coop as soon as possible.

- ❖ **Taste and Touch:** Touch and taste is another good method of checking coop conditions.



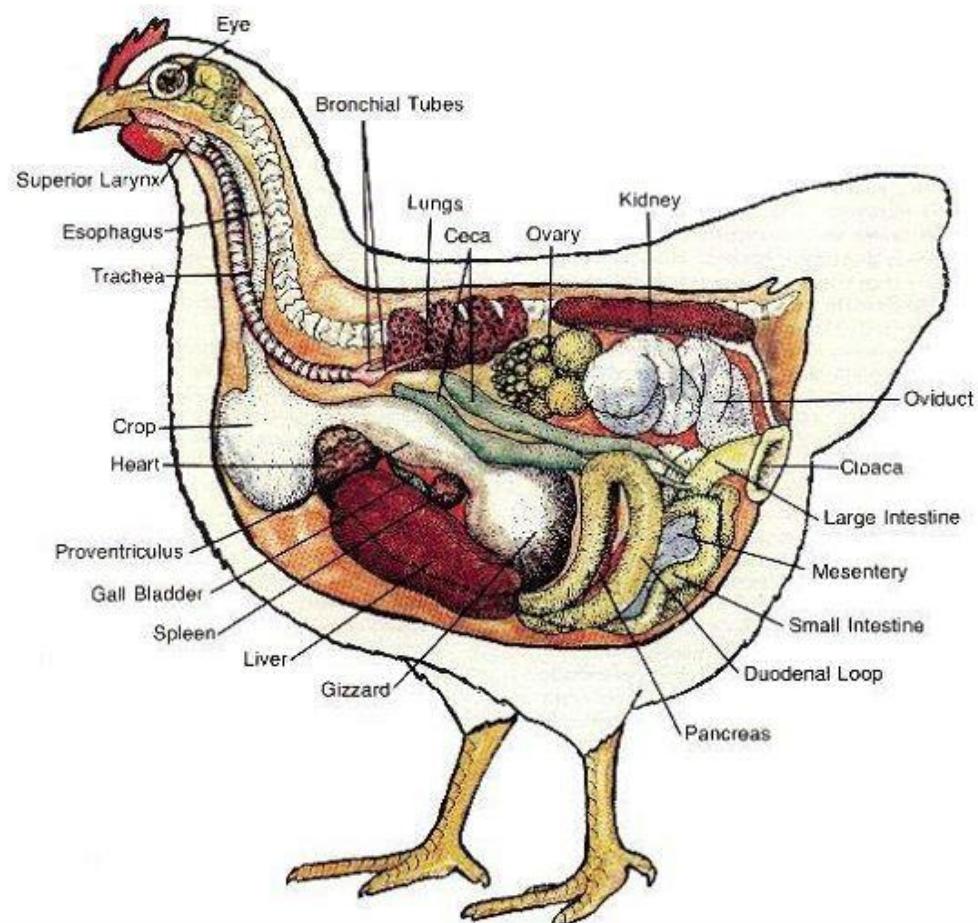
- A farmer should check the water and feed quality regularly.
- He/she should check the ventilation in the coop and make sure there is a comfortable air flow.
- The feed should be checked to see if the crumbs are too dusty or pellets too hard.
- The litter conditions can be checked by picking up a handful of litter, compressing and releasing to see if it is free flowing or clumpy. Clumping suggests that the litter is too moist.

Relying on stock sense will help a farmer become familiar with normal bird behaviour and he/she will gradually be able to identify any changes in behaviour. While observing bird behaviour a farmer must regularly maintain and analyse farm records on growth, feed and water consumption, bird mortality, feed conversion ratio (FCR) etc. A combination of observation and record keeping will help the farmer to identify and correct any shortfalls in performance. Stock sense combined with the farmer's knowledge, experience and skills in husbandry will produce a well-rounded farmer who will have the personal qualities such as patience, dedication and empathy when working with the birds.

## Key Points to Remember:

- ✓ The flock environment and behaviour should be observed throughout the day by the same person.
- ✓ When entering the coop the farmer should take care not to excite the birds as excitement can cause stress which in turn can lead to a lack of growth.
- ✓ The farmer should walk through the coop and get down to the birds level to assess the comfort level of the flock.
- ✓ While in the coop he/she should use stock sense (hearing, sight, smell and touch) to assess the conditions.
- ✓ Remember that healthy birds will scramble away from your path. Pick up the birds that do not move away and inspect them closely to identify other symptoms of disease. If a sick bird is found see how many other birds may also be sick.

## Anatomy of a Chicken:



A farmer should periodically assess the birds to ensure that they are healthy.



- ✓ **Eyes** should be clear, not tearing or cloudy
- ✓ **Skin** should be unblemished with no burn or hock marks
- ✓ **Breast** should be unblemished with no blisters
- ✓ **Feathers** should be clean
- ✓ **Legs and feet** should be firmly planted with no signs of bumble foot.
- ✓ **Vent/Butt** should be clean with no signs of loose droppings
- ✓ **Beak** should have no nasal discharge
- ✓ A healthy bird should be alert

## 1D. INTENSIVE COOP PRODUCTION SYSTEM

With the primary objective of facilitating fast growth and obtaining maximum profit, the intensive coop system is based on:

- (a) Controlled monitored environment
- (b) No outdoor access.

This system requires the confinement of birds in specially designed and constructed coops. The birds are totally dependent on the farmer for their sustenance. An intensive coop production systems facilitates easier flock management and gives farmers the ability to consistently reach production targets. The slatted floor system and the deep litter system are the two main intensive systems currently used in broiler production and the SOLID program will be using the deep litter system.

1. **Deep litter system:** In this system the floor is covered with litter material such as wood shavings or paddy husks. It is a fully confined system and the space allowance per bird is between 1 to 1.2 square feet. This allows the birds to move freely within the coop. The fully enclosed system safeguards biosecurity and protects the birds from thieves, predators and vectors.

## The Importance of Environment in Poultry Farming

Providing a conducive environment for broilers is essential in order to maximize their potential. To ensure the optimal performance of the flock it is essential to select an environment that allows the birds to achieve their optimal growth rate, and maintain uniformity, feed efficiency and yield. The location must not compromise the health and welfare of the birds. The following factors should be considered when selecting a location:

1. **Ventilation:** Ventilation is the main means of controlling the birds' environment. It provides fresh air, removes moisture, limits build-up of harmful gases, controls relative humidity and helps maintain good litter conditions. Good ventilation is essential in maintaining the full genetic potential of flock. Dust, Ammonia, Carbon Dioxide, Carbon Monoxide and excessive moisture are the main contaminants of coop air. Continued exposure to these contaminants can:
  - ✓ Damage the birds' respiratory tracts.
  - ✓ Expose birds to diseases including chronic respiratory disease, E.coli and ascites.
  - ✓ Contribute to poor litter quality.
  - ✓ Reduce bird performance and weight gain and affect profitability.
2. **Temperature:** One of the main aims of ensuring appropriate ventilation is to maintain a comfortable coop temperature. The behaviour of the birds (judged using stock sense) is the most practical indicator of the birds' comfort levels.
3. **Lighting:** Lighting is an essential requirement in broiler production and is a key factor that contributes to flock welfare and good performance. Uniform distribution of light throughout the coop is essential. Broiler activity depends on the intensity and distribution of light.
4. **Litter:** Litter is the substance the flock is in contact with throughout its life cycle in the coop and as such it plays a very important role in broiler production. Litter helps to control and absorb moisture (water or dropping) and helps in building immunity against diseases. Litter is only removed or replaced during the introduction of a new flock, or

when parts of the coop have been effected by water spillage. Good litter should be:

- ✓ Light in weight
- ✓ Soft and compressible to ensure bird comfort
- ✓ Have low dust levels
- ✓ Biodegradable
- ✓ Highly absorbent, non-caking and dry rapidly
- ✓ Does not heat up quickly
- ✓ Non-contaminated
- ✓ Readily available, inexpensive and able to be sold as fertilizer

The types of litter recommended for broiler production in Sri Lanka include:

- **Wood shavings:** This is an ideal choice because it has the highest rate of absorbency. A by-product commonly available at timber depots/ mills, it is usually given free of charge or at minimal cost. The shavings should be collected and stored in feed/ gunny bags and should be protected from moisture. This material is also the preferred choice of fertilizer post coop usage.
- **Paddy husks:** While this is also a good choice of litter young chicks may be prone to consuming it and usage may have to be minimized during the brooder stage. It is freely available as a by-product at rice mills and is usually sold at minimal cost. The husks are slow to decay and can be sold as fertilizer after its coop life. It should be stored away from moisture.



Saw dust is NOT recommended as litter because it can lead to respiratory problems in birds. It also clumps up the litter and does not dry quickly.

**5. Stocking density:** The correct provision of space is essential to the success of a broiler production business. Ensuring adequate room allows the broilers to attain their genetic potential. Incorrect stocking density could result in poor uniformity in the batch as a consequence of having to compete for food and water. Inadequate space also compromises the health of the birds due to poor litter conditions, heat, and poor weight gain. In the worst case scenario high density stocking can cause extreme stress within the flock leading to bird death and heavy economic losses for the farmer.

In open sided coops the following space provision is recommended:

Week	Required Space (Square Feet)
1	0.25
2	0.40
3	0.50
4	1.2
5	1.2
6	1.2

## 1E. BROILER NUTRITION

Feed represents the largest component of broiler production costs. To optimize performance broiler ration should be formulated to provide the correct balance of energy, protein, amino acids, minerals, vitamins and essential fatty acids. Nutrition is the most important factor contributing to broiler productivity and growth and thereby to profitability. As such, farmers need to pay close attention to the formulation of feed to ensure that the birds receive a balanced diet.

The main ingredients of broiler feed are listed below.

Ingredient	Approximate Proportion
Wheat/ Maize	40 – 60 percent
Rice Polish	15 – 25 percent
Broken Rice	10 – 15 percent
Soya	20 – 30 percent
Fish Meal	5 – 10 percent
Oil / Fat	2 – 4 percent
Di Calcium Phosphate	9 – 12 kg
Vitamin Mineral Premix	0.5 – 1kg
Min	1kg
Salt	2 – 3 kg
A Biotic Growth Promoter	0.25 – .5kg

The main components of broiler nutrition are:

Nutrition Component	Benefits	Source
Energy	Helps tissue growth, maintenance and activity	Cereal grains, fats and oils
Protein	Supports the construction of body tissue specifically muscle, nerve, skin and feathers	Cereal grains, soya bean and fish meal
Macro minerals (Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chloride and Sulphur)	<p>Supporting growth, skeletal and immune system development and help maintain the feed conversion rate FCR</p> <p>Chickens need these minerals in large amounts.</p>	Additives to feed
Trace minerals and vitamins (Copper, Chromium, Fluoride, Iodine, Iron, Molybdenum, Manganese, Selenium, and Zinc)	<p>Trace Minerals are inorganic matter that cannot be destroyed by cooking or heat and are essential for a variety of bodily processes</p> <p>Chickens need these minerals in small amounts.</p>	Additives to feed

## 1F. MAIN CHALLENGES IN BROILER PRODUCTION

1. **Natural calamities:** Natural disasters including cyclones, flash floods and long drought periods could have a direct impact on poultry farming.
2. **Predators and thieves:** Under intensive farming systems the most dangerous predator for broilers is the mongoose. If it gains entry to a week old 100 bird flock virtually the whole flock will be wiped out within minutes. Snakes, specifically pythons can also gain access to the coop if not properly secured. Snakes cause less damage but it can be a traumatic experience to see one inside. Rats are also a threat and can snatch away baby chicks and consume valuable feed.
3. **Dealing with neighbours:** Running a successful broiler operation can create envy among some neighbours. It is important to maintain good hygienic practices in order to minimize complaints. It is also important to be watchful of thieves.
4. **Diseases:** This issue will be discussed in detail in the following module.

# **2. MODULE TWO: BROODING, LIFECYCLE AND FLOCK BIOSECURITY**

Module two looks at the brooding period and broiler life cycle, and how to manage flock biosecurity. Brooding refers to the early stages of a chick's life where the utmost care is required in order to ensure the health, safety and growth of the flock. This module will cover the different developmental stages of a broiler chick's life, focusing on several important factors including feed, temperature, space, and other essential requirements to successfully raise and harvest a flock. This module will also address the issue of biosecurity and how to identify and prevent health risks. Attention to the three aspects of brooding, life cycle and flock biosecurity are vital to a farmer's success.

## 2A. BROODING

### Brooding – Why is it Important?

The brooding period – which lasts for seven to ten days – is the most important time in a bird's life. Several factors, primarily, temperature, light, water and food must be given special consideration when chicks are in their brooding stage. During this period a farmer must establish a suitable feeding and drinking routine that will allow birds to develop a good growth pattern and reach their target body weight – with maximum uniformity within the flock. Establishing the correct temperature during brooding is also essential because it is during this period that chicks move from a dependent body heating system to an independent one.

### Brooder Preparation:

A farmer must prepare a special brooder area for young chicks. The following steps provide guidance on how to create and prepare a brooder.

#### Equipment required for a 100 chick brooder:

Feeders  
Drinkers  
Heating source (3 x 40 watt bulbs, shade)  
Height adjuster  
Light source  
Brooder guards

Step 1	Select an 8' x 12' area in one corner of the coop
Step 2	Place a layer of clear plastic (polythene) covering the mesh above the short wall surrounding the brooder area. This is done to prevent a draft or air flow.
Step 3	Suspend another piece of clear plastic 8' feet above the brooding area. Covering the sides and top of the brooding area with plastic insulates the chicks, ensuring that they are kept warm. Some air flow should remain to allow the chicks' access to fresh air. This will also allow unwanted gasses (carbon dioxide, carbon monoxide, ammonia, etc.) to escape.

<b>Step 4</b>	Cover the '8 x 12' brooding area with litter consisting of wood shavings or paddy husks. The litter should be 5 inches in depth.
<b>Step 5</b>	Cover the litter with newspaper. Newspaper is kept in the brooder for three days. If overly soiled or wet another layer of paper should be introduced on top of the existing layer. Newspaper is used to deter the birds from eating litter and to train them to eat only the feed.
<b>Step 6</b>	Insert brooder guards in the brooder area. A brooder guard consists of two 8 x 2 feet galvanized metal sheets that are put together to create a space with a diameter of 4 feet (expandable up to 6 feet) that is the brooding area.
<b>Step 7</b>	Fix three 40 watts electric bulbs under a large metal shade over the middle of the brooder to serve as a heat source. The bulbs should be placed one foot above the ground. The heat supply required by the chicks is calculated at approximately one watt per bird. The heat source is turned on at least three to four hours before the chicks arrive in order to provide a comfortable environment for the chicks to be brooded.
<b>Step 8</b>	Set attraction lights (general lighting) or a brighter bulb (11 watt CFL) 4 feet over the coop to encourage chicks to feed and drink water over the first five days.
<b>Step 9</b>	Place two chick feeders filled with feed and two 4.5 litre water drinkers filled with water in the brooder before the chicks arrive. Feeders and drinkers should be spread out around the brooder area.
<b>Step 10</b>	Carry out an equipment check. This equipment should be functional and ready when the chicks arrive.



A chick brooder

#### Chick Pre-placement Check List:

Once the brooder has been set up and before the chicks have arrived the farmer should conduct the following checks.

- ✓ **Heater checks:** Ensure that the electricity supply to the coop and all three 40w bulbs are in working order. It is important to have two spare bulbs on hand. If the brooder is being managed without electricity make sure the brazier has sufficient coal and the kerosene lamp has a good wick and enough fuel.
- ✓ **Attraction lights check:** Ensure that the attraction light (general lighting) is working and is spreading an even amount of light around the brooder area.
- ✓ **Thermo-Hygrometer:** A Thermo-Hygrometer measures the temperature in the brooder. It should be suspended at the bird's height along the wall of the brooder.
- ✓ **Floor temperature:** The floor or litter is the chicks' first point of contact and it has to be comfortable. If the litter is not preheated the chicks will feel cold and stressed. Chicks cannot regulate their own body temperature for the first five days and this mechanism is not fully developed until they are 14 days

old. A chick is totally dependent on the farmer to provide the correct ambient temperature. If this aspect is overlooked the internal body temperature of the chick drops it will lead to increased huddling, and reduced water and feed intake. This in turn will result in stunted growth and susceptibility to disease. At the time of placement the floor temperature should at least be 32 °C.

- ✓ **Minimum ventilation check:** The ventilation in the coop should be enough to send out exhaust gases and to bring fresh air into the coop. The polythene should effectively shield the flock from drafts but there should be enough room and fresh air at the top of the coop for good ventilation. Chicks are more susceptible to air quality issues than older birds. Ammonia levels should be kept low (below 10 particles per million) at all times.
- ✓ **Drinker check:** Two clean and sanitized 4.5 litre drinkers (for 100 chicks) should be suspended in the brooding area. Check for water leaks. Clean and fresh water must always be available. Using 4.5 litre vessels will minimize the necessity to go in to the brooder regularly, and thus reduce the stress levels of the chicks.
- ✓ **Feeder check:** Two clean, dry chick feed trays (for 100 birds) should be kept in the brooding area. Each tray can hold up to 3kg of feed and should be full in order to minimize the need to enter the brooder. Supplemental feeding should be done in the first three days by sprinkling some feed on the paper. This should be done three times a day. Feeders and drinkers should not be placed directly under or near the heat source as this could reduce feed intake.
- ✓ **Brooder guard checks:** Two sheets of galvanized metal should be cleaned, disinfected and kept ready for chick placement.

It is extremely important that the feeding system does not run empty as this will induce severe stress on the chicks and reduce growth.



## Managing the Brooder Environment

### 1. Brooding Temperatures

A young chick is unable to regulate its own body temperature and therefore its temperature has to be regulated appropriately using external/artificial heat sources such as electricity, gas or charcoal. Temperature is very important in the first four days of a chick's life. In nature the brooding hen keeps the young chicks warm, but in commercial broiler production this is the farmer's job.

If the chicks are too cold it will adversely affect their immune system and growth, and they will become more vulnerable to disease. Some chicks may even die as a result of inappropriate temperature. To avoid any such issues a farmer must constantly monitor and adjust brooding temperatures. One way of monitoring brooder temperature is to observe chick behaviour (using stock sense). Chick behaviour is the best indicator of their comfort level and based on their distribution in the coop a farmer can monitor the conditions in the coop.

Huddled up closely and chirping	Too cold
Crowding around the edges	Too warm
Dispersed evenly within the circle	Just right



Too cold



Too warm



Just right

A farmer's ability to manage temperature is most important during the first ten days of a bird's life. Mistakes made during this critical period may be irreversible and may negatively impact the performance for the entire life of the flock. Mortality is normally highest during the first few days of brooding, so the chicks need special care. Very small chicks are particularly vulnerable and dead chicks should be removed immediately and buried.

## Brooding Temperatures:

Age (days)	Temperature under brooder (°C )
0	35
7	33
<b>Post Brooding</b>	
14	29
21	28
28	27
35	27
42	27

## 2. Food and Water

Final broiler performance and profitability are largely dependent upon attention to detail throughout the entire production process. Establishing a proper food and drink routine is a priority during the brooding period. By the end of the brooding period, if a chick's body weight reaches four times the weight at the time of input, it is a good indicator of successful brooder management.

Chicks should reach the farm at the earliest possible time after hatching and immediately start feeding and drinking. A proper brooding environment should be provided in order to meet all the young flocks' nutritional and physiological requirements. This promotes early development of feeding and drinking behaviour, and optimizes gut, organ and skeletal development to support body weight gain and good health throughout the growing period.

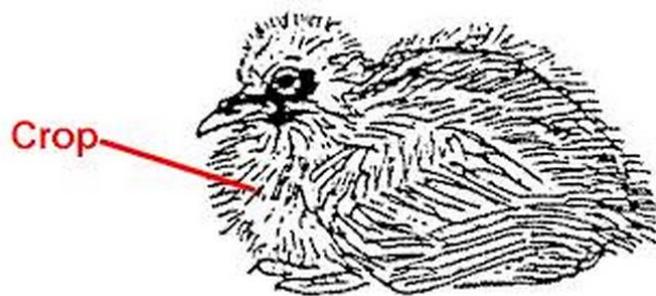
Once all chicks are placed in the brooder sprinkle a few crumbles of the chick booster feed on the paper (top dressing). The rustling sound of the feed falling on the paper immediately attracts the chick's attention and they

begin eating. This should be done several times in the first day in order to stimulate consumption.

From the second day onwards water drinkers should be suspended from the ceiling. This minimizes water spillage and provides for better litter quality and also enhances better air circulation.

### 3. Crop Fill Check

A farmer can assess the chicks' appetite development and adjustment to the new environment by monitoring water and feed levels, and by checking the chick's crop fill at regular intervals. The crop is one of the most important indicators of a chick's food and water intake. A chicken's crop is "a part of the oesophagus (food pipe) where the initial stages of digestion can occur. The crop is found at the base of the neck where you can sometimes feel the contents whether they are food, grit or water" ([www.chickenvet.co.uk](http://www.chickenvet.co.uk)).



Monitoring crop fill during the first 24 hours is critical. An initial check two hours after placement will indicate if the chicks have found feed and water. Checks at 4, 8, 12, 24 and 48 hours after arrival should be made to assess appetite development.

To do a crop fill check, randomly pick up a few chicks from four different places in the brooder and gently feel their crops.

- If the crop is soft and rounded it indicates that food and water have been found.
- If the crop is full but the coarseness (bits and pieces) of the feed crumbs are felt, water consumption is not sufficient.
- Target crop fill four hours after placement is 80 percent and after 24 hours it should be 95 percent to 100 percent.
- A fully filled crop is a visible protrusion, soft, rounded and firm to the touch. An empty one is hardly visible and seldom felt.



Checking the crop of a chick

#### 4. Chick Placement / Brooding

Key requirements to keep in mind during chick placement:

- ✓ Chicks should be from the same source /hatchery and age.
- ✓ Practicing the ‘all in – all out’ principle is strongly recommended.
- ✓ Chick placement in the coop should be done at the shortest possible time after leaving the hatchery. Delays in placement could dehydrate the chicks and result in higher chick mortality and reduced growth rate.
- ✓ Chicks should be transported in the shortest possible time and during the cooler times of the day.
- ✓ Check each delivered chick box before placing the birds in the coop. Count, record and remove dead chicks on arrival. Bury dead chicks as soon as possible.
- ✓ Weigh 5 percent of the chicks to determine and record the average day old chick weight.

How to place chicks in the brooder:

- Step 1:** Lower the light intensity and carefully place the chicks evenly distributed throughout the brooder, near feed and water sources.
- Step 2:** Once all chicks have been placed bring the light to full intensity within brooder and sprinkle some feed on paper.
- Step 3:** After two hours check if all aspects of brooding are in order and do necessary adjustments.
- Step 4:** Use ‘stock sense’ to closely monitor chick behaviour in the first 5 days. It could indicate any problems with the feeders, drinkers, ventilation or heating source.

## 5. Chick Quality Check

A good quality chick should be:

- ✓ Clean and dry after hatching.
- ✓ Chirpy, alert and active.
- ✓ Stand firmly and walk well.
- ✓ Should be free of deformities (scissor beaks, crooked legs, twisted necks and blindness).
- ✓ The yolk sac should be fully retracted and the navel should be fully healed, with no black buttons. The yolk sac is a pouch that is attached to the gut and it encloses the yolk in birds. The yolk contains all the nutrients a chick needs during its early stages of life.
- ✓ Legs should be shiny and waxy to the touch.
- ✓ Eyes should be bright, round and active.

When a good quality chick is provided with proper nutrition and good brooding the mortality rate should be less than 0.7 percent during the first 7 days. The flock should have uniform growth and the target weight should be achieved.

## Brooding Next Steps

Following the chicks' introduction into the brooder a farmer must continue to monitor the flock and make the following adjustments:

- ✓ **Adjust canopy (heat source):** The height of the canopy (off the ground) should be adjusted based on the Thermo-Hygrometer reading and by observing the behaviour of the flock.
- ✓ **Remove paper covering:** The newspaper should be removed from the brooder and burned at the end of the **3<sup>rd</sup> Day**.
- ✓ **Adjust drinker height:** Adjust the height of drinkers on day 2 to minimize spillage. Drinkers should be placed slightly above the litter to maintain water quality and maintain accessibility. The bird's feet should always be flat on the litter and it should never have to stand on its toes to drink water. The lip of the drinker should be at the level of the bird's back. Frequent assessment and adjustment is required.
- ✓ **Feeder check:** Raise feeders incrementally throughout the growing period so that the lip of the feeder and chest are at the same level at all times. Spillage should be minimized yet feed should be readily accessible. During brooding stage feeders should never be empty.
- ✓ **Feed Conversion Rate (FCR) Check:** At seven days a body weight/FCR and mortality check should be conducted. These checks are excellent indicators of how successful the brooding management has been. At seven days the average live weight of a bird should be 190g, with a FCR of 0.86 and mortality rate of less than 0.5 percent.
- ✓ **Post placement chick check:** After placement of chicks in the brooder two very important 'chick checks' should be made. They are simple and effective ways of evaluating pre-placement management.
  - **Chick Check 1:** 4 to 6 hours after placement sample ten chicks from various parts of the brooder. Check the temperature of the chick's feet against the neck or cheek. If the feet are cold preheating temperature should be re-evaluated. Cold litter results in poor feed intake, poor growth and poor uniformity of flock.

- **Chick Check 2:** Crops of chicks should be checked at **4, 8, 12, 24 and 48 hours** after arrival to ensure that they have found feed and water. At least 95 percent of the crop should feel soft and pliable. Hard crops indicate inadequate water intake and the reason has to be checked immediately. Swollen and distended crops indicate that chicks have located water but not feed. The availability and consistency of feed should be checked immediately.

## 2B. GROWING PHASE

Under an intensive management system the farmer has to ensure that his flock receives maximum nutrition. He/she has to provide the necessary inputs and look out for bird welfare in order to reap the desired benefits. Growth management programs which optimize flock uniformity, feed conversion, average daily gains and liveability are most likely to produce a flock of broilers that maximizes profitability.

### Post Brooder Coop Management

After brooding the birds for seven days a farmer must assess the birds' behaviour before dismantling the brooder set up. If the nights are colder the birds may remain in the brooder for a few more days provided the required space and ventilation is provided.



The transition from the brooder to the larger coop generally made on day eight.

The following steps should be taken during the transition:

- Step 1:** Introduce litter material outside the brooder covering a floor area of 4'x12' in the coop
- Step 2:** Remove the brooder guards.
- Step 3:** Carefully rake the brooder litter, causing minimal disturbance to the birds. Mix this with the fresh litter already laid out. Litter should be raked on days 7, 14, 20, 25, 31, in order to minimize ammonia build up and to encourage drying. If the litter under the drinkers is wet it should be removed and fresh litter should be introduced. **The rest of the litter should remain in the coop till the flock is harvested.**
- Step 4:** Remove the translucent polythene sheets from in and around the coop and wash them. Remove the brooder canopy, clean and disinfect it and store it away.
- Step 5:** Raise the CFL light bulb to 8 feet above the ground to illuminate the whole coop.
- Step 7:** Install three 5kg feeders in the coop. Replace the 4.5 litre drinkers with three 9 litre drinkers. Both feeders and drinkers should be suspended in two rows from the ceiling using nylon cord. Each unit should have a height adjuster. Heights of feeders and drinkers are adjusted so that the feeder and drinker lips are at the level of the birds' back. Feeder/drinker height adjustment should be done every other day until the flock is harvested.

## Ongoing Feed and Water Requirements

Clean water should be available right throughout the birds' life. Broiler booster feed and grower/broiler starter feed is provided for the birds' development and weight gain. Finisher feed is given on a controlled basis to reduce heat stress related deaths.

A flock of 100 broilers requires the following quantities of feed:

Feed Type	Number of Bags Needed	Time Period for Use
Chick Booster	1 (50kg)	Day 0 to 13
Chick Starter / Grower	2 (50kg)	Day 14 to 24
Chick Finisher	4 (50kg)	Day 25 to 40/Market

## Chick Booster to Starter Feed: Consumption and Targets

Chick booster is a crumble feed of a smaller particle size when compared with starter feed.

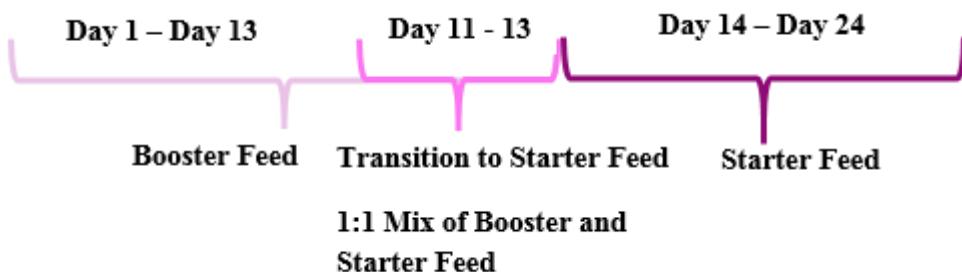
Once placed in the brooder chicks have to obtain their nutrients from manufactured feed provided by the farmer. During this time their uptake is at its lowest and their nutrient intake requirement is at its highest. During this time the proper nutrient concentration and right environmental conditions must be provided in order to develop good chick appetite. Final body weight is positively correlated with day 7 body weight – therefore a good start is critical.

Chick booster feed is given until day 13. It can be given for longer if the target weights are not achieved. Chicks that don't have a good start are susceptible to diseases, have compromised weight gain and are prone to environment stressors.

While booster feed is more expensive when considering its impact on biological performance and overall profitability its advantages outweigh its cost.

On **day 11** the farmer should begin the transition from booster feed to starter/grower feed. Start by mixing the two types of feed in **1:1** proportions. This is done to prevent any reduction in nutrient uptake due to

the introduction of another feed type. By day 14 the birds should have moved totally to starter feed.



### Starter to Finisher Feed

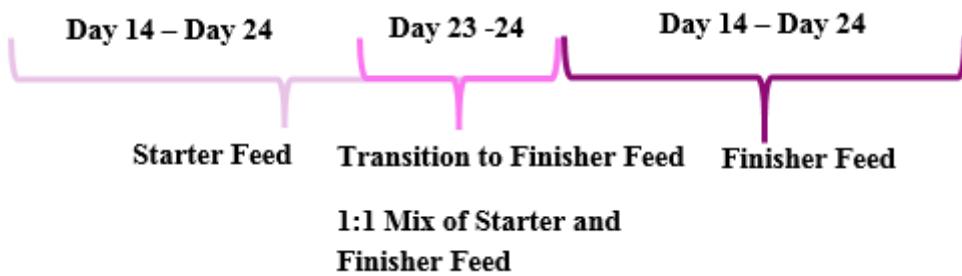
Starter feed is also in crumble form like booster – but bigger in particle size.

Starter feed is given to the birds from day 14 to 24. The transition from booster feed will involve a change in nutrient density. During this time broilers grow rapidly and this growth phase must be supported by adequate nutrient intake.

The transition from starter to finisher feed should be well managed especially since finisher feed is in pellet form. Broiler growth and feed efficiency is improved by pelleting feed. These performance improvements are due to:

- ✓ Low feed wastage
- ✓ Reduced selective feeding
- ✓ Decreased ingredient separation
- ✓ Prevention of diseases causing organisms
- ✓ Less time and energy spent on eating
- ✓ Improved palatability

Mixing starter and finisher feed commences from day 23 to a 1:1 proportion. By day 25 the birds will be totally on pelleted finisher feed. Broiler finisher feed accounts for most of the total feed intake and cost of feeding a broiler. A detailed guide to feeding performance targets is provided in Module Five.



## Water Management

Water is an essential nutrient that impacts virtually all physiological functions. 65 – 78 percent of the body composition of a bird (depending on the age) comprises of water. Many factors including temperature, relative humidity, diet composition and rate of body weight gain, can influence water intake. Good quality water is essential for efficient broiler production. Water consumption should increase over time. If at any point it decreases the farmer should assess the bird health, environment and managerial techniques.

It is essential to clean drinking systems between flocks. If a separate storage tank exists for the use of poultry operations, it should be drained and scrubbed out clean. All drinkers should be taken out and scrubbed clean using a detergent. The cleaning solution should be used according to the manufacturer's recommendations. The drinkers must be dried in the shade (drying in the sun can deteriorate the plastic and affect the durability of the drinker) and stored away. They must be sanitized before being used for the next flock of birds.

Water testing should be carried out on a periodic basis, at least once a year and particularly after a flood situation. Samples should be collected in a sterile container from the source as well as from the house. The national water board provides laboratory services. Factors to be considered when measuring water quality include:

- ✓ **Mineral content:** Broilers can tolerate high levels of certain minerals like Calcium and Sodium in water but they are very sensitive to other minerals like Iron and Manganese, which give a bitter taste. This sensitivity could decrease water consumption. Filtration systems could be used to resolve this issue. Water filters should be cleaned weekly.

- ✓ **Microbial contamination:** Water should be tested to ascertain the level of Coliform Bacteria, which has a direct impact on bird performance. High bacteria levels lead to poor intestinal health and loose faeces, and negatively affect the overall flock performance. Water acidifiers or Chlorine could be used to sanitize water. Water should be tested at least once in six months to ascertain the level of contamination.
- ✓ **pH level:** The pH level is the measure of hydrogen ions in a solution. This is measured on a scale of 1.0 to 14.0 with 7.0 being neutral. A pH level below 7.0 indicates that the liquid is acidic while a pH level above 7.0 indicates that the liquid is alkaline. A pH level above 8.0 could cause bitterness in the water and reduce the birds' water intake.
- ✓ **Total dissolved solids (TDS):** TDS indicates the salinity level of water and the level of inorganic ions dissolved in water. Calcium, magnesium are the primary components that contribute to TDS.



Remember, that you should NOT give your flock water that you yourself would not drink.

## 2C. BENEFITS OF A LIGHTING PROGRAM

There is no universally applicable lighting program for poultry farmers. As such the recommendations provided in this manual should be customized based on the specific environmental conditions and requirements of the farmer.

### Benefits of a Lighting Program:

- ✓ Darkness is a natural requirement for all living beings. It promotes rest and proper rest helps in every way.
  - It improves the Feed Conversion Ratio through energy conservation. Resting helps to increase weight gain.
  - It reduces mortality by helping to maintain good heart health.
  - It improves immune systems and makes birds stronger and healthier.
  - It improves bird uniformity, and promotes a good average weight in the flock.

During the first 5 days it is essential to stimulate activity in order to enhance feed and water uptake which has a direct impact on the digestive and immune system development. A lighting level of 25 lux is recommended for the darkest part of the house. After 7 days, or at a live weight of 160g the intensities should be gradually reduced to 5 to 10 lux.

General guidelines for a lighting program are as follows:

Age (Days)	Hours of Darkness
0	0
1 to 5	1
6 to 11	6
12 to 35	4
36 to 37	8
38 to 39	2
40	1

Main factors to consider when using a lighting program:

- ✓ On the first day, after placement, 24 hours of light is essential to encourage adequate feed and water uptake.
- ✓ Feed and water should always be available to ensure that the flock goes into darkness on a full crop. They will return to feeding once the lights are on thus preventing dehydration and stress. Always ensure that feed and water is available before the lights go out.
- ✓ Birds should be weighed weekly, and the lighting program should be adjusted according to the average weight of the birds (more light is needed for more weight).
- ✓ The duration of darkness should be increased according to the age of the birds as per the table above.
- ✓ During hot weather the number of dark hours can be reduced to encourage feeding.

## 2D. LITTER MANAGEMENT

Correct litter management is the cornerstone to bird health, flock performance, yield quality and profitability of a poultry operation. It is a crucial aspect of environmental management.

### Important Points to Remember:

- ✓ Litter material should cover the entire flock placement floor surface of the coop.
- ✓ It should be ideally 3 to 4 inches in thickness.
- ✓ After 7 to 10 days, the brooder guards are removed, and the chicks' space increases from 0.25sqft to 0.4sqft per bird. The litter in the brooder is raked and mixed with the new litter in the extended area. This action is useful for immunity development, to speed up drying and to reduce residual gases such as ammonia from the brooder litter.
- ✓ Hereafter litter should be raked once in 4 to 5 days until the end of the starter feed period.
- ✓ Following this the litter should be raked every 7 days.
- ✓ At 12 to 14 days the bird should be given their full floor space of 1.2sqft per bird. This will minimize stocking density and encourage quicker drying of litter.
- ✓ Litter under water drinkers must be checked regularly. If litter is wet due to any leakages the affected litter should be replaced immediately with fresh litter.
- ✓ Towards the finisher feed stage, particularly during hot weather, birds have a tendency of consuming more water and the excreta may have a higher in moisture content. Under such circumstance a thin layer (about one inch) of fresh litter may be introduced over the old litter and raked. Fresh litter should never be applied over moist or damp area.
- ✓ The same litter should remain in the coop for the full cycle.

### Testing Litter Quality:

Litter quality should be evaluated regularly. To test litter quality, pick up a handful of litter and gently squeeze it and release.

- If it disintegrates upon release with slight adherence on palm, the quality is acceptable.

- If it stays compact on release, there is excessive moisture that may cause bird welfare and health challenges. Litter with high moisture contributes to elevated ammonia levels. In addition to carcass downgrades due to breast blisters, skin burns and weight loss, this could also result in serious environmental implications. In addition to impacting the birds' immunity excessive moisture can be a health risk for the occupants of the premises and could also lead to neighbourhood complaints and an enforcement of statutory rulings.

The main causes of poor litter quality include poor litter management, poor drinker management, high stocking density, poor water quality, poor feed quality, digestive health problems, low litter depth and improper rain cover.



**Good litter management can significantly enhance the profitability of the farm.**

## **2E. HARVESTING**

In a poultry operation involving a flock size of 100 birds or less, farm bird collection must be planned meticulously in order to make it an economical and efficient exercise. A farmer should start planning this from the time the flock is introduced to the coop.

If at least 1000 (10 sets of 100 birds) have been raised in farms in the neighbourhood – and if all farmers begin operations at the same time, all or most of the flocks should be ready for harvesting/ collection on a planned date. This will create economies of scale for the seller, transporter and the buyer and will ensure shortest possible time from collection to market. The main objective of planning such an exercise is to insure low levels of dead chickens on arrival at the market, to ensure minimal shrink/ loss of weight at time of sale, and to maintain high animal welfare standards.

### **Logistics of Harvesting:**

A planned and well-coordinated harvesting operation will bring many benefits to the collector. It will lower transport mortality, lower shrinkage (loss of weight) and result in a higher market end yield. The effort is worth it. Keep in mind that:

- ✓ Catching should be done as early in the day as possible to minimize stress, shrinkage and mortality.
- ✓ There should be good coordination between the seller and the buyer/transporter.
- ✓ The bird collection time should be accurately communicated to the farmer so that the feeders can be taken out of the coop with enough time to allow the gut to empty.

### Feed and Water Withdrawal

Feed (only) should be withdrawn 6 to 8 hours before collection of birds. Less than 6 hours will result in excess feed and faecal residue remaining in the gut. Since there is no conversion to meat, this is a tangible waste of good feed which could have been given to the next batch of birds.

Withdrawal of food more than 12 hours before collection could lead to yield shrinkage, health issues for the flock and possible death of birds.



**Water should NOT be withdrawn and should be available to the birds down to the time of catching.**

### Preparation for Catching

The farmer should be present at the time of catching to ensure that proper procedures are followed. The farmer should independently note down the number of birds and respective live weights when birds are placed/strung up on the scale.

Bird welfare should be given due consideration during catching. Preferably, catching should be done in the night or early morning. All feeders, drinkers and any other equipment must be shifted out of the house. Ample ventilation should be maintained.

Before catching minimize the light intensity to reduce bird activity. There should only be enough light to perform the job. Use a blue or green light, if available. It has a calming effect on the birds. Place birds carefully in clean crates. Current law permits only 10 birds per crate, if birds are bigger only 6 birds should be placed per crate.

## Manual Catching

Trained staff must be involved in the catching process. Reduce the pen space by using a mesh frame. Pick up birds by their legs without exciting them. It is difficult to prevent them from squawking in anxiety. However this is greatly reduced in dim light. Grip birds only by the feet (also known as the shank). Carry no more than three large birds per hand. Do not pass birds from one catcher to another.



The objective of a biosecurity program is to achieve hygienic conditions within the coop and thereby minimize the adverse effects of diseases with the ultimate aim of attaining maximum performance and bird welfare while providing for food safety.

## Minimizing Damages

Adhering to the procedures described above will help reduce bruising due to a breakage of the long bone; prevent wing tip damage due to improper gripping; and prevent choking to death due to being held upside down for a prolonged period. More damage to the bird will result in less quality and price of the meat.

## 2F. HEALTH AND BIOSECURITY

Biosecurity is the term used to describe an overall strategy employed to exclude infectious diseases from a livestock production site. A robust biosecurity program is critical to maintain flock health. Employing good hygiene practices and a comprehensive vaccination program are both essential in keeping diseases at bay. Biosecurity should become a way of life to a poultry farmer.

The main principles of flock health and biosecurity are to maintain hygienic conditions within the coop through the implementation of correct biosecurity measures and vaccination programs.

Disease control programs in poultry farms involve:

- Disease prevention (biosecurity or vaccination program)
- Early detection of ill health
- Treatment of identified disease conditions.

## Bird Health and Biosecurity

There are three primary factors that must be considered when developing a biosecurity program:

1. **Farm location:** The coop should ideally be located away from other poultry and livestock facilities.
2. **Farm and coop design:** The coop should be rodent (rat) and bird proof. The coop should be fenced off and practical for cleaning and disinfection. Floors should be made of concrete and be washable. It is recommended to maintain a clear and levelled area of 50ft around the coop – grass should be cut and bushes cleared. It is also recommended to build a gravel area (three feet wide) immediately around the house to prevent rats from getting in.
3. **Operational procedures:** Farmers must restrict the movement of personnel, feed, equipment and animals in order to prevent the introduction and spread of diseases. Single age sites or ‘all in all out’ programs are preferred so that the recycling of pathogens/ diseases causing agents and live vaccine strains is limited.

A biosecurity program is mandatory. A good biosecurity program should be practical, cost effective, flexible yet non-compromising and reviewed regularly.

### Key Components of a Successful Biosecurity Program:

- ✓ The farm should be fenced and have locked gates.
- ✓ Outsiders should be given limited entry to the farm. A foot bath should be kept outside the coop along with a split gallon can filled with a disinfectant diluted in water. Anyone going into the coop should dip their feet in the foot bath before entering.
- ✓ Clean footwear before using the disinfectant bath.
- ✓ Washing facilities for hands and feet should be away from coop.
- ✓ If it is a multi-age farm always start work with the youngest batch.
- ✓ Avoid contact with free range birds, pigeons etc.
- ✓ Have your own set of farm equipment. No sharing or exchanges.
- ✓ No pets should be allowed near the coop.

- ✓ The area around the coop should be free of debris and vegetation.
- ✓ Water and feed spills should be removed as soon as possible.
- ✓ All in all out is recommended (for birds of same age) to reduce cycling of disease agents.
- ✓ Dead bird disposal should be done in such a way that it avoids contamination of the environment, and prevents cross contamination with other poultry. A small pit, deep enough to prevent dogs from digging can be used for this purpose.

### **Decreasing the Risk of Disease**

The farmer himself could be one of the main sources of disease transmission. He/she must take every care when entering or leaving the pen. When entering he/she must leave behind the pair of slippers or shoes used for the outside and wear a pair dedicated for use in the bird cage. The special footwear must be worn after stepping into the disinfectant foot bath.

### **Disease Investigation**

It is important to be familiar with the normal production parameters and behaviour of the birds in order to detect any abnormality. This comes gradually, with experience. A farmer must keep abreast with local and regional challenges in order to be aware of any potential disease threats.

Seek veterinary advice when there is an abnormal number of deaths or a deviation from normal bird behaviour. A systematic approach is required when trouble shooting health issues on the farm. The following factors must be looked at:

- ✓ **Feed:** Availability, consumption, distribution, contaminants and toxins.
- ✓ **Light:** Adequate for efficient growth and development.
- ✓ **Litter:** Material used, depth, distribution, moisture level, contaminants.
- ✓ **Air:** Ammonia level, ventilation and air movement.
- ✓ **Water:** Availability, consumption, distribution, contaminants.
- ✓ **Space:** Bird density, limiting obstacles, feed and water availability.

- ✓ **Sanitation:** Hygiene of premises, pest control, maintenance, cleaning and disinfection practices.

Healthy day old chicks are essential for a good start to poultry farming. The growth rate, feed conversion efficiency, liveability and carcass quality will all be negatively affected by poor bird health.



### Disease Recognition

Early disease recognition is critical. A change in the feed or water intake can be one of the first indications of a disease. If unusual amounts of feed and water remains in the containers it must be considered a deviation from normal behaviour and the farmer must give it immediate attention.

Farmer should be vigilant of:

- ✓ Daily bird behaviour.
- ✓ Bird appearance – uniformity and feathering abnormalities.
- ✓ Environmental changes – litter quality, if it is wet and cakey etc.

Clinical signs of disease include respiratory problems, irregularity in faecal droppings (specifically if it is abnormal consistency, watery, with undigested feed particles or blood tinged) and a depressed appearance. If one or more of these problems are present veterinary assistance is advised.

## 2G. VACCINATIONS

Vaccinations protect birds against field challenges caused by specific pathogens by exposing birds to a safe form of the infectious organism (antigen). An appropriate vaccination program should be developed in consultation with a veterinarian, taking the local disease challenges into consideration. The table below provides a general guideline for a broiler vaccination program.

### General Broiler Vaccinations, Application and Timing:

Timing	Name	Application
Day 1	Infectious bronchitis (Live)	Beak dip, eye drop or drinking water
Day 7	New castle diseases B1 (Live)	Eye drop or drinking water
Day 11	Infectious bursal disease / Gumboro (Live)	Eye drop or drinking water
Day 22	Infectious bursal disease / Gumboro (Live)	Drinking water

Vaccinations alone cannot protect flocks against overwhelming disease challenges and poor management practices. Vaccinations will be more effective when disease challenges are minimized through well designed and implemented biosecurity and management programs.

## 2H. FARM SANITATION

Maintaining good hygiene is the single most important factor in keeping poultry healthy and in optimizing productivity. A broiler coop has to be clean enough to provide optimal hygienic conditions for bird growth. Farm sanitation does not mean choosing the right disinfectant. The key to farm sanitation is effective cleaning.

To maintain a successful sanitation program:

- ✓ Remove all birds from the farm at the end of each flock cycle.
- ✓ Immediately after bird removal apply an insecticide over the total litter surface and the short wall.
- ✓ Clean and disinfect the coop through dry and wet cleaning.
- ✓ Plan your cleanout program. For a cleanout program to be successful all the operations must be carried out on time. Cleanout is an opportunity to complete any routine maintenance on the coop and such tasks should be planned into the cleaning and disinfection program. Draw up a plan detailing the dates times, labour and equipment requirements for the sanitation program. The sole objective of the clean out plan is to ready the coop for the next batch of chicks.

### Dry Cleaning:

Items Needed for Dry Cleaning
Mammoty
Spade
Cobweb breaker
Hand brush
Ekel broom
Used feed bags



- 1. Removing dry matter:** Remove all dry matter from the coop. This includes used litter, remaining feed, feeders, drinkers, strings and light bulb. Soon after bird removal spray the litter, coop and surroundings with an insecticide in order to rid the area of the black beetle and other insects that could act as a disease carrying vector. Used litter should be sent out of the premise in order to minimize contamination of the farm.
- 2. Litter Removal and Disposal:** Litter is collected in used feed bags and sold/sent out of the premises to be used as fertilizer in a plantation.
- 3. Cleaning out the Inside of the Coop:** Having removed the litter, scrape out all remaining organic matter. Inside, clean the roof of the coop, break all cobwebs, clean the dust, etc. Clean all pillars and rafters using the same cobweb brush. Clean the mesh using a hand brush. Sweep the entire coop using an Ekel broom.

#### Wet Cleaning:



Items Needed for Wet Cleaning
Rubber hose
Nylon scrub brush
Disinfectant solution

At the end of dry cleaning the whole house should be washed with a steady stream of water.

- 1. Cleaning feeders and water cans:** Dismantle the feeders and soak in water for one hour before scrubbing with detergent soap. Rinse well and leave to dry in the shade. Scrub the water cans in the same manner and leave to dry in the shade. Soak the feeder drinker suspender strings for one hour, wash clean and shade dry.
- 2. Repairs and maintenance:** Check the house and equipment see to any repairs.
- 3. Floor treatment:** Since the initial floor will be clay (up to the production of six batches) the floor should be spread with fresh earth

from the dug pit. Sprinkle water on the fresh earth and then sprinkle some lime powder which acts as a good disinfectant. Paint the short side walls with dissolved lime powder.

4. **Cleaning external areas:** Weed and clean the immediate surroundings of the house. Spray the outer short wall with an insecticide followed by a disinfectant.
5. **Disinfection:** Disinfection should not take place until the whole house and its surroundings are thoroughly cleaned and all repairs are complete. After wet cleaning is done and the house is dry, spray a disinfectant at a rate of 3ml per litre of water on the inner and outside of the house, including the mesh and short wall.

Detailed below is an example of a cleaning, disinfection and restocking plan:

Day One	Chicken are sold and picked up	<ul style="list-style-type: none"><li>✓ Remove all feeders and drinkers and allow them to soak in fresh water.</li><li>✓ Spray an insecticide over the litter at a rate of 1ml per litre of water.</li><li>✓ Remove light bulbs.</li><li>✓ Soaked feeders and drinkers are washed using a plastic scrubber. Use a detergent, wash them clean and allow drying in the shade. Sun drying could degrade the plastic.</li></ul>
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Day Two	Dry Cleaning	<ul style="list-style-type: none"> <li>✓ Completely remove litter from coop using mammoty and spade.</li> <li>✓ Remove cob webs and dust from the ceiling, mesh and feeder drinker suspension strings using cobweb remover and hand brush.</li> <li>✓ Thoroughly sweep out the house with an ekel broom.</li> <li>✓ If it is a soil floor remove about an inch of soil, dig a small pit and bury it. Use fresh earth from the pit to spread on the coop floor.</li> </ul>
Day Three	Wet Cleaning	<ul style="list-style-type: none"> <li>✓ Using a rubber hose wash the coop thoroughly. Scrub short wall and mesh using a nylon scrub brush.</li> </ul>
Day Four	Maintenance Check	<ul style="list-style-type: none"> <li>✓ Check for floor and short wall cracks and repair if necessary.</li> <li>✓ Check for breaches in the mesh and repair or replace if necessary.</li> <li>✓ Check roof for leaks</li> <li>✓ Clean exterior of Coop</li> </ul>
Day Five	Disinfection	<ul style="list-style-type: none"> <li>✓ Spray a disinfectant at the rate of 3ml per litre. A two litre solution is sufficient to spray the entire coop. Moisten the floor and sprinkle lime powder on it. Dissolve 2kg of lime powder in 4 litres of water and</li> </ul>

		apply on short wall and let it dry. This acts as a good disinfectant.
Day Six – Day Eleven	Air drying	<ul style="list-style-type: none"> <li>✓ Let the coop sit open and dry</li> </ul>
Day Twelve	Brooder preparation and disinfection	<ul style="list-style-type: none"> <li>✓ Spray a disinfectant at a rate of 3ml per litre of water – inside and outside the coop. Close whole house using polythene and prepare the brooder system. Apply litter material, and disinfect.</li> </ul>
Day Thirteen	Prepare equipment	<ul style="list-style-type: none"> <li>✓ Prepare drinkers, feeders, water bucket, vitamin supplement, Glucose, water container, water acidifier, feed and vaccine.</li> <li>✓ Lay newspaper on the litter</li> <li>✓ Spray a disinfectant on feeders and drinkers, brooder guards, light shade and paper at a rate of 3ml per litre of water and let dry.</li> </ul>

Day fourteen	Chick placement	<ul style="list-style-type: none"> <li>✓ Have boiled and cooled water ready. Turn on heating source four hours before chick replacement.</li> <li>✓ Before placing chicks in the brooder mix a 200 dose vial of the IB (live) vaccine in 6ml of diluents, pour into a small plastic cap and have it ready to dip chicks' beaks.</li> <li>✓ Take one chick at a time, dip the beak in the vaccine solution and place in brooder.</li> <li>✓ Restock the coop with new chicks.</li> </ul>
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## 2I. SAFE USE AND HANDLING OF PESTICIDES AND DISINFECTANTS

### Safe Use of Pesticides

Pesticides are poisonous and must be handled with care and caution. **READ THE LABEL BEFORE OPENING A PESTICIDE CONTAINER.** Follow all label precautions and directions, including requirements for protective equipment. Apply pesticides only on the litter, and the inner and outer walls of the coop in a manner in which it will not contaminate any runoff water. Do not directly contaminate any nearby water sources.

Always read the label before opening a pesticide container. The label provides all necessary information and instructions on how make the most effective use of the pesticide or disinfectant.



## Using Insecticides Responsibly

It is the farmer's responsibility to see to it that insecticides are used for the proposed purpose with extreme care. He could be legally responsible for any harm or damage to the flock, the community, the environment or to himself, as a result of misusing pesticides. His/her responsibility extends to the effects caused by spray drift, runoff, or residues.

To reduce pesticide risks and harmful effects:

- ✓ Choose the right pesticide product
- ✓ Read the product label
- ✓ Determine the right amount to purchase and use
- ✓ Use the product safely and correctly
- ✓ Store and dispose of pesticides properly

### Transportation of Pesticides:

Make sure that pesticide containers are not leaking at the time of purchase. Do not transport or carry pesticides together with food items or feed in a way that allows contamination of the edible items. Pesticides should never be transported on your person (in pockets) or in a closed passenger vehicle.

### Storage of Pesticides:

Pesticides should be kept under lock and key. They should never be in the reach of children, unauthorized persons, pets, or livestock. They should be kept in original containers until used. NEVER store pesticides near food, feed, fertilizers, or other materials that may be contaminated by it.

### Pesticide Container Disposal:

Empty pesticide containers should be washed well, wrapped in paper and stored safely away before handing over to the local authority or recyclers. Make sure empty containers are not accessible to children or animals. Never reuse them. Never dispose of containers in a way that they could contaminate water supplies or natural waterways.

### Environment protection:

Many pesticides are toxic to animals, including honey bees, fish, domestic animals, and birds. Crops and other plants may also be damaged by misapplied pesticides. Care should be taken to protect non-pest species from direct exposure to pesticides and from contamination due to drift, runoff, or residues.

## Personal safety

When using pesticides/insecticides personal safety measures are crucial. Always use personal protective clothing and equipment including masks and respirators. Wash exposed skin after work. Follow label directions carefully. Avoid splashing, spilling, leaks, spray drift, and contamination of clothing. Never eat, smoke, drink, or chew while using pesticides. Have first aid measures handy.

Locally available insecticides and approved application rates for poultry pests: Permethrin – 10 percent EC spray – Mix one ml of pesticide in one liter of water and spray the solution on the litter and side walls.

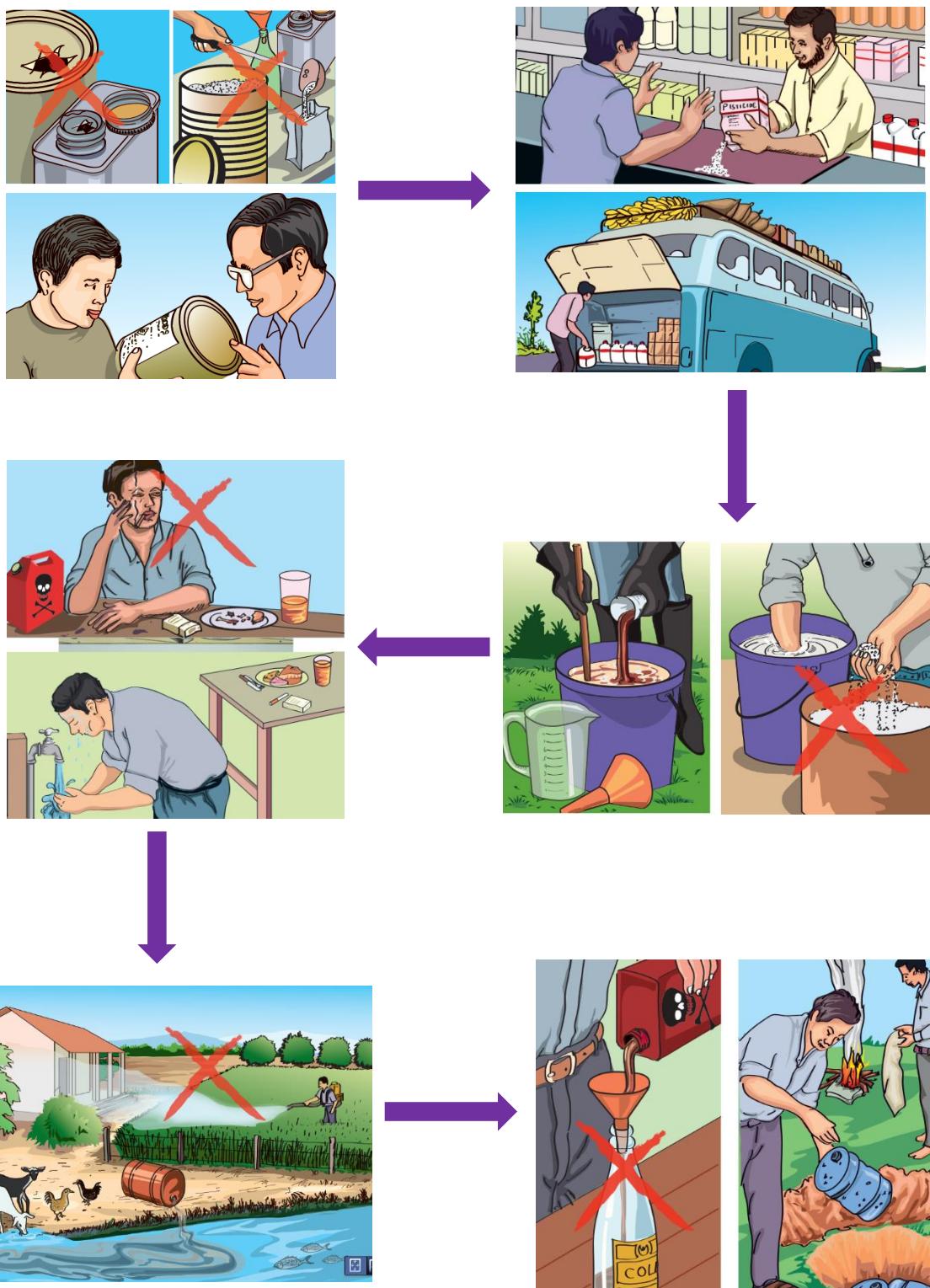
## Safe Use of Disinfectants

Disinfectants should be selected wisely and always follow label directions for safe use. It is the farmer's responsibility to provide a safe working environment for himself and those working in the coop. The safety of those working in the broiler farm must never be sacrificed for cost or productive efficiency. Despite their disinfectant and antiseptic functions, the chemical agents, if used improperly, may lead to accidents. Taking appropriate precautionary and protective measures will ensure safety and efficiency at work. Different disinfectants have varying applications, actions and effectiveness on Bacteria, Viruses and Fungi. In choosing a disinfectant, both the disinfecting properties and safety factors have to be considered. Many chemicals are corrosive, toxic or irritant and if used improperly or not according to instructions on protection, accidents can happen.

## Types of Chemical Disinfectants Locally used in Poultry Farms

- ✓ **Sodium Hypochlorite or liquid bleach:** This is the most commonly used disinfectant due to its cost effectiveness. The chlorine in this product possesses disinfecting, sterilizing and bleaching properties. Liquid bleach contains 5 to 10 percent chlorine and needs to be diluted 50 to 100 times.

## Steps for Safe and Effective Use of Pesticides and Disinfectants



## Health Hazards Caused by Disinfectants

Generally speaking, all chemical agents are hazardous to a certain extent and when used improperly, they will pose hazards to health. Chemical agents can enter the body through three different:

1. Swallowing
2. Penetration through the skin
3. Inhalating

Health hazards caused by the chemical agents include:

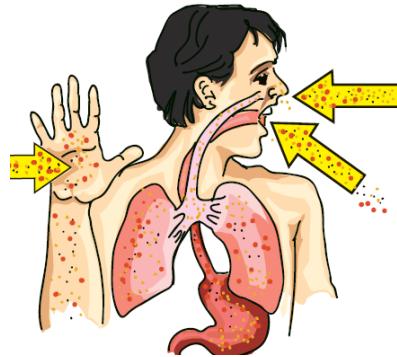
Skin – burns, itch, allergy, dryness and inflammation

Eyes – burns, redness and swelling or blindness in serious cases

Respiratory – coughing induced by irritation; the respiratory tract and lung might be affected when serious

Nerve system – headache, dizziness and numbness

Other organs – liver and kidney functions might be affected



## Safe use Storage of Disinfectants

The following protective measures should be taken when using and storing the chemical agents:

- ✓ Keep disinfectants under lock and key and well out of the reach of children, unauthorized persons, pets, or livestock.
- ✓ Do not eat, drink, smoke, when using disinfectants. They should not be stored with food and feed items.
- ✓ Use personal protective equipment.
- ✓ Wash hands, arms and face immediately after using the chemicals.
- ✓ Disinfectant containers should be clearly labelled.
- ✓ Follow manufacturer recommendations.
- ✓ Store in well ventilated places.
- ✓ Keep first aid measures at hand

# **3. MODULE THREE: COOP DESIGN, CONSTRUCTION AND EQUIPMENT**

Module three will focus on how to design and build a functional broiler coop and what equipment and resources are required for the construction. The module will begin with general guidelines and important factors that need to be considered when designing and constructing a broiler coop. The module will also detail materials required for construction and provide practical, step by step instructions on how to construct a 100 bird broiler coop.

## **3A.COOP DESIGN, CONSTRUCTION AND EQUIPMENT**

Broilers rearing under an intensive management system is widely different from free range/extensive systems since in intensive systems the flock is totally dependent on the farmer for survival. As such, the single most vital requirement in an intensive/caged boiler rearing system is the poultry coop.

In designing and constructing a practical and productive poultry coop the following key factors must be taken into consideration:

- ✓ Site Selection
- ✓ Stock Density
- ✓ Ventilation
- ✓ Light
- ✓ Protection from the weather and from predators

### **Site Selection:**

The location and design of a poultry coop must be carefully considered in order to ensure flock welfare, safety and profitability of the operation. The site should be easily accessible. A reasonable roadway is essential for transporting of building material, chicks, feed and for the collection of live broilers at the time of harvesting. A reliable potable water supply is essential. The ground should be well drained and not prone to flooding. The area surrounding the proposed broiler coop should be mowed and cleared of shrubs. The farmer should ensure a good distance is kept between the coop and any residential areas or out houses. The coop should be far enough to protect human health and close enough to provide security for the birds.

### **Stock Density:**

Stock density (the amount of space provided within the coop for each bird) is the most important basic principle in broiler housing. In warm climates the space requirement should be calculated at the rate of 1.2 square feet per bird. Less space than this creates stressed social behaviour, leaving room for disease vulnerability and cannibalism and resulting in decreased productivity and profit.

### **Ventilation:**

Ventilation is an extremely important factor in broiler housing. A building with open sides is the most suited for this purpose. Open side coops are designed to allow wind to blow across the width of the building. Coops should be built with the length of the building in the East-West orientation.

Having the coop face this direction helps to minimize exposure to direct sunlight.

Roofing material like cadjan, straw, and dried palm leaves are ideal to minimize heat stress but have their limitations since they are not easy to clear and could be a breeding ground for rats and squirrels, and a hunting ground for snakes. Tin or other metal have the advantage of being easy to clear and are less attractive to pests but can create a good amount of heat. In order to minimize the effects of solar radiation metal roofs should be painted white. That will reflect up to 70 percent of the solar heat radiation. Ground cover that does not impede air movement through coop can reduce reflected heat. Shade should be provided, especially if there is little air movement or if the humidity is high.

With no shade, or when confined in higher temperatures, poultry become heat stressed and irritable. The effects of heat stress include:

- A reduction in feed intake as environment temperature rises
- An increase in water consumption in an attempt to lower temperatures
- A progressive reduction in growth rate since nutrient / feed intake is reduced
- Possible cannibalism
- High mortality

### **Light:**

Broilers are very active in bright light. In the first few days of their life bright light is important for feeding, as the birds identify food by sight. Poor light conditions lead to low activity and poor performance. This is especially important for intensively managed day-old chicks, who need very bright 24-hour lighting for their first week of life. The height of the cage is designed to allow in maximum natural daylight.

Flocks perform best where there is plenty of natural light. If the interior of the house is whitewashed it reflects light. At sunset well-distributed artificial light should be provided to maintain consistency of performance. Light intensities are measured at the eye-level of the bird, not near the light source. The most practical way to judge the light level is to see if a newspaper can be read at bird level.

### **Protection:**

Under an intensive management system the main purpose of housing is to protect the birds from the weather, thievery and predators such as pole

cats, raccoons, dogs, cats, snakes, rats and birds of prey who could cause severe economic losses by attacking and destroying livestock. Coops are also designed to prevent other pests like squirrels, mice and wild birds from eating valuable poultry feed and transmitting diseases. Coops should also be safe from thieves.

## **3B. CONSTRUCTION OF A 100 BIRD BROILER COOP**

### **Land Selection:**

- ✓ The proposed land should be 200m away from the residential area.
- ✓ The minimum required land size is 100' x 100'.
- ✓ The land should be a flat highland, free from flooding.
- ✓ Within the selected space a 35' x 35' area must be cleared of all vegetation.

### **Preparation of the Proposed Location:**

- ✓ A 35' x 35' land area should be levelled and flattened. The earth could be filled if required.
- ✓ The surrounding premises should be covered or fenced to prevent any outside animals from entering.

#### **Required Tools/ Equipment**

- ✓ Mammoty
- ✓ Shovel
- ✓ Bucket
- ✓ Trowel
- ✓ Sprite level and/or water level
- ✓ Screed Level
- ✓ Nylon rope
- ✓ Plump–bob
- ✓ Hand saw
- ✓ Chisel
- ✓ Hammer
- ✓ Driller
- ✓ Screw Driver
- ✓ Spanner
- ✓ Measuring tape

#### **Required Manpower**

- ✓ One mason for four days
- ✓ Two carpenters for three days
- ✓ One unskilled labourer for ten days

## General Timeline and Construction Phases:

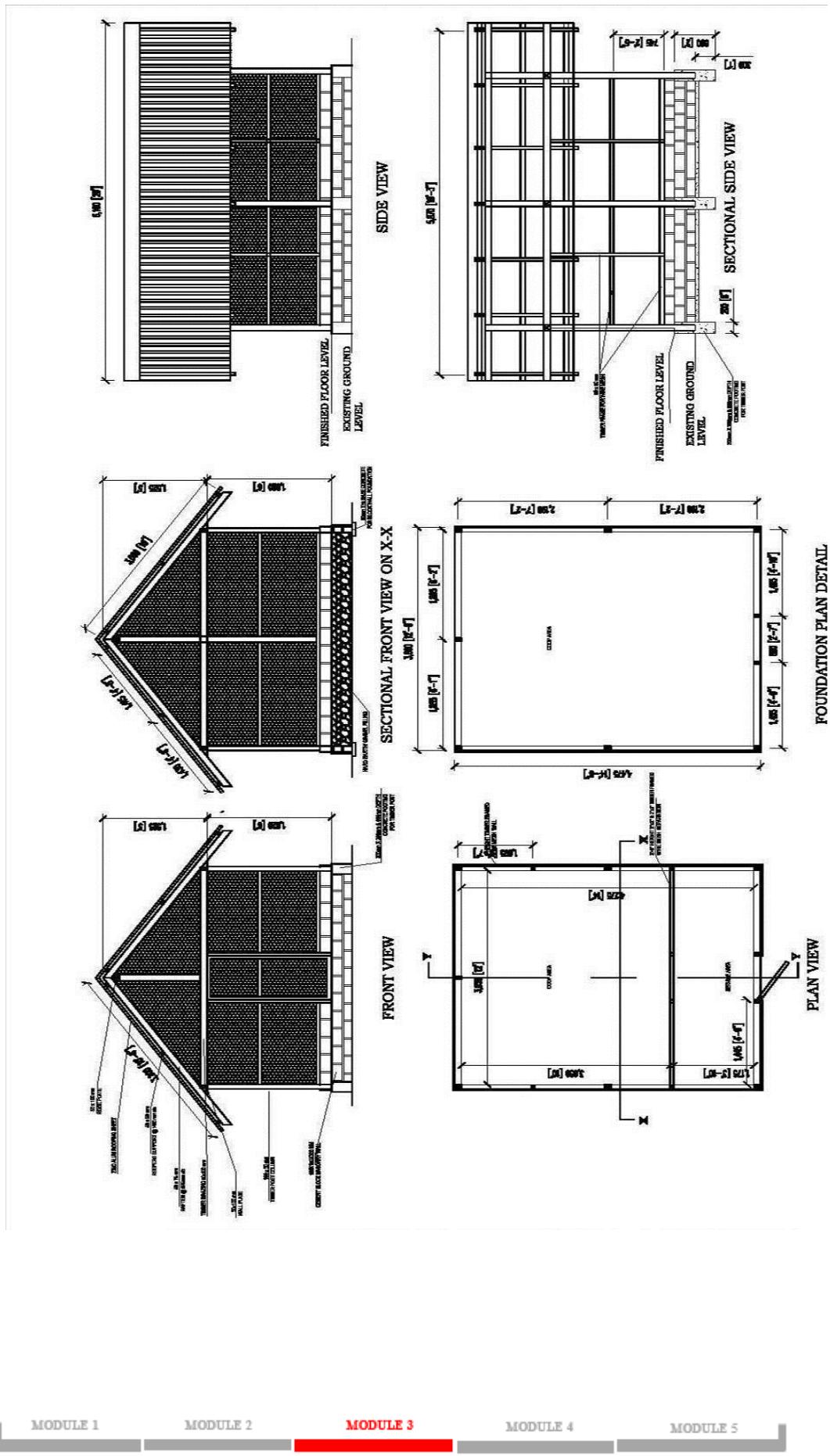
Construction Phase	Week 1	Week 2	Week 3	Week 4
Stage 1: Foundation work				
Stage 2: Frame work				
Stage 3: Wire mesh, roofing,, door work				
Stage 4: Finishing the coop				

## Full List of Materials

No	Description	Unit	Qty
A	<u>Up to Foundation Level</u>		
1	Cement (Tokyo Super)	Bag	6.00
2	River Sand	Cube	0.20
3	3/4" Metal	Cube	0.20
4	4" thk (12" x 6") Cement Block	Nos	130
5	Hard earth (gravel)	Cube	1.50
6	Shuttering Planks (8"x3/4" & 2' long)	L.ft	72.00
7	4"x3" Ginisappu Timber pillar post (9nos x8 ft long)	L.ft	72.00
8	Soli gram/ wood preservative	liter	6.00
9	Nails (2")	kg	1.00
B	<u>Foundation to roof Level</u>		
10	4"x2" Coconut Timber Ridge & wall plates (6 nos x 11ft long)	L.ft	66.00
11	4"x2" Coconut Timber vertical support (3 nos. x 5 ft long)	L.ft	15.00
12	4"x2" Coconut Timber Brazing ( 3 nos x 14 ft long)	L.ft	42.00
13	3"x2" Coconut Timber Rafter (14 nos. x 10 ft long)	L.ft	140.00
14	2"x2" Ginisappu Reaper for roof (7 ft x 12 nos)	L.ft	84.00
15	2"x2" Ginisappu Reaper for door frame (3 nos x 6ft long)	L.ft	18.00

16	2"x2" Ginisappu Reaper for wire mesh frame (12 Nos x 6ft long)	L.ft	72.00
17	2"x2" Ginisappu Reaper for wire mesh frame (8 Nos x 7ft long)	L.ft	56.00
18	2"x2" Ginisappu Reaper for wire mesh frame (4nosx 8ft long)	L.ft	32.00
19	2"x1" Ginisappu Reaper for separation frame 6ft long	L.ft	30.00
20	1"x1/2" timber beading for wire mesh frame	L.ft	450.00
21	Nails (4")	kg	1.00
22	Nails (3")	kg	1.50
23	Nails (1")	kg	1.50
24	Cap Nails (1 1/2")	kg	1.00
25	Bolts, Nuts & washer 5" long	Nos	7.00
C	<u>Roof covering and wire mesh covering</u>		
26	0.3mm thk Corrugated Zn-Al Sheet 2.5' width ( 18 nos x 10.5ft long)	L.ft	189.00
27	0.3mm thk Zn-Al Ridge sheet (2 ft width)	L.ft	20.00
28	1/2" x 1/2" welded wire mesh (3' width)	L. ft	150.00
29	Door hinges (4")	Nos	3.00
30	Door lock hinge (4")	Nos	1.00
31	1" Screw	Nos	30.00

# Coop Design Blueprint



## 3C: STAGE 1 – FOUNDATION WORK (1<sup>ST</sup> WEEK)

### Required Materials

Item	Specification and Number/Units
Three foot long timber poles	16
Thin nylon rope	30 yards
Cement	6 Bags
River sand	$\frac{1}{4}$ tractor load
3/4" Metal – Stones/Gravel	$\frac{1}{4}$ tractor load
12" x 6" x 4" Cement blocks	130
2' long Shuttering Planks	36
4" x 3" 8ft long timber posts	8
2" Wire Nails	1kg
Wood Preservatives (Soligrame)	2 litres
Water (Provided by the farmer)	1 Barrel

### Required Tools/ Equipment

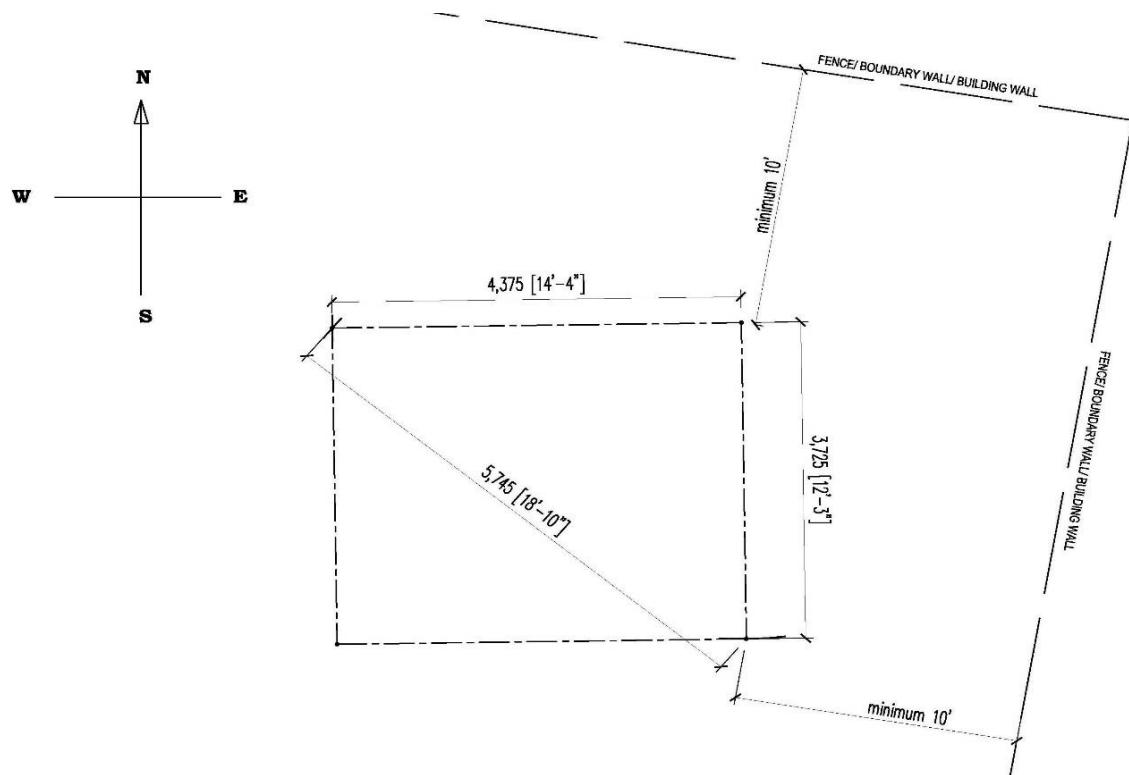
- ✓ Mammyoty
- ✓ Shovel
- ✓ Bucket
- ✓ Trowel
- ✓ Sprit level
- ✓ Hammer
- ✓ Plump–bob
- ✓ Hand saw
- ✓ Measuring tape

### Required Manpower

- ✓ One mason
- ✓ One unskilled labourer

## Instructions for Foundation Construction

<b>Step 1</b>	Use a mammyot to clear the proposed location and make it levelled and flat.
<b>Step 2</b>	Use a compass (or note the direction of the sun rise) to identify the East-West direction. Mark it on the ground with the length of the coop along the line.
<b>Step 3</b>	Tentatively mark the four corners of the coop – with the front facing the East-West direction. Make sure that the shortest distance from the coop wall to any fences and/or buildings is a minimum of ten feet (see Figure 1).



**Figure 1**

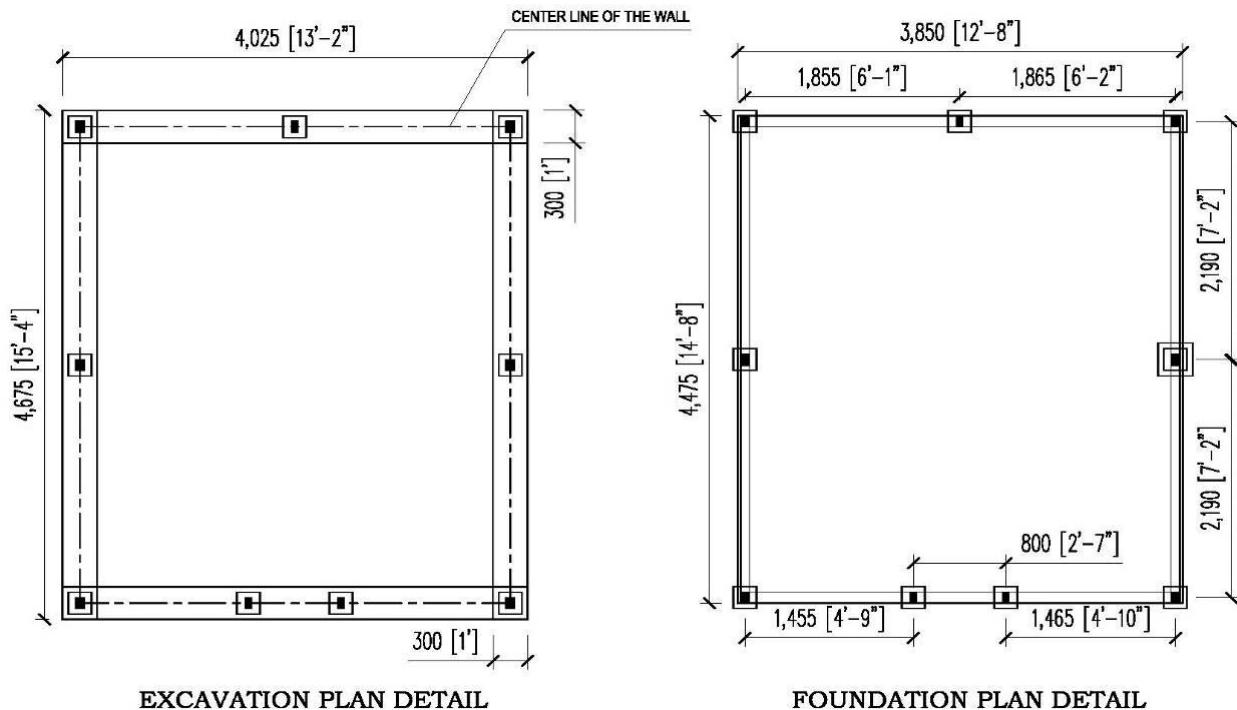


Figure 2

- |               |                                                                                                                                                             |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 4</b> | Draw the setting poles outlining a space with nylon rope (as shown Figures 3 and 4) and mark the centre line of the coop according to the given dimensions. |
| <b>Step 5</b> | Start the excavation. To do the excavation for the wall foundation dig a 12" wide and 9"deep trench under the existing ground level (see Figurer 5).        |
| <b>Step 6</b> | Dig the column post pit as shown in Figure 4. The column posts should have a cross section of 8" x 8" and a depth of 18" from the existing ground level.    |



Figure 3



Figure 4



Figure 5



Figure 6

<b>Step 7</b>	Pour 1:2:4 ratio of cement: sand: metal mixture concrete in 3" thickness as a base. See cement block to concrete mixture foundation as shown in Figure 7.
<b>Step 8</b>	Do four rows of cement block masonry work in 1:4 cement: sand mix mortar as shown in Figure 7 and 8 below, while allowing space for poles.
<b>Step 9</b>	Make a 9' 8" x 8" internal cross section and 2' height column box with the provided shuttering planks
<b>Step 10</b>	Place the column boxes on the column pits vertically and provide adequate side support that will not move during concreting.



**Figure 7**



**Figure 8**

<b>Step 11</b>	Place timber posts vertically (Soligrame should already be applied) in the centre of the column boxes with adequate supports. A height of 6 feet should be kept above the foundation level.
<b>Step 12</b>	Pour 1:2:4 mix concrete (cement: sand: metal) to all 9 column post footings to the proposed foundation level (see Figures 9 and 10).
<b>Step 13</b>	After 24 hours remove the shuttering carefully and water all the footings for a minimum of three times a day for three days.
<b>Step 14</b>	After two days do the hard earth filling and slight compaction inside the building up to the foundation level.



Figure 9



Figure 10

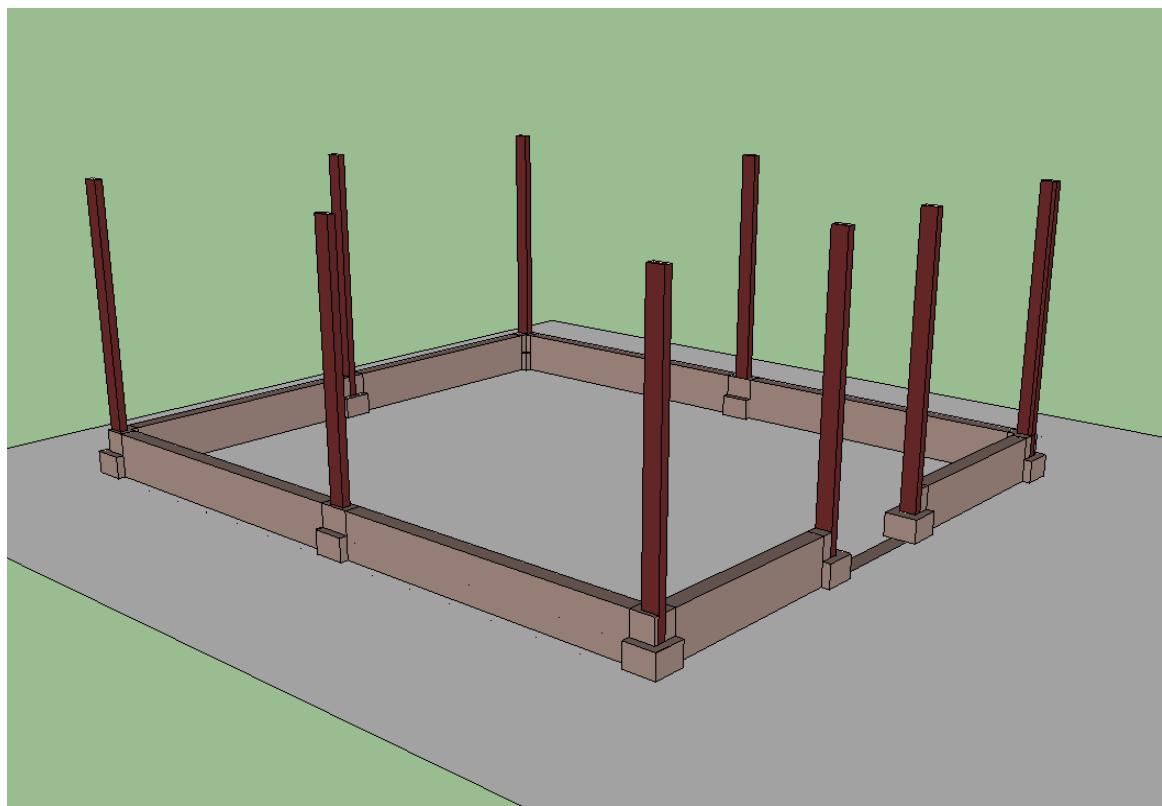


Figure 11

## 3D: STAGE 2 – FRAMEWORK (2ND WEEK)

### Required Materials

Item	Specification and Number/Units
14ft long 4"x2" cross section Coconut Timber	3
11ft long 4"x2" cross section Coconut Timber	6
5ft long 4"x2" cross section Coconut Timber	3
10ft long 3"x2" cross section Coconut Timber	14
7ft long 2"x2" cross section ginisappu Timber	12
6ft long 2"x1" Ginisappu timber reeper	2
4" wire nail	1.5kg
3" wire nail	.5 kg
Soligrame	2 liter
5" long bolt & nuts	7

### Required Tools/ Equipment

- ✓ Sprit level
- ✓ Hammer
- ✓ Hand saw/power saw
- ✓ Measuring tape
- ✓ Drill
- ✓ Chisel
- ✓ Scewrdriver
- ✓ Spanner
- ✓ 2" Brush

### Required Manpower

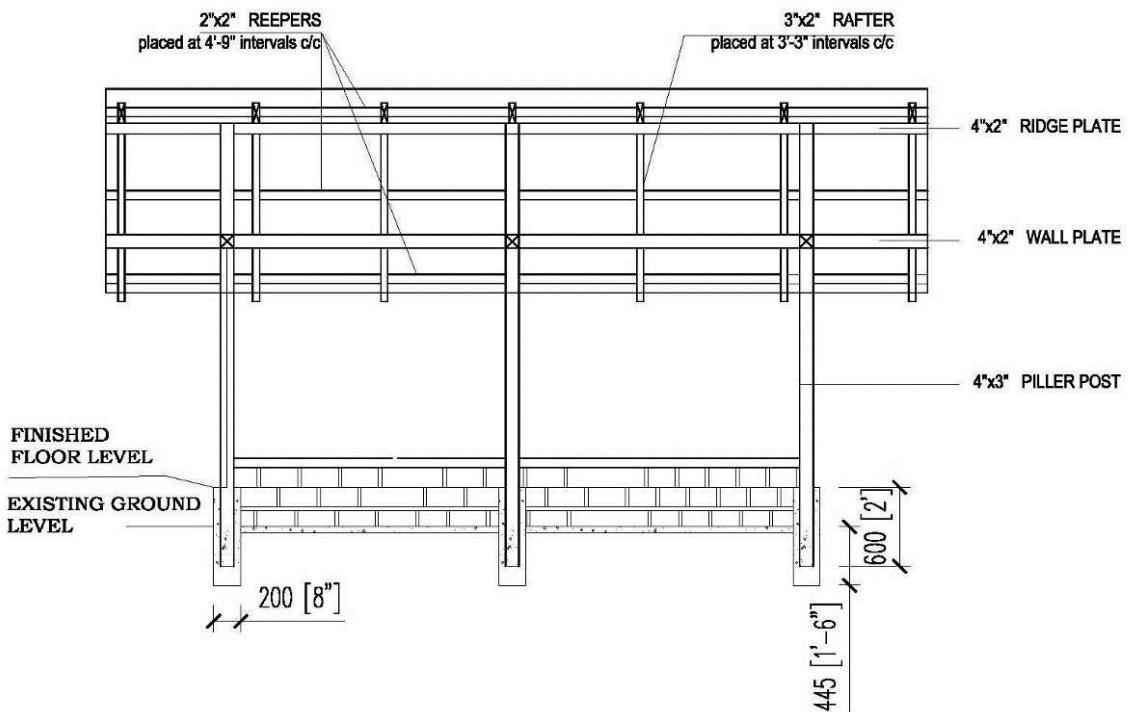
- ✓ One carpenter
- ✓ One unskilled labourer

## Instructions for Frame Construction

<b>Step 1</b>	Separate the timber by size and apply wood preservative (Soligrame) with a brush.
<b>Step 2</b>	Place a 14' long brazing timber on the rear side vertical posts (across 12' wide side, leaving 10" extend to outside from the centre of the vertical posts) and nail with 4' long wire nails. Place the other two 14' long brazing timbers and nail (parallel to the first one) on intermediate and front side posts.
<b>Step 3</b>	Join two 11' long timbers together for ridge plate- making the total length 20' (see Figure 13). Join the other four timbers to each other to make two more 20' long sets for wall plates.
<b>Step 4</b>	Place the joint wall plates along both sides above the brazing plate (see Figure 13) and nail with 4" long nails.
<b>Step 5</b>	Fix the three 5' long timbers vertically on the centre of the brazing timber.



**Figure 12**



**Figure 13:** Sectional side view of the shed building

- |               |                                                                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 6</b> | Place the joint wall plates along both sides above the brazing plate (leaving 2'-10" on both ends from the centre of the corner posts) and nail it (see Figure 13). |
| <b>Step 7</b> | Place and fix the joint ridge plate on top of the centre vertical supports leaving 2'-10" on both ends as per the wall plate.                                       |
| <b>Step 8</b> | Place the 3"x2" sectioned 10' long rafter timber on the ridge plate and wall plate in the interval of 3'-3" c/c (see Figures 15 and 16).                            |
| <b>Step 9</b> | Place and nail the 2"x2" timber reepers above the rafters on both sides with an interval of 4'-9" (see Figures 15 and 16).                                          |

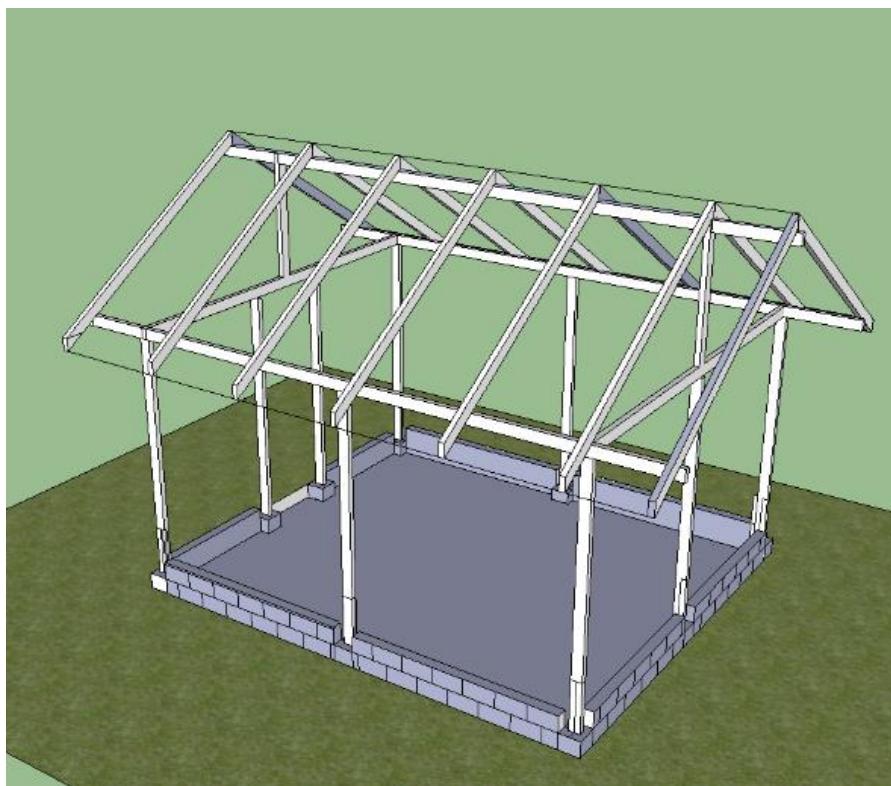


Figure 14



Figure 15



Figure 16

## 3E: STAGE 3 – WIRE MESH, ROOFING, DOOR WORK (3RD WEEK)

### Required Materials

Item	Specification and Number/Units
6ft long 2"x2" cross section Ginisappu Timber	15
7ft long 2"x2" cross section Ginisappu Timber	8
8ft long 2"x2" cross section Ginisappu Timber	4
6ft long 2"x1" cross section Ginisappu Reeper	3
1" x $\frac{1}{2}$ " timber beading	450
10' long roofing sheet	18
2' wide ridge sheet	20 t.
$\frac{1}{2}$ " x $\frac{1}{2}$ " welded mesh	150 .
3" wire nail	1 kg
1" wire nail	1.5kg
Soligrame	2 liters
Door hinges	3
Door lock hinges	1
1" screw	20

### Required Tools/ Equipment

- ✓ Hammer
- ✓ Hand saw/power saw
- ✓ Measuring tape
- ✓ Drill
- ✓ Chisel
- ✓ Screwdriver
- ✓ Spanner
- ✓ 2" Brush

### Required Manpower

- ✓ One carpenter
- ✓ One mason
- ✓ One unskilled labourer

## Instructions for Wire Mesh, Roofing and Door Work Construction

<b>Step 1</b>	Separate the timber by size and apply wood preservative (Soligrame) with a brush.
<b>Step 2</b>	Fix two rows of 7' long 2"x2" timber reepers to the long side of the coop – one row above the cement block work and another 3 feet above the first one. Fix two rows of 6' long timber to the rear and front sides without covering the door opening.
<b>Step 3</b>	Roll the wire mesh (with 3" overlap) around the shed and nail it with 1"x1/2" timber beading to the timber frame without covering the door opening. Correctly cut and cover the cable area on both sides (triangle area) with mesh as shown.
<b>Step 4</b>	Place the roofing sheet above the roof framework and nail it with the cap nail to 2"x2" reapers.
<b>Step 5</b>	Cover the ridge with the 2' wide ridging sheet and nail it with cap nails to the reapers.



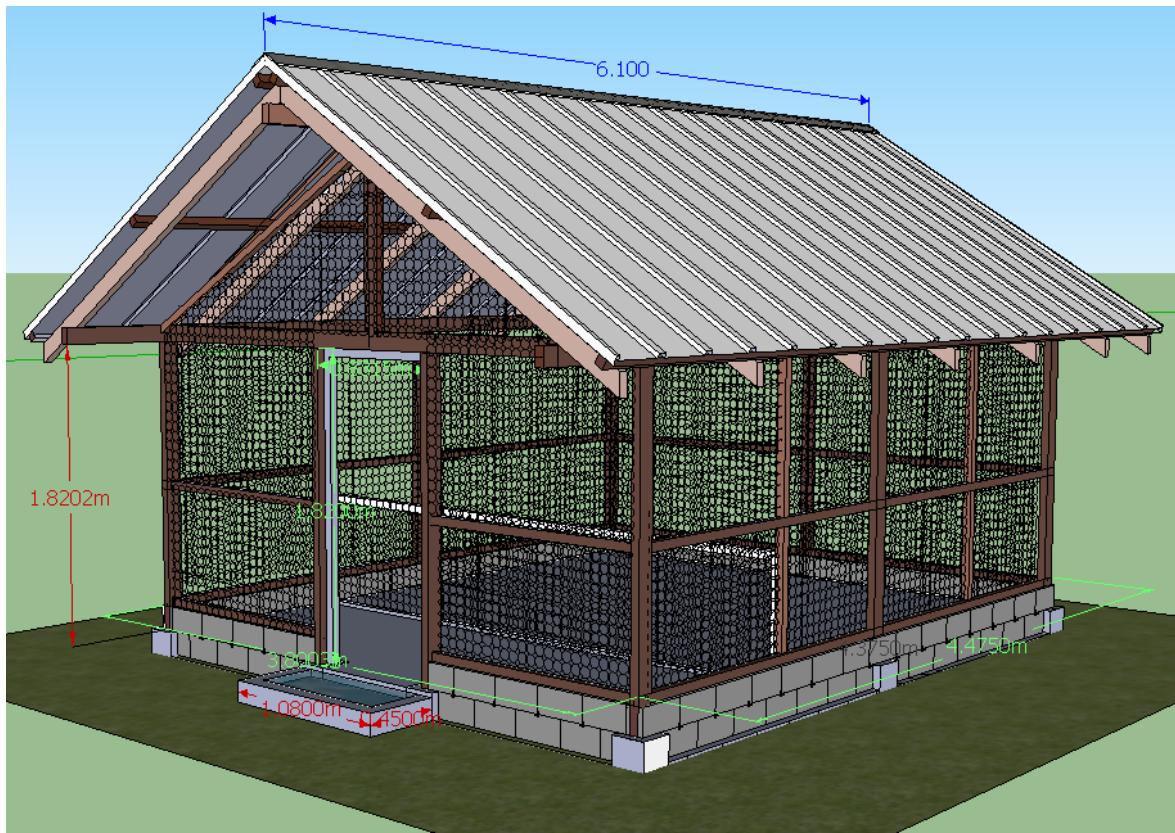
Figure 17



Figure 18



Figure 19



**Figure 20**

- |               |                                                                                                                                                                                                  |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 6</b> | Make the 2'-6" width and 6'-0" height door frame with 2"x2" timber as per the drawing. Then cover it with wire mesh. Place three hinges and door hook hinges and fix it to the shed with screws. |
| <b>Step 7</b> | Make the 12' long and 2'-6" separation wall with a 2"x2" timber frame and cover it with wire mesh.                                                                                               |
| <b>Step 8</b> | Construct 1'-6" x 3'-0" and 3" deep foot wash bath in front of the entrance (see Figure 20).                                                                                                     |

Completed 100 bird poultry coop

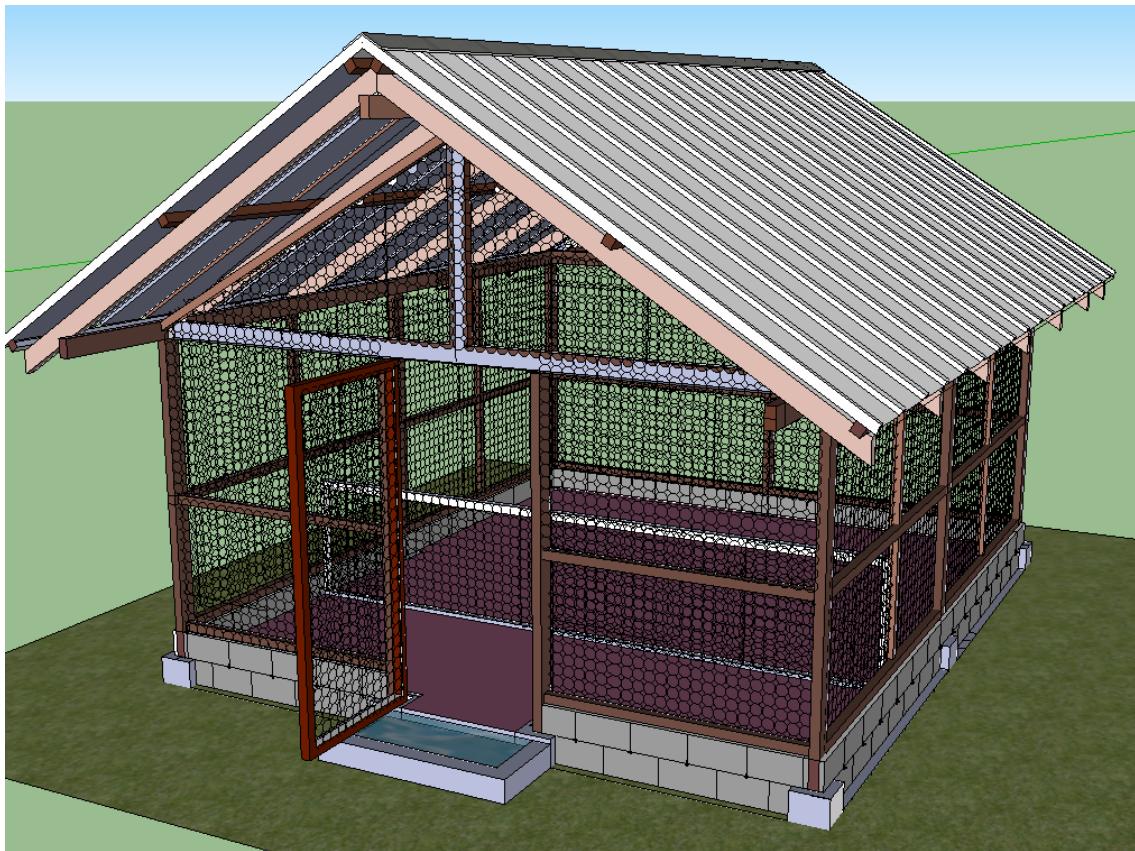


Figure 21

## 3F: EQUIPMENT REQUIRED FOR A 100 BIRD POULTRY COOP

Item	Description	
<b>Brooders</b>		
Brooder guards	Two 8'x 1'6" galvanized sheets could be used for this purpose. They are propped up and clipped using a wire clip or a tender tree branch split in the middle.	
Hover	This is a galvanized umbrella like structure with three bulb holders. The hover and the electric bulbs is used as the heat source.	
Standard electric bulbs	Three 40w bulbs are used for heating the brooder.	
CFL Bulb	One 11 watt CFL bulb is used as the light source in the brooder.	
Paddy husks	Two gunny bags of paddy husks for the litter material.	
Old newspaper	Ten sheets of old paper are laid over litter on the first three days to prevent young chicks from picking up the litter. It is also used to introduce the first feed to the chicks.	
<b>Feeders</b>		
Two chick feed boosters	Using chick feed boosters (CFB) during the brooding stage minimizes feed wastage and contamination. Unlike the chick tray the CFB design prevents the chicks from stepping on the feed, soiling and digging into it. Each can hold up to 3 kg of feed.  <b>Installation recommendation:</b> Two chick feed boosters are placed in the brooder floor to feed 100 chicks. CFB's are placed on the floor of the brooder. After the brooding stage the CFB's are	

Three 5kg manual feeders	<p>removed and three 5kg manual feeders are introduced for 100 birds. They are suspended from the ceiling. The height adjuster should be added to each feeder.</p> <p>Manual feeders are recommended for the proposed broiler coop. The feeders are adjustable to allow for sufficient feed volume with minimal wastage. Feed distribution and the proximity of the feeder to the birds is essential for achieving target feed consumption rates and FCR. If the feeder space is insufficient growth rate will be reduced and flock uniformity will be severely affected.</p>
<b>Drinkers</b>	
Two 4.5 litre drinkers	<p>Consistently available clean, cool and fresh drinking water is essential for good broiler production. Without adequate water intake feed consumption will decline thus effecting flock performance.</p> <p>In the proposed house manual or automatic bell type drinkers could be used. This is called an <b>open drinking system</b>. Though this system is cost effective it requires very good management, without which, problems associated with litter quality, carcass condemnations and water hygiene could be prevalent thus adversely affecting flock performance. Damp litter under the drinkers is an indication that they are set too low. If stock sense is not practiced maintaining water purity would be difficult as birds will introduce contaminants. Daily cleaning and height adjustment are essential when using this system.</p>
Three 9 litre drinkers	<p><b>Installation recommendation:</b> Two 4.5 litre drinkers per 100 chicks is recommended during brooding. After brooding, three nine litre drinkers are provided for 100 birds. They should be suspended from the ceiling. Height adjuster should be added to each suspended drinker.</p>

Disinfectant	Disinfectants used should be safe on the flock and on humans. Quaternary ammonium compounds such as ‘Omnicide”, used at the rate of 3ml per litre of water, is recommended for the purpose. It is available in 50ml containers.
One pressure spray can	Small capacity cans (1.5l) are economically available for the purpose
<b>Miscellaneous</b>	
One reel of Nylon string (medium)	Used to suspend manual drinkers and feeders
Six ‘S’ – hooks	Used to hang the feeders and drinkers on the nylon string
Six adjusters	Used to adjust height of feeders and drinkers as flock growth progresses
Two plastic buckets (large)	For carrying feed into the feeders, washing of drinkers
One hand brush (Nylon)	To remove dust and cob webs from mesh
One ekel broom	To sweep around the coop
One cob web cleaner	For picking cob webs from ceiling
One shovel .	For removal of used litter
One mammoty	To loosen hardened litter, removal of wet litter
One rake	To rake litter once in 4 days
One empty 5 l oil can	Split in the middle it could be used as a feet disinfectant container. Placed at the coop entrance.
One detergent/ soap	For washing drinkers and feeders
Two sponges	For washing drinkers and feeders
Two plastic scrubbers	For washing drinkers and feeders

# **4: MODULE FOUR: POULTRY BUSINESS BASICS**

Modules one through three have focused on the technical aspects of raising broilers, but in order to be an effective poultry operator a sound understanding of business basics is essential. Becoming a profitable, sustainable poultry business operator requires the ability to manage logistics, identify and build good and effective relationships with suppliers and buyers, and have the ability to manage finances. Module four will provide an overview of basic business principles relevant to a commercial poultry operator.

## 4A. OVERVIEW OF BUSINESS TERMS AND PRINCIPLES

Business	An organization that operates with the intention of making a profit
Entrepreneur	Someone who organizes, manages and takes on the calculated risk of starting a new business
Product	Something produced or manufactured to be sold – a good
Service	Work done for pay, that benefits another
Client	A regular customer that receives a service
Supplier	An organization that provides supplies to a business
Buyer	A person who contracts to acquire an asset in return for some form of consideration

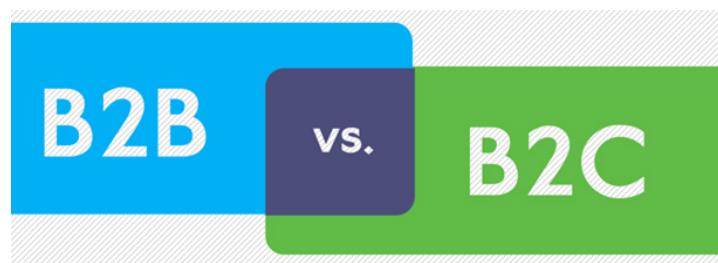
A profitable, sustainable broiler business operator must have the ability to:

- ✓ Manage logistics ( delivery of inputs, transport of harvest)
- ✓ Identify and build good, effective relationships with suppliers and buyers
- ✓ Manage operations and finances

### Points of Sales

In order to make a profit in the broiler industry a customer must be identified and secured. There are two basic customer divisions for all businesses:

1. Business to Business (B2B) – One business sells goods or services to another business.
2. Business to Consumer (B2C) – A business sells goods or services directly to the end user.



## The Basics of Financial Management

Finance is the management and allocation of money and other assets.

Key financial terms include:

Assets	The value of everything a company owns and uses to conduct their business.
Liabilities	The value of what a business owes to someone else.
Expenses	Money spent on supplies, equipment or other investments.
Fixed Cost	A one-time expense that doesn't vary with business volume. A fixed cost is a cost that does not change with increases or decreases in the volume of goods or services that are produced by your company. These costs are obviously the easiest to predict and plan for. Rent, salaries, and utilities all usually fall into this category.
Variable Cost	Expenses that change in proportion to the activity of a business. Variable costs are just the opposite of fixed costs. They can vary depending on what a company is producing and its demand, and as a result variable costs are much harder to forecast.
Revenue	The entire amount of income before expenses are subtracted.
Net Income/Profit	Revenues minus expenses.
Break-Even	The point at which sales revenues equal expenses.
Payback Period	The amount of time it takes to recover the initial investment of a business.
Return on Investment (ROI)	How much money a business gets in return from an investment.
Working capital	A financial metric which represents operating liquidity (funds on hand) available to a business or organization.
Accounting	A system that provides quantitative information about finances.

Management	The act of organizing and conducting a business to accomplish goals and objectives.
Capital Expenditures	Items purchased by your business that create future benefits.
Reinvestment	Using profits from the business and investing them back into the business in order to increase the value and future return (profit) of the business.

People running successful businesses are regularly faced with the decision of what to do with the cash earnings. At the most basic level, there are two possibilities:

1. Reinvestment: Retaining the cash and investing it with the aim of increasing the value of the business.
2. Save or spend the funds on other costs.

### Benefits of Working as Part of a Collective Organization or Buy Back System

- ✓ **Economies of Scale:** Economies of scale are the cost advantages that enterprises obtain due to size, output, or scale of operation – with cost per unit of output generally decreasing with increasing scale, as fixed costs are spread out over more units of output.
- ✓ **Strategic Alliance:** A Strategic Alliance is a cooperation between two or more people or businesses that benefits both parties.
- ✓ **Target Market:** A specific group of customers at which a company aims its products and services.
- ✓ **Marketing:** The process of promoting, selling and distributing a product or service.

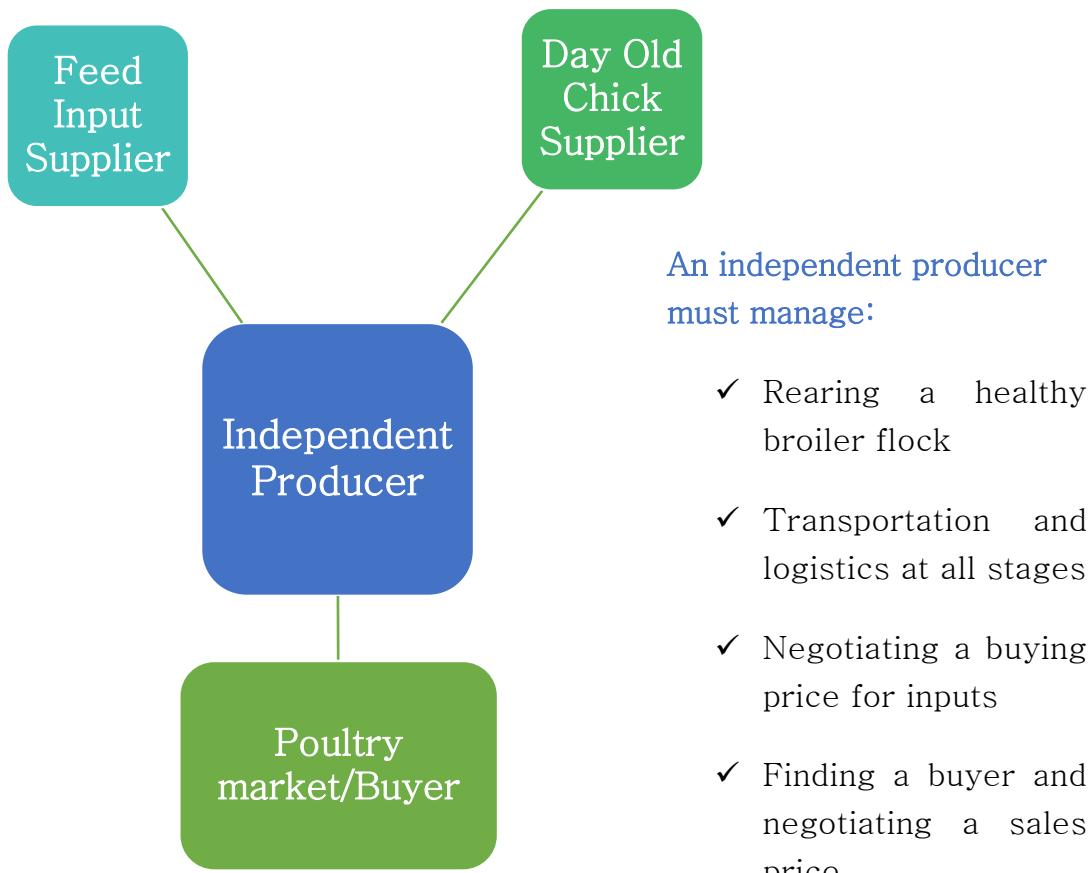
## 4B: POTENTIAL BROILER BUSINESS MODELS

There are five basic types of business models poultry farmers can choose from once they get their operations up and running.

1. Independent Producer
2. Buying assurance only by wholesaler – No inputs provided
3. Buy back by supporting grower/farmer through input supply and buying back
4. Working Collectively – CBBL Model
5. SOLID Model

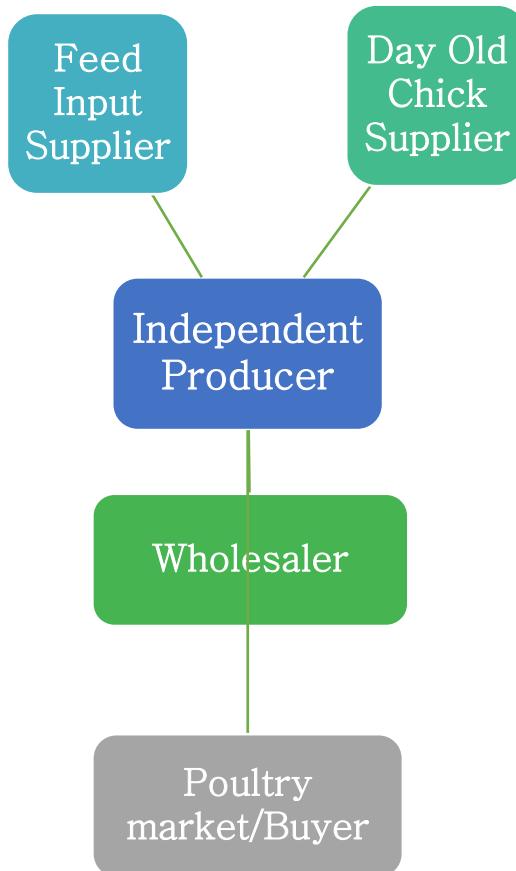
There are advantages and disadvantages to each model. It is up to each farmer to select which option works best for them.

### Independent Producer:



## Wholesaler/ Middleman System

(Buying assurance only – no inputs provided)



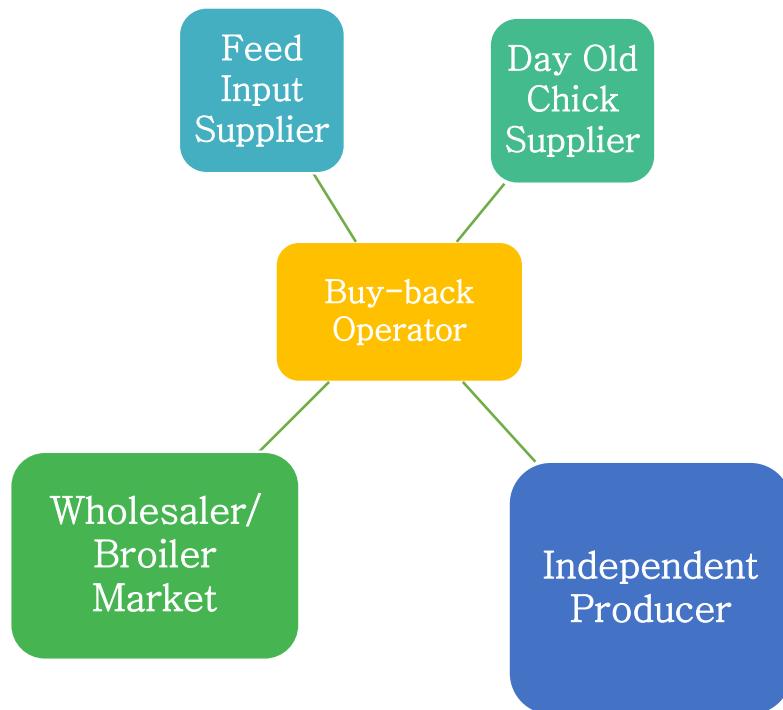
Under this system an independent farmer must manage:

- ✓ Rearing a healthy broiler flock
- ✓ Transportation and logistics for inputs
- ✓ Negotiating a buying price for inputs

The wholesaler/middleman must manage:

- ✓ Finding a buyer and negotiating a sale price
- ✓ Transport and sales logistics

## Buy-Back System (Input supply and buy-back)



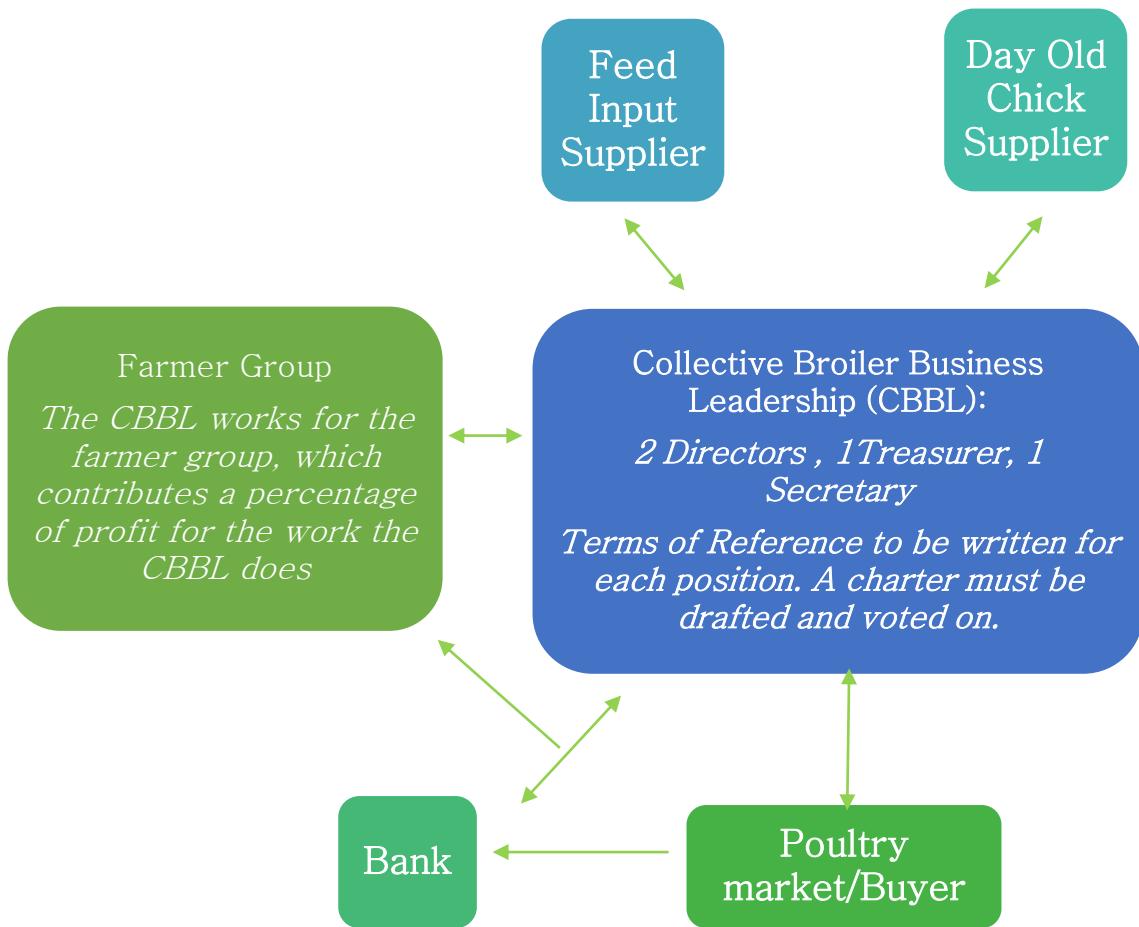
Under this system an independent farmer must manage:

- ✓ Rearing a healthy broiler flock

The buy-back operator must manage:

- ✓ Negotiating a price for inputs
- ✓ Organizing transport and logistics for inputs
- ✓ Finding a buyer and negotiating a sale price
- ✓ Transport and sales logistics

## Farmer Run Collective Business Model



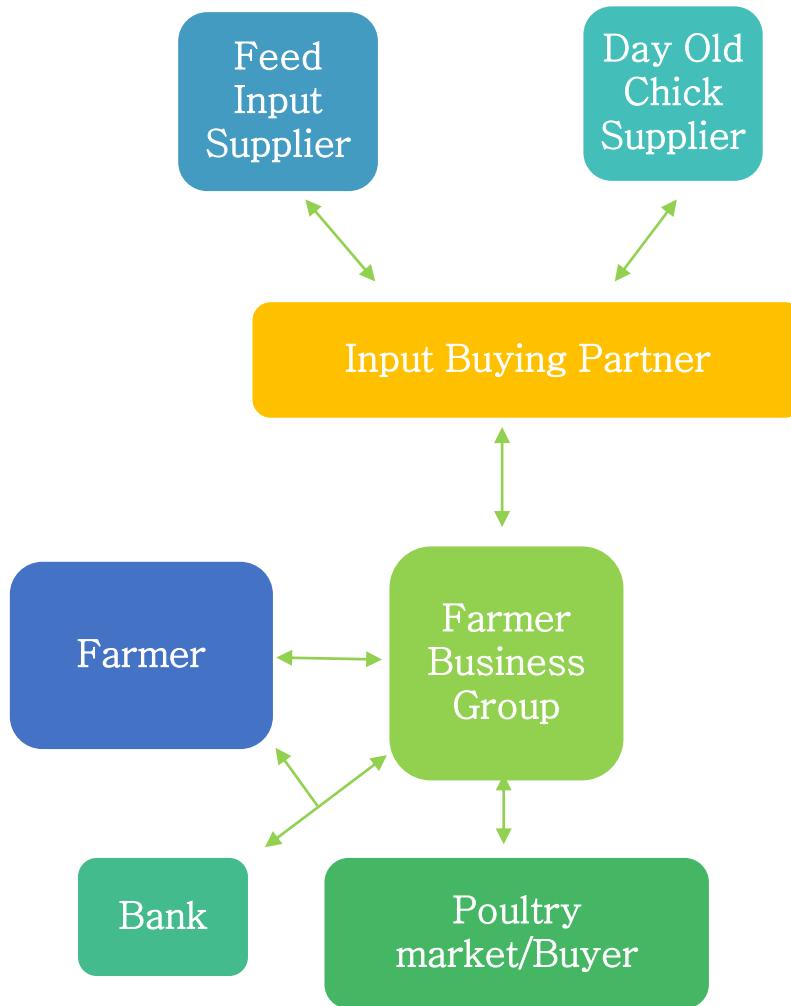
Under this system an independent farmer must manage:

- ✓ Rearing a healthy broiler flock

The collective broiler business operation must manage:

- ✓ Negotiating and buying inputs
- ✓ Organizing transport and logistics for inputs
- ✓ Finding a buyer and negotiating a sale price
- ✓ Transport and sales logistics

## The SOLID Model



Under this system an independent farmer must manage:

- ✓ Rearing a healthy broiler flock

The Input Buying Partner must manage:

- ✓ Negotiating and buying inputs
- ✓ Organizing transport and logistics for inputs

The Farmer Business Group must manage:

- ✓ Finding a buyer and negotiating a sale price
- ✓ Transport and sales logistics

When examining all of the business modules it is important to understand that amount of work that is required to take on all the tasks to run a broiler operation. In some situations the amount of work can be overwhelming such as an independent producer. In other situations the amount of work is limited to only focusing on rearing a healthy broiler flock, such as in the buy-back model, but the amount of profit is also generally less – the business or individuals supporting the operation need to be paid or take a piece of the profit for their contribution. Thus it is important for broiler operators to find a business model that provide the right balance allowing them to focus on the aspects of the operation which are the most important (generally rearing a healthy flock), but also allow them to maximize efficiency and profit.

# **5: MODULE FIVE: BROILER MANAGEMENT SUPPORT TOOLS**

Modules one through four of this manual have addressed several key topics relevant to broiler producers. This final module will provide an overview of the information covered under the Broiler Management Training Program and will supplement the information provided throughout this program by presenting several useful and practical support tools that will help broiler producers to put this knowledge into practical application.

## 5A. Weekly Space Requirement per Bird

Weeks	Required Space (Square Feet)
One	0.25
Two	0.40
Three	0.50
Four	1.2
Five	1.2
Six	1.2

## 5B. The Recommended Temperature Profile

Weeks	Temp. °C
One	35
Two	33
Three	29
Four	28
Five	27
Six	27

## 5C. How to Interpret chick behaviour

Huddled up and chirping	Too cold
Crowding around the edges	Too warm
Dispersed evenly within the circle	Just right

## 5D. Lighting Program

Age (Days)	Light Dark (Hours)
0	0
1 to 5	1
6 to 11	6
12 to 35	4
36 ,37	8
38,39	2
40	1

## 5E. Feed Type According to Bird Age

No.	Day	Broiler Feed Type	Bag size KG	Number of Bags
1.	0 to 13	Booster	50	1
2.	14 to 24	Starter /Grower	50	2
3.	25 to market	Finisher	50	4

## 5F. Suggested Transition from One Feed Type to Another

Day	Type of Feed		
	Broiler booster	Broiler starter /grower	Broiler finisher
0 to 10	100%		
11 to 13	50%	50%	
14 to 22		100%	
23 to 24		50%	50%
25 to 40			100%

## 5G. Suggested Transition from One Feed Type to Another

	Energy (MJ/Kg)	Crude Protein %
Pre starter	12.65	22.25
Starter	13.2	21.23
Finisher	13.4	19.23

## 5H. Broiler Performance

Age (days)	Mortality	Feed (g)		Body weight (g)	FCR
		Per day	Cum		
1		12	12	54	
2		15	27	67	0.40
3		19	46	87	0.53
4		23	69	110	0.63
5		27	96	134	0.72
6		32	128	166	0.77
7	(0.41%)	37	165	192	0.86
8		44	209	225	0.93
9		48	257	261	0.98
10		53	310	301	1.03
11		60	370	350	1.06
12		64	434	400	1.09
13		69	503	457	1.10
14	(0.90%)	73	576	519	1.11
15		78	654	579	1.13
16		82	736	650	1.13
17		85	821	720	1.14
18		89	910	792	1.15
19		93	1003	867	1.16
20		97	1100	944	1.17
21	(1.36%)	103	1203	1023	1.18
22		112	1315	1086	1.21
23		116	1431	1149	1.25
24		122	1553	1212	1.28
25		126	1679	1275	1.32
26		128	1807	1339	1.35
27		130	1937	1403	1.38
28	(1.80%)	132	2069	1466	1.41
29		132	2201	1535	1.43
30		132	2333	1605	1.45
31		132	2465	1674	1.47
32		132	2597	1743	1.49
33		133	2730	1812	1.51

34		133	2863	1882	1.52
35	(2.47%)	133	2996	1951	1.54
36	(2.55%)	135	3131	2015	1.55
38		135	3266	2093	1.56
39		135	3401	2161	1.57
40	(3.0%)	135	3536	2225	1.59

## 5I. General Broiler Vaccinations, Application and Timing

This is only a guideline. For information on prevalent diseases contact the Govt. Veterinary Surgeon in the area.

Timing	Name	Use
Day 1	Infectious bronchitis	Beak dip, eye drop or drinking water
Day 7	New castle diseases B1	Eye drop or Drinking water
Day 11	Infectious bursal disease / Gumboro	Eye drop or Drinking water
Day 22	Infectious bursal disease / Gumboro	Drinking water

## 5J. Prevalent diseases and their symptoms

List of common diseases prevalent in Sri Lanka (this is not a comprehensive list).

Category of Disease	Examples	Common symptoms	Remarks
Bacterial	E.coli	Poor growth, diarrhoea	Treatable with antibiotics
	Mycoplasma	Poor growth, rales	
	Salmonella	High mortality	
	Clostridium	Poor growth, wet litter	
Viral	Infectious bronchitis (IB),	Rales, poor growth	Untreatable. Preventable with vaccines
	Gumboro (IBD)	High mortality 10 to 12%	
	Ranikhet (NCD)	High mortality , even 100%	
Protozoan	Coccidiosis	Moderate mortality, poor growth	Treatable with anti-protozoan drugs
	Leukocytozoonosis	Moderate mortality	

## 5K. Weekly Management and Performance

Week	PERFORMANCE										
	Space Requirement (sqft/bird)	Temperature (°C)	Chick feed booster (3kg Nos.)	Feeder (5kg Nos.)	Chick Drinker(One litre) -Nos.	Drinker (9 litre) -Nos.	Feed Intake - grams	Water Intake - ml	Average live weight (g)	Feed conversion ratio	Mort.% Cum.
1	0.25	35	02	-	03	-	170	340	160-200	0.98 to 0.86	0.5
2	0.40	33	-	03	-	03	440	880	367-406	1.2 to 1.08	1.0
3	0.50	29	-	-	-	-	840	168	675-731	1.39 to 1.29	1.4
4	1.2	28	-	-	-	-	1627	325	1063-1150	1.53 to 1.41	2.6
5	1.2	27	-	-	-	-	2550	510	1520-1626	1.68 to 1.57	3.5
6	1.2	27	-	-	-	-	3634	726	1980-2105	1.85 to 1.73	4.0

## 5L. Broiler Pen / Batch Card

Broiler Batch Card						
Batch No				Hatchery		
Input Date.				Breed		
Dead on arrival				DOC Weight (g)		
				Feed		
Date	Age Days	Number of birds		Mortalit y	Feed	Average Live Weight
	0					
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	.					
	.					
	42					

Summary					
Total sold			<u>PROFIT LOSS statement:</u>		
Culls			Gross income:		
Rs./ live kg			Total Expenditure:		
% of mortality			Nett profit:		
Feed conversion Ratio :					
Total Feed/ Total weight = FCR					

## 5M. Broiler Budget

Batch No.\_\_\_\_\_

<i>Expenses and Direct Costs</i>	<i>Rs.</i>
<b>A. DIRECT COSTS</b>	
Chickens (____ Birds x Rs.____ per DOC)	
Feed : Booster :        bags @ Rs.	
Starter :        bags@ Rs.	
Finisher:        Bags@Rs.	
SUB TOTAL	
<b>B. INDIRECT COSTS</b>	
Heating cost	
Medicine, vaccines, disinfectants	
Litter	
Electricity	
Transport Total	
Miscellaneous costs (5%)	
SUB TOTAL	
<b>C. (A+B)                          TOTAL COST Rs.</b>	
<b>D. GROSS INCOME</b>	
____ Kg live weight sold @ Rs.____ per Kg    Rs.	
<b>E. NET. INCOME / PROFIT = D - C</b>	

