

POULTRY KEEPING AND MANAGEMENT

A Flexible Learning Course



Acknowledgements

Course Team

This course was drafted at a COL workshop in Nairobi, Kenya in October 2013. The participants worked with Professor Fred Lockwood to test the rapid course development model. Subsequent work was done on the materials by the team leader.

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Course Overview

Introduction

Welcome to our course on poultry keeping. Poultry keeping is one of the most popular forms of businesses among small-scale farmers. This is because poultry requires little capital, is easy to rear and easy to manage. Poultry keeping thus provides farmers with a great opportunity to start an income generating activity. The aim of this course is to provide you with all the knowledge and skills you need to raise poultry for meat and eggs and manage a small-scale commercial poultry business. This main target group of this course is farmers who are interested in starting a poultry business. However, extension workers and other stakeholders who are interested in working with small-scale poultry farmers will also benefit. There are many types of poultry but in this course we shall concentrate on chicken. We will start by looking at the economics of poultry production so that you can make an informed decision about the viability of this business before you start. Then we shall discuss various important aspects of poultry farming, such as, poultry housing, types of chicken breeds, brooding, feed management, health management, and poultry production and marketing.



Course Objectives

By the end of this course you should be able to:

- Explain the economic importance of poultry farming
- Determine the best housing design for your poultry project
- Identify a suitable breed for your poultry project
- Determine the best poultry management system to use for your project
- Formulate feed rations based on the nutrient requirements of your chicken
- Implement routine poultry management practices such as, poultry hygiene, debeaking, pasting and detoeing;
- Identify poultry diseases and take the necessary control measures
- Prepare your poultry products for the market and record all your activities.



Course Content

This course is divided into the following 9 units:

- Unit 1: Introduction to Poultry Keeping
- Unit 2: Poultry Housing
- Unit 3: Breeds of Poultry
- Unit 4: Poultry management systems
- Unit 5: Feed management
- Unit 6: Routine poultry management practices
- Unit 7: Health management
- Unit 8: Poultry products and marketing

To help you acquire the skills you need to be a good poultry farmer, you will be expected to attend demonstration seminars which will be held at the Thika Training

Institute's model farm.

Icons Used in the Units

In the margin of these units, you will find the following icons which tell you what to do:



Read the objectives of the unit.



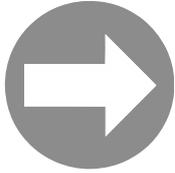
Complete the Activity. Activities help you to process and apply what you are learning.



Read the summary of what you have covered in the unit.



Take note of an important point.



Unit 1

Introduction to Poultry Keeping

Welcome to the first unit in our course on poultry farming. In this unit you learn about the advantages and disadvantages of poultry farming, the economics of poultry keeping and what motivates farmers to keep poultry. We shall also give you a summary of the cost of poultry production to help you assess if the business is profitable.

Let us start by reviewing our objectives for this unit.



Unit Objectives

By the end of this unit you should be able to:

- Explain the advantages and disadvantages of poultry keeping.
- Assess the viability of your poultry business.

Section 1.1: Advantages and Disadvantages of Poultry Keeping.

As you well know, poultry is kept in many rural and peri-urban homes in Kenya either for domestic or commercial purposes. In this section we shall discuss the advantages and disadvantages of poultry keeping.

A pedicure on the other hand, is a beauty treatment for improving the condition and appearance of the feet and toenails. A standard pedicure starts with sanitizing the feet. This is followed by filing and/or cutting the toenails, and soaking the feet in warm, soapy water to which an antiseptic is added. Once the feet are softened, the therapist then proceeds to scrub any areas of the foot which has hardened, rough skin. Under the nail is cleaned and cuticles are gently pushed back. Nail polish is then applied to the toenails.

Advantages of Poultry Keeping

What are the advantages of poultry keeping? Think about it for a minute and then complete the following activity.



Activity 1.1

Advantages of Poultry Keeping (Time: 5 mins)

Write down at least 3 advantages of poultry keeping?

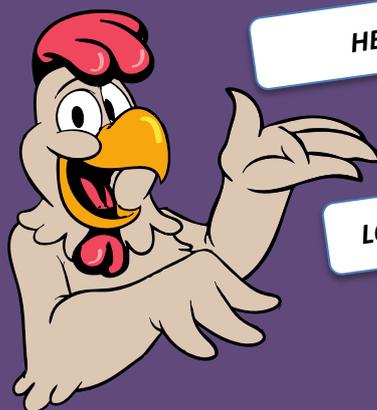
1. _____
2. _____
3. _____

We believe your list included the following advantages of poultry keeping:

- Chicken can be reared in a small space
- The stocks needed to start a chicken business are readily available
- Chicken can be reared throughout the year
- The returns on investment take a shorter time
- Many people prefer to eat chicken compared to other sources of protein
- Chicken feed on by-products such as, maize germ, maize bran, sunflower seed cake, wheat bran and wheat pollard
- Market for chicken meat is wide and lucrative
- Growing customer base does not require advertisement **CHOLESTORAL**

TAKE NOTE

Advantage of Chicken Meat



HEALTHY

LOW IN FAT

LOW IN CHOLESTEROL

HIGH IN PROTEIN

You now know the advantages of poultry keeping; let us look at the disadvantages.

Disadvantages of Poultry Keeping

The disadvantages of poultry are not many and include the following:

- Some chicken diseases can affect humans
- Chicken can die of preventable diseases like New Castle, Gumboro, Fowl Typhoid, Cholera and Cholera Pox
- If not well protected, chicken can be eaten by a host of predators, like mongoose, eagles, cats and snakes

As you can see, the disadvantages of chicken are not so serious because they can all be prevented. In the next section we shall discuss the economics of poultry keeping.

Section 1.2: Economics of Poultry Keeping

Before you start a poultry business, it is important to find out if it makes economic sense. In this section we shall look at the economic value of chicken and how to cost your poultry project.

Economic Value of Poultry

A poultry business provides an important supplement to income from crops and livestock. Poultry farming helps to reduce overdependence on traditional commodities whose prices are not stable. Before you continue reading, complete the following activity.



Activity 1.3

Economic Value of Poultry (Time: 20 mins)

A. Write three reasons why chicken keeping is an important economic activity.

1. _____
2. _____
3. _____

B. Use the space provided below to write down one compelling reason why you are interested in chicken farming.

Compare your answers with the information given in the following section.

The economic value of poultry is one of the reasons why farmers take an interest in poultry farming. The following is the economic value of poultry keeping:

- Provides income from the sale of chicks, meat and fertilized and unfertilized eggs;
- The feathers are used to make stuffing for pillows mattresses and quilts
- It supplement other incomes from livestock and crops
- Poultry droppings are used as livestock (ruminant) feed, as it is a rich source of non-protein nitrogen and provides protein
- Poultry manure increase soil fertility and can be sold as fertilizer
- Poultry droppings make excellent slurry for biogas production plants
- The by-products of a hatchery are used to make livestock protein supplements.
- It can generate foreign exchange earnings through the export of poultry products
- Used for recreation and also in poultry competitions and shows. In some communities they are kept for their crowing ability.
- Use in special festivals, traditional ceremonies, as a gifts, and in traditional medicine.

We hope you now appreciate the economic value of poultry. Let us now estimate the cost of poultry production so that you can determine its profitability.

Economics of Poultry Production

Before you start a poultry business, it is important to determine whether it is profitable and sustainable. There are two costs of production that you should take into consideration. These are:

- Fixed costs
- Variable costs

Your profits will be greatest if you are able to keep your variable costs to a minimum. Let us look at each type of cost in further detail.

Fixed costs

These are the costs that remain constant throughout the management of one flock. These include the following:

- Cost of day – old chicks (approximately 12%)
- Housing depreciation
- Depreciation of equipment
- Depreciation of birds (laying birds) this does not apply to broilers.
- Miscellaneous e.g. insurance of building and equipment

Variable costs

These are those costs that vary depending on the number of chicken you have. They include the following:

- Feed costs – is the major item that takes 73% or over
- Labour cost – 7%
- Mortality – 5% throughout the growing period
- Fuel for brooding and litter – 2%
- Veterinary and pharmaceutical costs – 3%
- Transport and marketing costs – 10%

To help you understand how to calculate the profitability of your poultry project, we have worked out the production cost of 100 layers in Table 1.1 below.

Table 1.1: Estimated cost of 100 layer birds

APPENDIX III: ESTIMATE COST OF 100 LAYER BIRDS		
ITEM	QUANTITY	COST (Kshs)
Cost of Chicks	@ Ksh 100	10,000
Day 1 (vitamins + antibiotics + liquid + glucose)		800
Feeds		
Day 1 - 8wks. Feed with CHICK MASH	1 chick takes 2kg for 8wks (2kg x 100) = 200kg = 3 bags	9450
9 th wk - 18 th wks. Feed with GROWER MASH	Average feed intake is 7kg for 2.5 months 7kg x 100 = 700kg/70 = 10bags A bag costs ksh 2650 = 10 x 2650	26,500
From 18 th week Feed with LAYERS MASH	1 bird takes an average of 150g/day = 100 x 150 = 15kg/day For the birds to feed themselves we give them an allowance of 1 month. If 15kg /day, 1 week = 15 x 7 = 105kg/70 = 1.5bags per week For 1 month = 1.5 x 4 = 6 bags x 2850	17,100
Vaccines		
Day 1 Gumboro	380	3,040
Day 7 Gumboro	380	
Day 14 Gumboro	380	
Day 21 NCD + 1B	350	
Day 28 Gumboro	380	
Day 35 NCD + 1B	350	
8 – 10 weeks Fowl pox	420	
F/Typhoid	400	

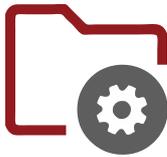
Miscellaneous {Estimates}

Feeders		
Waterers		
Wood shavings		10,000
Source of heat		
Labour		
Vitamins & drugs		
TOTAL COST FOR 100 LAYERS		76,890

In addition to costing your project you should keep the following points in mind:

- To succeed in poultry farming you must make decisions based on sound economic principles.
- To achieve a good profit in layers each bird should produce 200-220 egg per year.
- In both broiler and egg production you should keep the mortality of birds as low as possible.
- You should organize and manage your labour well in order to achieve the highest possible income returns.

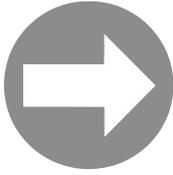
You have now come to the end of this introductory unit. We hope you now understand the advantages, disadvantages and economic value of chicken farming.



Unit Summary

In this unit we have learnt that poultry keeping has many advantages. We saw that poultry keeping is requires a low investment, does not require a big space and has good returns on investment. We also considered the disadvantages of poultry keeping which included the risk of diseases and predators. Lastly, we looked at the economic value of chicken farming and noted that it includes income from the eggs, meat, feathers and chicken droppings, among others. We also looked at the costing of a chicken project.

In the next unit we shall discuss poultry housing.



Unit 2

Poultry Housing

Introduction

Poultry housing is a very important part of your poultry farm as it protects the birds from predators and rough weather conditions. A comfortable poultry house is also important for efficient production and convenience of the poultry farmer. In the last unit you learnt about the advantages, disadvantages and economic value of poultry keeping. In this unit you will learn the requirements of a good poultry house, how to identify a suitable location for a poultry house, and the different types of poultry house systems that you can adopt. As usual, we shall start by reviewing our objectives for this unit.



Unit Objectives

By the end of this unit you should be able to:

- Describe the requirements of a good poultry house;
- Identify a suitable size for a poultry house and a good site for construction
- Determine the most suitable poultry production system for your project.

Section 2.1: Requirements of a Good Poultry House

The following are the requirements for a good poultry house:

- a) Protection:** ensure that the poultry is protected from extreme weather conditions, such as, high winds and droughts. Also protection from predators, e.g. hawks, owls, mongoose, wild cats etc.
- b) Good Ventilation:** the house should have good ventilation, that is, able to supply oxygen and remove carbon dioxide and dampness. A damp atmosphere favours the development of pathogen and retards the activity of the birds. High temperatures may cause deaths or drop in egg production, low shell quality, and reduced weight gain. A combination of high temperatures and high humidity may kill young chicks. To protect birds from the cold, you can use old feed bags as curtains to cover the chicken wire at night.
- c) Ease of cleaning:** it should be easy to clean and facilitate parasite and disease control. All the interior fittings should be removable or easy to clean.
- d) Sunlight:** this is in order to maintain the heat of the flock (VHD). The sun also has disinfecting value and is important to the birds.
- e) Economical construction:** it should use cheap, durable and locally available materials.

- f) **Accessibility:** the house should be convenient in relation to other buildings in the surrounding area. It should be tall enough for a grown-up person to work in there.
- g) **Spacious:** always ensure that your poultry have enough space to run around. This will help you to avoid frequent loss of your birds due to suffocation and contamination.
- h) **Safe:** ensure that your poultry house does not have sharp edges that can injure the birds;
- i) **Floor:** the floor should be cemented or made of concrete for ease of cleaning;
- j) **Disinfection:** a disinfectant dip should be placed at the door of each house to prevent entry of diseases agents into the flock house;
- k) **Storage:** a separate room should be constructed to keep feeds and other equipment in a safe place protected from weather and contamination by humans and rodents.

Perches

Perches are timber frames on which birds perch for rest. They are important for chickens to rest on during the night. It is the natural behaviour of chicken, such as layers and indigenous table birds to sleep above the ground in trees. A one meter perch can roost five adult birds. The perches should be removable to facilitate cleaning. Perches are best made of bamboo or round sticks to accommodate for the size and structure of the birds' feet. If the sticks are too big or too small, the birds may fall. Perches can also be square and flat: 5-10 cm broad. Figure 1.1 below shows a picture of a perch.

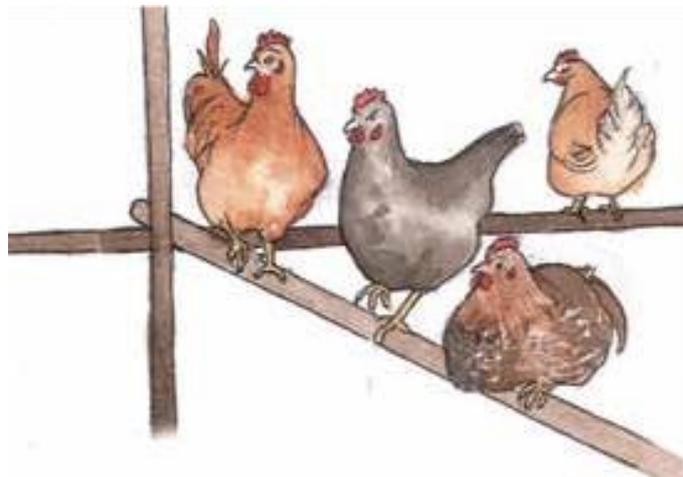


Figure 1.1: Chicken perch

Nesting Boxes

Chickens need areas where they can lay their eggs. You should allow one nesting box for 4-5 hens. The nests should be large enough to make the birds comfortable. They should be placed in a dark and private place in order to discourage egg eating and cannibalism. The floor of the nest should be covered with soft dry grass or wood shavings to prevent egg breakage. The advantages of laying nests are:

- Eggs laid in the next boxes are cleaner
- It reduces the problem of egg breakage
- Egg eating by the hens is reduced
- Removal of eggs by the farmer is easy and time saving.

The nests for brooding must be individual and should be placed in a dark and quiet place. They should also be easily removable. Figure 1.2 shows an example of nests.

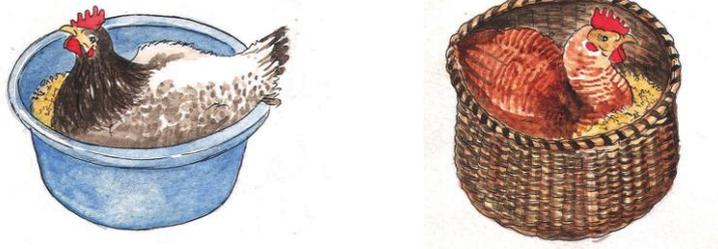


Figure 1.2: Nests for laying and brooding

You are making very good progress! Before you continue, review what you have learnt by completing the following activity.



Activity 2.1

Qualities of a good poultry house

Which of the following are NOT good qualities of a chicken house? Identify them with a circle.

- Well ventilated house
- Dark and dump
- Easy to clean
- Difficult to access
- Economical to construct
- Leaking roof with big open cracks in the walls

Compare your answers with those given at the end of this unit.

You now know the requirements of a good poultry house. Next we shall look at sizing and location of a poultry house.

Section 2.2: Sizing and Location of a Poultry House

Sizing a Poultry House

The size of a poultry house is very important as it helps you to avoid overcrowding. Overcrowding results in vices such as cannibalism and stress due to discomfort. An ideal poultry house is open-sided to allow natural ventilation and has an east-west orientation to minimize the amount of sunlight directly entering the house. The house should be rectangular in shape and the walls not higher than three feet (3ft). The walls of a poultry house can be made of off-cuts, iron sheets or bricks. While the windows should be covered with wire mesh or chicken wire. To reduce the risk of rodents gaining entry into the poultry or flock house, you should clear all the vegetation around the flock house.

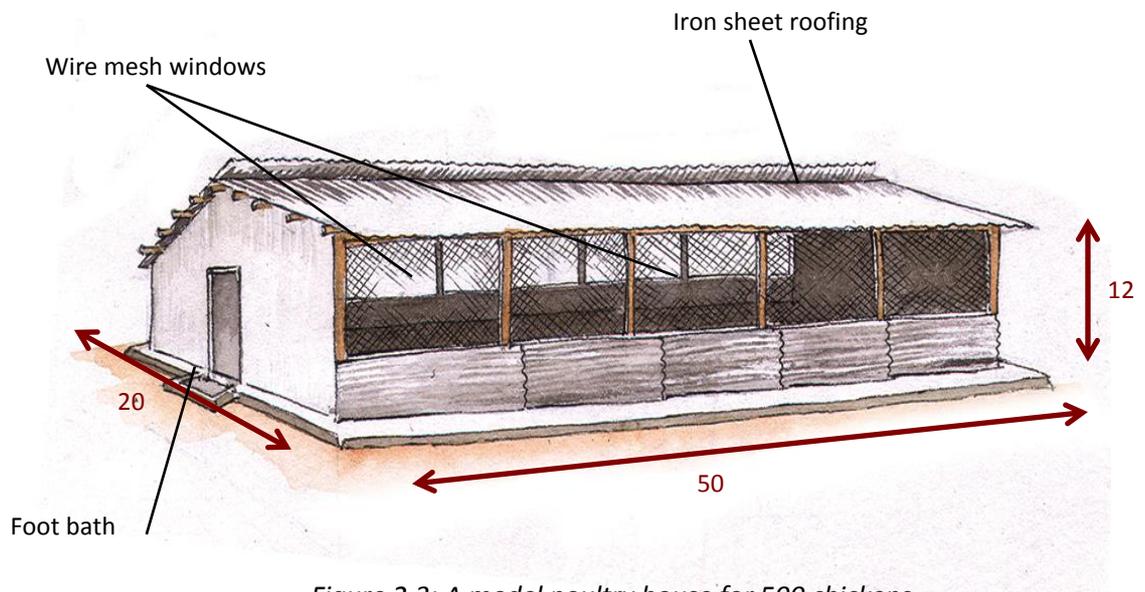


Figure 2.3: A model poultry house for 500 chickens

The house should provide adequate space for the flock. The ideal stocking density is one square foot per bird. When calculating the floor space, consider the internal fittings such as the dropping boards, perches, nest- boxes, feeding troughs, etc. Table 2.1 below gives you the minimum floor space per bird.

Table 2.1: Minimum floor space per bird

Number in flock	Light breeds	Heavy Breeds
10 – 50	4 Sq. ft	5 sq.ft
100-150	3 ½ sq.ft	4 ½ sq.ft
100-150	3	4
150 and over	2 ½	3 ½
Broilers	1sq.ft/bird	
NB: The larger the flock the less is the relative space requirement per bird.		

Location of a Poultry House

A poultry house should be located on well drained land and should also be protected from high winds.

As a way of reflecting on what you have just learnt, complete the following activity.



Activity 2.2

Sizing a Poultry House (Time: 10mins)

The floor space of a poultry house should allow 3-4sq feet per bird. If you want to keep 1000 birds, how much floor space would you allow in your design?

Compare your answer with the one given at the end of this unit.

You have come to the end of this section on poultry house sizing and location. In the next section we shall discuss poultry management systems.

Section 2.3: Common Poultry Production Systems

1. Extensive or Free Range System

This is the simplest and oldest method of rearing chicken. Birds are allowed to move freely in a fenced ground which has a simple house to provide shelter at night, see figure 2.4. The Laying nests are located inside the house while the feed and water troughs are placed outside under a simple shelter to protect them from rain.



Figure 2.4: Free or extensive range system

What are the requirements of the extensive system?

1. **Land:** the land must be large, well-drained with trees for shade. An external fence is required to restrict chicken from straying. 100 birds require 0.4 of hectare.
2. **Runs (partitioned areas):** the land should be partitioned to allow rotation. This reduces diseases and parasites.
3. **House:** the house is constructed to provide shelter and an area for laying nests. It should be easy to move form one run to another.

Advantages

These include:

- Cannibalism and egg eating are reduced because the birds are not crowded and are free within the run.
- No need to provide grit as birds picks it from the soil.
- Less feed is used as birds pick insect and grass.
- Manure is evenly spread to the runs, this helps vegetation to regenerate.
- Birds are of good body size and stamina.

Disadvantages

These include:

- A lot of land is needed which may not be available if you intend to keep a large number of birds;
- Birds can be stolen or eaten by predators;
- Eggs get lost in the runs;
- Eggs get dirty.

2. Intensive Systems

In this system, the flocks are kept inside the house entirely with no access to the land outside. There are two types of intensive systems: the deep litter and battery system.

A. Deep Litter Systems

In this system, birds are kept in large pens and on floors covered with litters like straws or saw dust up to a depth of 8-12 inches. This system is suitable for producing fertile eggs when cocks and hens are kept together and for raising chicks and broilers, see Figure 2.4 below.

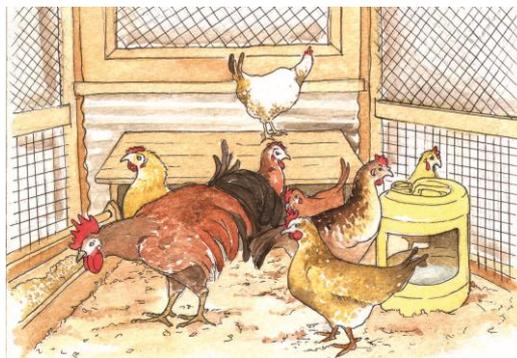


Figure 2.4: A deep litter housing system.

Requirements for deep litter systems

1. **Site:** the site should be located in a well drained area;
2. **House:** the roof should be leak proof, made of aluminium sheets, corrugated iron sheets or asbestos. A grass-thatched roof is not good as it harbours pest and require frequent replacement.
3. **Ventilation:** the wall on the leeward side should be open from 60-90cm above the ground and covered with wire mesh. Good ventilation is important so as to reduce heat, humidity and harmful gases.
4. **Floor:** the floor is covered with litter, such as, saw dust, wood shaving, crushed maize cobs, and coffee and rice husks, chopped dry grass, etc. The litter should be turned regularly and more added as it becomes contaminated with droppings. Turning or stirring the litter encourages the multiplication of micro-organisms. These breaks down the hen's dropping and eventually convert the litter into a mass of fine, dry, friable material which is normally odourless and comparatively hygienic. Turning is done either with the help of a fold, or by throwing grains regularly on the litter. As the chicken scratch for the grains, they turn the litter. When introducing new litter mix with a little of the old so as to introduce bacteria which help the litter to decompose. The depth of the litter should be kept between 15-30cm.
5. **Feeders and waterers:** these should be clean and well distributed to avoid overcrowding of birds and contamination of the feed and water.
6. **Roosts:** you should provide timber frames on which the bird perch for rest. You should allow 22.5cm – 30cm per bird and 1-1.2m high. The roosts should be moveable in order to avoid dampness caused by the accumulation of droppings in one spot.
7. **Nests:** are laying boxes: these should be large enough to make the birds comfortable. They should be built in a dark place in order to discourage egg eating and cannibalism. The floor of the nest should be covered with soft dry grass or wood shavings in order to prevent egg breakages.

There are two types of nests: the individual nests and the communal nests:

- The individual nest accommodates one bird at a time. It measures 25-30cm wide, 30-35cm high & 30-36cm deep
- The communal nest accommodates many birds at a time. Its door is 20x20cm.

Advantages of Deep Litter System

- Many birds can be kept in a small area (high stocking rates);
- Labour requirement is low as one person can care for many birds;
- The system can be used to rear breeding stock;
- Birds are safe from predators and thieves;
- There is fast accumulation of manure;
- Less loss of eggs as in free range;
- Ammonia produced by decomposing organic matter in the litters acts as a disinfectant against coccidiosis.

Disadvantages of Deep Litter System

- Incidences of pecking, egg eating, cannibalism, feather plucking are high;
- There is an accumulation of pests and pathogens in the litter. Dry litter causes respiratory problems;
- It is difficult to know a poor layer as birds lay eggs in common nests;
- Eggs may become dirty especially if laid on the floor;
- Litter may be difficult to find in some areas.

B. Battery Cage System

In this system, birds are confined entirely in cages throughout their laying period, see figure 2.5. The cages are made of wire mesh. In each cage 1-3 birds are kept. The cages are arranged in rows which are then arranged in tiers, that is, a row is built over another. Cages have tiers varying from 3-6 in numbers with slanting floors to allow the eggs roll easily into the tray. The lowest tiers are normally 60-90cm above the floor. This height allows easy cleaning of the floor. The water troughs and feeder are fitted above the front side of the cages from one end of the row to the other. Eggs are collected from a tray behind the tiers. The cages are 45cm wide and at the front 45cm high and 57.5cm deep.



Figure 2.5: Battery cage system

We hope that your answer included the following causes of direct contamination:

- touching infected skin, or
- being in close contact with a person who is infected or who is sneezing, and/or coughing.

Advantages of Battery System

- Higher egg production due to less energy wastage by birds;
- Accurate egg records can be kept because it is easy to know which bird has laid;
- Cannibalism and egg eating are minimized;
- Eggs are clean because the hens do not step on them;
- Less labour is needed especially where mechanization is practiced
- It is easy to identify sick birds quickly;
- Birds do not contaminate food and water thus there is no re-infection with worms and coccidiosis;
- Culling or handling is easy as hens are restricted to a small place;
- Broodiness is discouraged as the birds are not able to reach eggs;
- A large number of birds can be kept in a small place;
- There is greater efficiency in the control of diseases and parasites.

Disadvantages of Battery System

- A high initial capital is required in addition to the house;
- It requires increased level of management;
- In case of a disease outbreak, it can spread very fast;
- Birds develop bruises on combs, breast and toes.

3. Semi Intensive System

The semi intensive system can be divided into two: the fold system and the house and run method.

A. The Fold system

In this system, birds are confined in small structures called an ark or fold. A fold unit measure 3.5m long by 1.5m wide and 1.5m high. This is enough to hold 10-15 hens.

One third of the fold is roofed to provide shelter. The rest of the fold is left open but it is enclosed with wire mesh. The unroofed part is used for sunning and exercise. The folds should be moved daily to a fresh ground to reduce build up of diseases, provide fresh grass, avoid accumulation of droppings and also to spread the manure. See figure 2.6 for an illustration of the fold system.

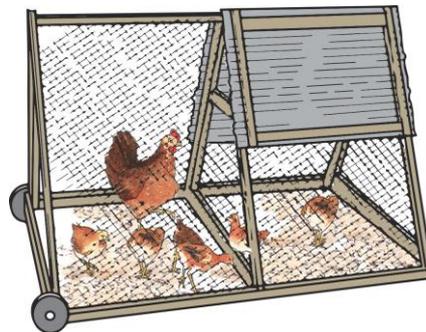


Figure 2.6: The fold system with wheels

Advantage of the fold system

- Manure is spread uniformly in the field.
- Less feed is used because the bird eat grass
- This system reduces build-up of parasites and diseases.

Disadvantages of the fold system

- Few birds are kept per fold. Where many birds are kept, many folds will be required and this is very expensive
- It is labour intensive in that folds have to be moved from one place to the other.
- Individual egg production record is difficult to keep.

B. House and Run Method

This method is useful for keeping small population of birds, around 20-50 birds. It consists of solid roofed housing which is used for keeping birds at night, laying eggs and roosting. Birds are allowed to run freely around the house during the day within an area enclosed with chicken wire. It is desirable to provide two runs (Run A and B) for alternating use to avoid build up of diseases and parasites. As Run A is being used for poultry, Run B can rest under a vegetable crop. Birds should be rotated between Runs A & B after every 6 months or one year in order to give ample time for the parasites, worms and disease pathogens to die off. See figure 2.7 for an illustration of this system.

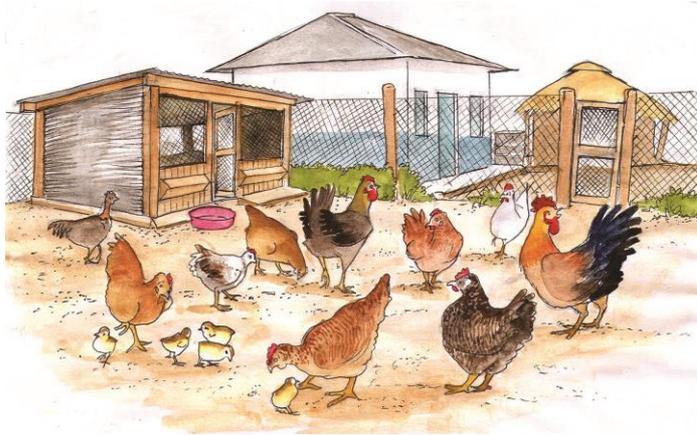


Figure 2.7: House and run housing system

Advantages of the house and run method

- It facilitates the rearing of about 20-50 birds as a side (supplementary) business within a large commercial farm.
- Security for the birds especially at night is good since the building is usually a permanent house.
- The run does not need large a area as in the extensive method.

Disadvantages of the house and run method

- Accumulation of parasitic worms and pathogens in the fenced area.
- Cost of fencing and permanent house is high.
- Losses from snakes, wild animals and thieves.

That brings us to the end of this section on poultry housing management systems. We hope you now understand the different systems and are able to pick one for your poultry project.

Before you continue, review what you have just learnt by completing the following activity.



Activity 2.3

Poultry Housing Management Systems (Time: 15 minutes)

Draw a line to connect a poultry housing management system with its unique feature.

Housing management system	Features
Extensive or free range system	Birds confined in arks or folds which are moved daily to fresh ground
Battery cage system	House surrounded by a wire mesh enclosure that allows birds to run freely during the day.
Fold system	Birds confined in a building and stay in doors for the whole of their life
House and run system	Birds are kept inside a cage throughout their laying period
Deep litter system	Birds roam freely in fenced ground with a simple house to provide shelter at night

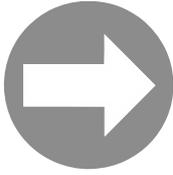
You have now come to the end of our second unit on poultry housing. Let us review what you have learnt.



Unit Summary

In this unit we have discussed described the requirements for a good poultry house. We noted that these include good ventilation, enough space, and protection from weather elements and predators. Next we looked at how to design a poultry house. We hope you still remember that you need to allow 4-5sq feet per bird when designing the size of your poultry house. Lastly we considered the various poultry production systems used by farmers. These were broadly divided into three main categories, namely, the extensive or free range system, the intensive system such as the deep litter system; and the semi-intensive system such as the fold system. We hope you are now able to make an informed decision when choosing a housing system for your poultry project.

In the next unit you will learn about poultry breeds.



Unit 3

Poultry Breeds and Incubation

Introduction

In the last unit we learnt about the qualities of a good poultry house, how to estimate the size of a poultry house and the different housing systems used by farmers. In this unit we shall look at the common chicken breeds found in Kenya. We shall also discuss both natural and artificial incubation practices. As usual, let us start with our unit objectives.



Unit Objectives

By the end of this unit you should be able to:

- Identify the common chicken breeds found in Kenya;
- Apply the appropriate incubation practices in the hatching of chicks.

Section 3.1: Common Poultry Breeds

The term poultry refers to domesticated birds kept for meat, eggs and feather production. There are different species of poultry which are kept by farmers. These are:

- chicken
- ducks
- geese
- turkey
- quails
- ornamental chicken

Chicken keeping dominates the poultry business as one of the species that is reared by a majority of farmers. In this section we shall discuss common chicken breeds found in Kenya.

Chicken Breeds

There are three breeds of chicken found in Kenya. These are:

- Indigenous chicken
- Exotic layer and broiler chicken

Let us examine each breed in further detail starting with indigenous chicken.

1. INDIGENOUS CHICKEN (Kienyeji chicken)

Indigenous chicken are mostly kept under the free-range management system in small flocks of less than 30 birds. These are birds on which no selection of breeds or improvement by crossbreeding has been done. Many households in rural areas keep this chicken for domestic consumption. They are more robust and adapt to local conditions than hybrids. Indigenous chicken lay between 8 and 15 eggs per clutch depending on availability of feed. They are broody and hatch about 80% of the eggs they sit on. However only 20-30% attain maturity. This poor survival rate is caused by exposure to risks such as diseases, predators and poor nutrition, which reduce their productivity. If these risks are controlled, their survival rate can increase by 80%. Figure 3.1 shows a picture of indigenous chicken.



Figure 3.1: Indigenous or Kienyeji chicken

Advantages of Indigenous Chicken/Improved Indigenous Chicken (*Kuroiler/Kenbro*) include:

- They are easy to establish for low income families;
- They are more prolific and unproblematic to rear on small plots of land;
- They are more genetically diverse, well adapted, and more resistant to local pest and diseases;
- They are vital for future food security, leading towards self-employment and self-reliance;
- Meat and eggs are tastier and preferred by most consumers compared to the exotic breeds;
- They are more tolerant to harsh conditions including diseases compared to the exotic breeds;
- They can be fed on cheap locally available feeds;
- Local markets are readily available for both eggs and meat;
- Survival rate of chicks high.

2. EXOTIC LAYER AND BROILER CHICKEN

Exotic breeds are either good as layers or broilers or dual purpose. Layers are breeds used for egg production. Broilers are reared for meat.

They can be categorized into:

- Light breeds
- Heavy breeds.

Let us discuss each in turn starting with light breeds.

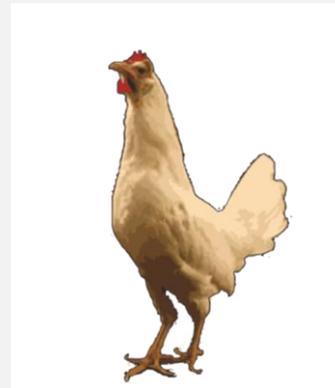
Light Breeds

Light breeds mature early and get into production earlier than the heavy breeds and have a lower incidence of brooding. They are smaller in body hence cheaper to maintain but the carcass is smaller and inferior. They tend to be more nervous than the heavy breeds and are easily upset by sudden and quick movements. You should therefore avoid sudden appearances as this frightens them. Light laying breeds include the White Leghorn, Brown Leghorn and Black Leghorn and the Black Minorca.

Table 3.2: Types of light breeds

- ***The white leghorn***

This is a good layer, which starts laying at 5-6 weeks. The leghorns do not normally sit. Its egg shell is white and has an attractive appearance on the market. It has been used extensively to produce hybrids for egg production. It is white in colour with a single and large comb.



- ***Black leghorns***

This is a hardy and prolific breeder but very nervous.



- ***Brown leghorn***

This is a hardy and prolific layer for egg production. It is a carrier of the recessive genes for golden colour carried on the sex which is used in breeding.



- **Cambridge breeds or auto-sexing breeds**
Are pure breeds produced by crossing a non-barred breed with a barred breed for a number of generations?



Heavy Breeds

Heavy Breeds are quieter, eat more, and in most cases go 'broody' (i.e. try to incubate their own eggs). Examples of heavy breeds are Rhode Island Red, Light Sussex, Plymouth rock, New Hampshire red. Many of them are dual purpose, meaning that they are both good layers as well as table birds or broilers, see figure 3.3 below.

Figure 3.3: Types of light breeds

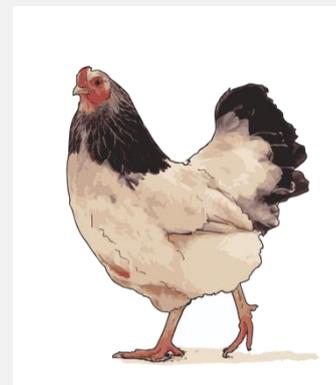
1. Rhode Island Red

This is a dual purpose bird, that is, it is a good layer as well as a table bird (broiler). It's body is broad and deep, with a brilliant deep red coloured plumage. The comb is single or rose comb. This bird has great stamina and a high production capacity. It produces eggs with a brown or tainted coloured egg shell. The bird's flesh is yellow.



2. Light Sussex

This is also a dual purpose bird with white skin. The colour of its plumage is white with black only in the neck hackle, on the wings and on the tail feather. The comb is single and of medium size. It produces eggs with a tainted coloured shell. Because of its hardiness this breed is used for the production of many useful commercial hybrid crossers.



3. Plymouth Rock – Dual purpose

This is an early maturity bird with fairly heavy body. It has a single comb of medium size. The egg shell is brown in colour while the flesh, skin and feet are yellow. The bird is a prolific layer and makes a good mother.



4. The Barred rock – Dual purpose

This is a tail bird with a deep long square body. The barring (black parallel stripes of plumage) is uniform throughout the body with a grayish under colour.



5. New Hampshire red

This is a hardy bird and an excellent layer which produces tinted eggs. It has a single comb of medium size. The flesh, feet and legs are yellow in colour.



As a way of reflecting on what you have just learnt, complete the following activity.



Activity 3.2

1. The following birds are all poultry breeds except:
 - a) Quail
 - b) Parrot
 - c) Turkey
 - d) Chicken
 - e) Ducks

2. Which of the following characteristics are true of light poultry breeds? Tick the correct ones.
 - a) Nervous and get upset by sudden movements
 - b) They eat more,
 - c) Mature early and get into production earlier
 - d) They go 'broody' or try to incubate their own eggs
 - e) Are smaller in body hence cheaper to maintain
 - f) They have an inferior carcass
 - g) They are quieter

Compare your answers with those given at the end of this unit.

You now know the various chicken breeds available in Kenya and their characteristics. Next we shall discuss incubation practices.

Section 3.2: Incubation

Incubation is the process of keeping eggs under favourable temperatures in order to promote embryonic growth and the hatching of young chicks. Before we look at the process of incubation, let us look at the composition of a chicken egg.

Composition of a Chicken Egg

A chicken egg is made up of various parts as shown in figure 3.5 below:

- The shell
- The shell membrane
- Albumen
- Chalazae
- Yolk.

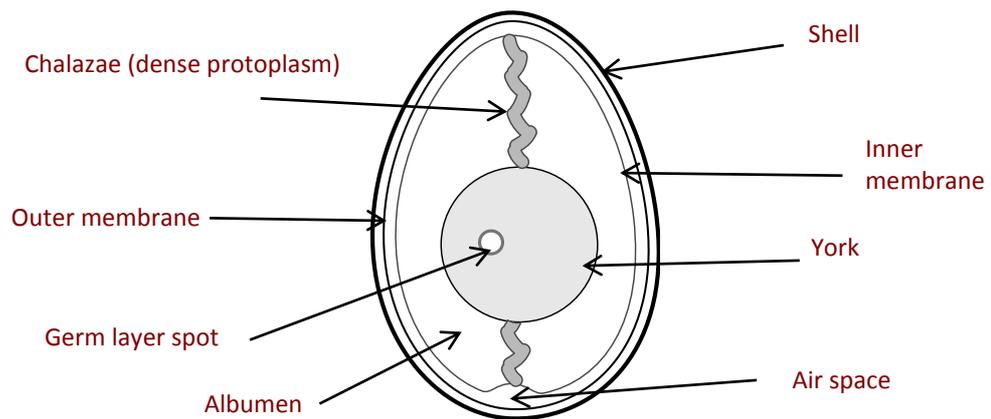


Figure 3.6: Diagram of a fertilized chicken egg

The Shell

This forms 12% of the egg and is largely made up of calcium carbonate which makes it hard. It protects the interior parts of the egg and has pores that allow gaseous exchange.

Shell Membranes

This is the inner lining of the shell. It has 2 membranes that separate at the broad end of the egg to form an air space.

Albumen (egg white)

The albumen makes up 55% of the egg. It is a jelly-like, colourless fluid when fresh.

It surrounds the yolk and serves as a food reserve for the developing chick.

Chalazae

These are 2 twisted cords which hold the yolk from both ends of the egg.

If the chalazae is broken the yolk shakes and is displaced from its normal position.

Yolk

The yolk makes up 33% of the egg. It is yellow in colour and spherical in shape. It has a germ spot which develops into a chick. A fertilized germ spot is called a blastoderm while an unfertilized one is called a blastodisc. The yolk contains food reserves for the developing chick and is rich in vitamins, fats, minerals and protein.

Qualities of Eggs for Incubation

Eggs for incubation should have the following qualities:

- They should be fertilized
- They should be of medium size i.e. about 55-60gms in weight
- Should have smooth shells
- Oval shaped
- Not cracked
- Clean to ensure that pores are open

- Should not have abnormalities such as blood spots, meat spots, double yolk etc.
- Should not be more than 5 days old.

Egg Candling

Egg candling is a method used to check eggs for fertility and determine which ones will hatch into chicks. It involves observing an egg through light rays, see figure 3.7 for the candling technique.

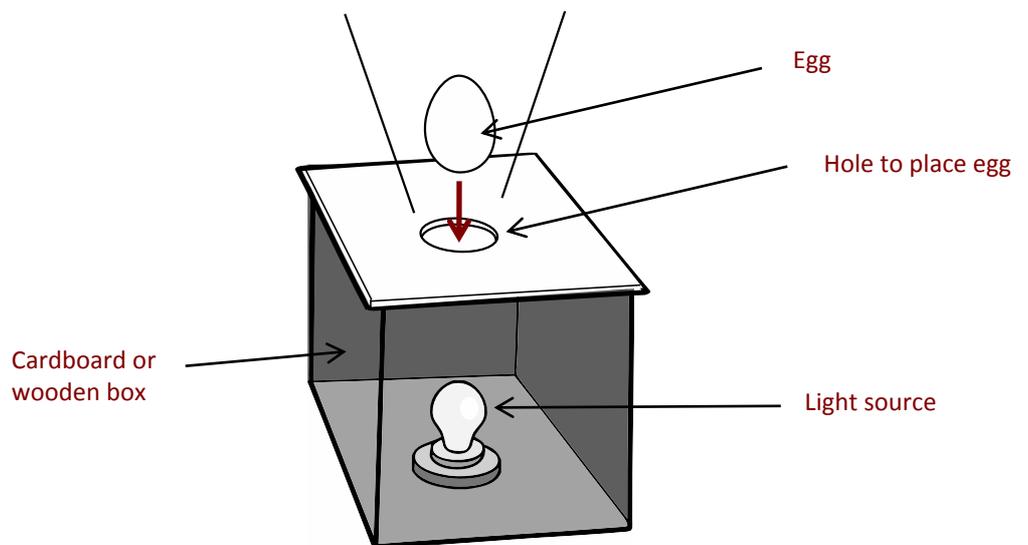
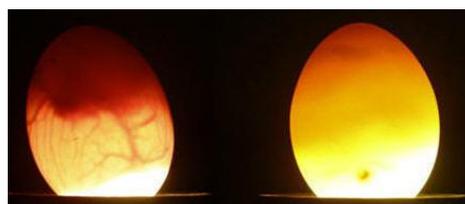


Figure 3.7: Candling technique

Candling Method

As you can see from Figure 3.7, candling is a simple method which you can do at home using the following procedure:

- Cut a small round hole on top of a cardboard box. The hole should be just big enough to sit the pointed end of the egg
- Place a torch inside the cardboard box just under the hole
- Place the egg on the hole and turn on the light
- You will be able to see if the egg is fertile. A fertile egg has blood veins and a black spot inside the egg. Figure 3.8 shows you the results of candling.



a) Fertilised egg

b) Unfertilised egg

Figure 3.8: Results of candling

Incubated eggs should be candled 2 or more times. The first candling should be done on the 5th and 7th day to check for fertility. If they are fertile blood veins will be seen. If they are not, they appear clear. The second candling is done on the 18th day to confirm the presence of a chick. An egg with a living embryo clearly shows a large section containing the embryo and a smaller clear section, containing the air space.

Methods of Incubation

Egg incubation means putting an egg in a place where the right conditions for embryonic development are provided so that a chick is ultimately hatched from the egg. For chicken eggs, these conditions must be provided for 21 days.

How are incubation eggs selected?

Eggs for incubation are selected on the following basis:

Eggs that;

- Are fertilized
- is neither too small nor too large
- are clean
- have no cracks on the eggshell
- are less than seven (7) days
- are from breeder birds with a good cock-hen ratio.
- are stored under low temperature below 23.9^oC.

There are two main methods of incubation. These are:

- Natural incubation
- Artificial incubation

Let us briefly look at each method starting with the natural incubation.

A. Natural Incubation

In natural incubation, you choose a broody hen that is large enough to cover the eggs and thus keep them warm. The hen should be healthy and preferably vaccinated, with a good brooding and mothering record. The signs of broodiness are indicated when the hen stops laying, remains sitting on her eggs, ruffles her feathers, spreads her wings and makes a distinctive clucking sound. Brooding may be induced with dummy eggs.

About 10-15 eggs are adequate to sit on. More than 15 eggs leads to low hatchability. Allow the hen to sit in a dark, vermin proof, simple laying box or quiet place for the 21 days. Use nesting material, such as, dry grass, sawdust and wood shavings to line the nest. The hen warms the eggs and turns them regularly to ensure even heating until they hatch. Figure 3.9 below shows an illustration of brooding hens.



Figure 3.9: Brooding hens

Factors to consider during natural incubation

You should consider the following factors during natural incubation:

- The broody hen should be dusted with appropriate insecticides to rid her of parasites itchy parasites often cause hens to get up and abandon eggs;
- Provide dry grains with grit, greens and water for the brooding hen;
- Remove any broken eggs;
- Wash eggs that get soiled (dirty) using a clean cloth soaked in warm water;
- Ensure no egg is left out in the cold by providing less than 15 eggs per hen;
- After the eggs hatch, you should move mother and chicks to a new clean place.

Advantages of Natural Incubation

The natural incubation method has the following advantages:

- A small-scale farmer who cannot afford an incubator can multiply his flock using this method;
- It is less laborious as there is no need of turning the eggs and checking the temperature;
- It does not require maintenance cost;
- It requires little skill.

Disadvantages

Natural incubation has a number of disadvantages. These are:

- Only a few chicks can be hatched at a time per hen;
- The farmer cannot plan when to incubate;
- The availability of broody hen sitters is not always possible.

B. Artificial Incubation

There are many commercial artificial incubators of varying capacities. Most depend on electricity, but some use gas or kerosene for heating. All use a thermostatic switching device to keep the temperature constant within one (1) Celsius degree. The correct humidity is usually maintained by having a pre-determined surface area of water appropriate for each incubator chamber.

Why is it necessary to turn eggs during incubation?

Turning eggs during artificial incubation is important because of the following reasons:

- To stop the embryo from sticking on the inner shell membrane;
- To enable the embryo utilize nutrients efficiently;
- To enable even distribution of heat inside the egg.

How are eggs set in an incubator?

Eggs are set with the large end facing upwards. This part of the egg contains an air sac, which carries oxygen to the chick during the hatching process. See figure 3.10 for a photograph of an artificial incubator.



Figure 3.10: Artificial incubator with eggs set with large end facing downwards

You have now come to the end of this section on incubation practices. Before you move on, complete the following activity.



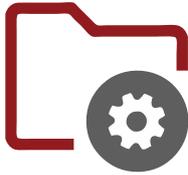
Activity 3.2

Incubation Practices (Time: 15 minutes)

1. Which of the following sign tells you that an egg is fertilized during candling? Tick the correct answer.
 - A ring of blood around the embryo
 - Visible blood veins with a dark spot in the centre
 - A dark cloud around the centre of the egg
2. Which of the following eggs are NOT suitable for incubation? Tick the correct answers
 - Eggs more than 5 days old
 - Fertilized eggs
 - Eggs with abnormalities such as blood spots or double yolks
 - Eggs with smooth shells
 - Fertilized eggs
 - Cracked eggs
3. What is the difference between natural incubation and artificial incubation? Write your answer in the space provided below.

You have now come to the end of this unit on poultry breeds and incubation. It's

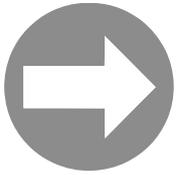
now time for you to review what you have learnt.



Unit Summary

In this unit we have discussed the various poultry breeds found in Kenya. We noted that there are mainly three types, that is, indigenous chicken, exotic layers and broilers and hybrid chicken. We also looked at incubation practices and examined the two methods of incubation used in Kenya and their advantages and disadvantages. We also discussed the factors to consider during incubation.

In the next Unit we shall discuss how to manage poultry from the minute they hatch.



Unit 4

Poultry Management

Introduction

Welcome to the fourth unit in our course on poultry management. In the last unit you learnt about the different chicken breeds available in Kenya and the three poultry production systems used by farmers. In this course we shall discuss poultry management. We shall look at the various methods of brooding chicken, the requirements of an artificial brooder and how to rear pullets, layers and table birds.



Unit Objectives

By the end of this unit you should be able to:

- Describe the methods of brooding chicken
- Describe the general brooder management of chicks
- Apply the appropriate brooder management practices for pullets, layers and table birds
- Conduct routine poultry management activities, such as cleaning and disinfection, debeaking, pasting, detoeing, vaccination and culling.

Section 4.1: Methods of Brooding Chicken

In this section we shall discuss the meaning of brooding and the methods of brooding chicken. Before we start, think about the meaning of brooding and then complete the following activity.



Activity 4.1

Meaning of Brooding

Write down the meaning of brooding in the space provided below

Compare your answer with what you read in the following section.

Brooding is the rearing of chicks from 1 day old till the time they are ready to leave the brooder at 8 weeks. Chicks are precocial, that is, they are able to walk and feed themselves within hours of hatching. However, their bodies are not able to regulate temperature properly for the first two weeks of life. Brooding provides chicks with the necessary warmth, food and water and helps to prevent chick mortality and achieve maximum growth.

There are two main methods used for brooding. These are:

- Natural brooding
- Artificial brooding.

Let us look at each method in further detail starting with natural brooding.

Natural Brooding

In nature, chicks hatch after 2 to 4 weeks of incubation by the hen. The hatched chicks provide the stimulus to the hen to change her work from incubating eggs to brooding the young. This method of brooding chicks is suitable if you want to raise a few chicks. The brooding hen provides the chicks with warmth. An average hen can brood up to 15 or 20 chicks depending on her size and the weather conditions. Some hens can easily adopt chicks hatched by other hens. The hen stays with the chicks until they are old enough to feed on their own.

During natural brooding, you should provide food and water for the hen and the chicks. During the 1st week feed the chicks with small quantities of feed frequently, for example, every 2 hours. The feed should consist of chick mash mixed with water or milk to a crumbly consistency. Feed the hen with growers mash and take care to ensure that the chicks do not get access to the hen food. Provide both the chicks and hen with clean water.

You should also spray the cage regularly to eliminate mites and other pests. During the 1st week, give them vaccination against Marek's disease. If you are using a cage or fold, you should move them frequently to avoid parasitic infestation or a disease outbreak

Disadvantages of Natural Brooding

- Many broody hens are required for brooding a large number of chicks;
- Brooding is not frequent among many laying strains thus natural brooding is not practicable for large poultry.

Artificial Brooding

Artificial brooding becomes necessary when brooding hens are not available or when a large number of chicks are being raised. In this method the chicks are kept in a structure (brooder) in which food and other requirements for their growth are provided. The chicks remain in the brooder for 6-8 weeks after hatching.

Requirements for an Artificial Brooder

The following are the requirements for an artificial brooder.

1. **Litter:** this is usually in the form of wood shavings. It should be spread on the brooder's floor and be able to maintain warmth and absorb moisture.
2. **Fresh air:** Holes for ventilation should be made on the walls of the brooder to allow gaseous exchange. However the holes should not allow draught into the brooder.
3. **Heat source:** You can provide heat from an electric bulb, charcoal burner, lantern or a gas burner. When using a charcoal burner, lantern or gas burner, you should place a wire guard around the heat source to prevent the chicks from burning when they crowd around it.

You should ensure that the brooder maintains the following temperature:

- 1st week – 32° C – 35° C
- 2nd week – 29.7° C – 32.2° C
- 3rd week – 26.6° C – 29.7° C

Maintain the temperature above the floor at 32° C for the first week and then lower it by 4° C every week up to the fourth week. If the heat is withdrawn at once the chicks overcrowd at one point of the brooder and this results in several chicks dying. Check the temperature using a thermometer and observe the reaction of the chicks to the heat. Figure 4.1 below shows the behaviour of chicks under different brooder conditions.

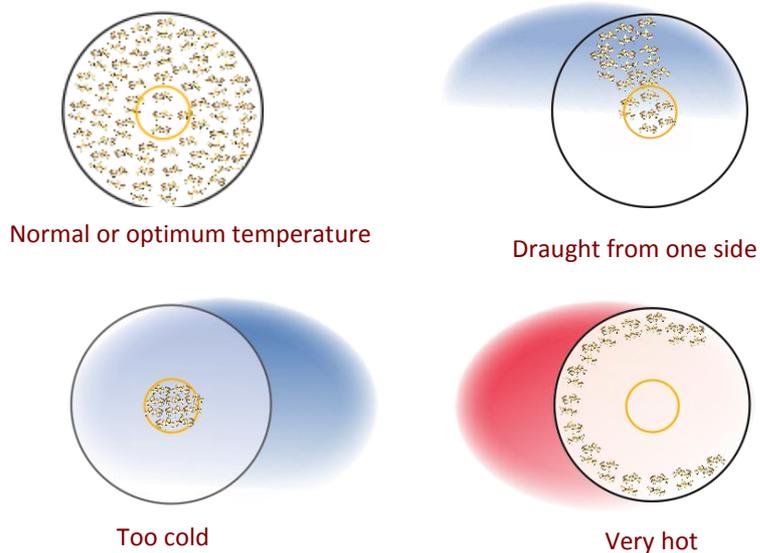


Figure 4.1: Behaviour of chicks under different brooder conditions

As you can see in Figure 4.1 the chicks respond to changes in temperature and draught in the following ways:

- At high temperature the chicks move away from heat source
- At low temperature the chicks crowd around the heat source

- At normal or correct temperature the chicks are evenly spread in the brooder
- If there is drought from one side the chicks crowd in one corner.

4. Light: the brooder should have enough light to allow chicks to see food and water. You should use a dim or dull light as bright lights can cause blindness in the chicks and influence toe pecking.

5. Feeders: make sure you have a sufficient number of feeders so that the chicks can feed without overcrowding. Clean them every morning before feeding the chicks to avoid infection. The design of the feeders should ensure that the chicks do not contaminate the feed with their droppings. The various types of feeders are shown in figure 4.2 below.

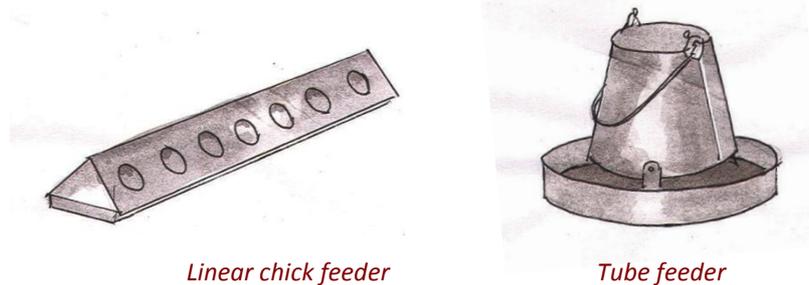


Figure 4.2: Types of feeder.

6. Drinkers or Waterers: provide the chicks with clean and safe water and ensure that they do not step on the drinker or defecate in the water. The watering containers should have pointed tops to discourage the chicks from perching on top. Figure 4.3 below shows a variety of drinkers used in the brooder.

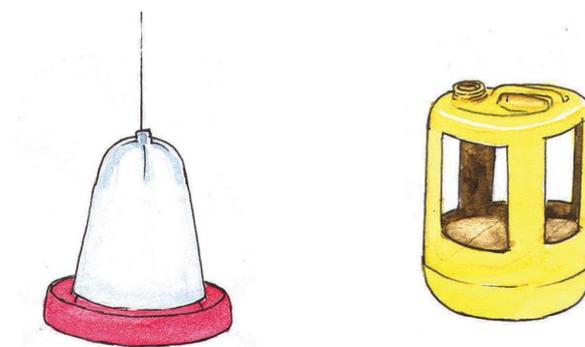


Figure 4.3: Waterer/Drinker

7. Corners: most brooders are round so that there are no sharp corners. Corners encourage overcrowding and suffocation. If your brooder has sharp corners, you should fit cardboards at each corner to round it up.

We hope you now understand the two brooding methods used by farmers. Next let us look at the general management of a brooder.

4.2: General Brooder Management

In this section we shall discuss what you need to do before and after the chicks arrive. We shall start by looking at the preparations you should make before the chicks arrive.

Preparation Before Chicks Arrive

If you adopt artificial brooding method, you should make the following preparation before your chicks arrive:

- Prepare the brooder 2-3 days before chicks arrive;
- Ensure the brooder and all equipment are clean and well disinfected;
- Examine the heating equipment and test to make sure it is functioning properly;
- Spread 100-125mm litter which has been sterilized in the sun over the floor to act as insulation and to absorb moisture from droppings. The litter can be made of sawdust, wood shaving, groundnut shells, broken maize cobs etc.;
- Spread gummy bag on the floor of the broods. This prevents the chicks from eating saw dust (litter);
- Spread some food on the gummy bag and some placed in the feeders. This helps the chicks to know where the feed is after they eat up all the feed on the floor.
- When chicks have learnt where to eat from the gummy bag is removed.
- Warm the brooder to a temperature of 32-35°C some 24 hrs before the arrival of the chicks.
- On collecting the chicks, inspect them to ensure that:
 - the chicks are uniform
 - the chicks are alert
 - the chicks have no deformities
 - the chicks do not have any sign of infection.
- Transport the chicks in well-ventilated boxes without direct exposure to sunlight, wind or rain.

General Brooder Management after Arrival of Chicks

Once the chicks arrive in the brooder, you should ensure the following:

- Start by giving them wholesome drinking water, vitamins, glucose and liquid paraffin. This provides the chicks with energy and helps them to overcome the stress caused by travelling. Liquid paraffin assists in the passage of faeces and prevents pasting.
- Feed them on chick mash for the first 8 weeks. Chick mash has 20-22% D.C.P and Vitamin A and D in addition to other feed substances. The high amount of protein & Vitamin A helps in faster growth.
- Check on the chicks regularly for the 1st two weeks
- Follow a regular vaccination programme, that is, vaccinate against new castle and fowl typhoid
- Ensure the temperature is well regulated at all times. Chicks should not be chilled or overheated, since this may result in:
 - Increased mortality
 - Dehydration
 - Retarded growth

- Poor flock uniformity.
- Dust the chicks with an appropriate insecticide to control parasites.
- Control coccidiosis by giving coccidiostat to chicks through water or feed.
- In the 6th week, introduce perches for the chicks to perch on.
- Introduce grit (sand) in the brooder to help in the digestion of the feed.
- Introduce Growers Mash in the 7th week. This should be introduced gradually with a ration of $\frac{1}{4}$ growers mash mixed with a $\frac{3}{4}$ ration of the chick mash. By the 9th week the chicks should be feeding on growers mash only.
- Provide security against thieves and pests e.g. cats and dogs that eat chicks.
- Remove the chicks from the brooder when they are 8 weeks old. At this time they are big enough to be taken to the main poultry house.

We hope you now understand how to prepare the brooder to receive chicks and how to take care of the chicks during artificial brooding. Before you proceed to the next section complete the following activity to remind yourself the important points.



Activity 4.2

Brooder management

1. List 4 things you should check in the brooder before the chicks arrive.
 - i There is enough light
 - ii The temperature is at least 32° to 35° C
 - iii There are sufficient feeders and drinkers for the number of chicks
 - iv The litter is warm and it has absorbent qualities

2. List 4 things you should check when collecting chicks:
 - i.
 - ii.
 - iii.
 - iv.

3. Write down four things you should do to ensure that chicks are comfortable in the brooder.
 - i.
 - ii
 - iii
 - iv.

In the next section we shall look at the specific management of pullets, layers and broilers.

4.3: Management of Pullets, Layers and Table Birds

Once chicks leave the brooder they are taken to the poultry house. Their subsequent

management depends of the type of chicken, that is, whether they are pullets, layers or table birds. We will discuss at the management of each type individually.

Management of Pullets

A pullet is a female which is one year of age or younger and has not yet completed the first laying period. Pullets can be reared under free range, deep litter or battery systems.

Before their arrival, the poultry house should be properly cleaned and disinfected.

If the pullets are reared under the deep litter system, you should spread clean and dry litter 10cm – 15cm above the floor. Spread the litter evenly avoiding the corners in order to prevent the pullets from crowding in the corners at night. Crowding as we mentioned before causes death due to suffocation or crushing.

If the pullets are reared in a free-range system, they only need shelter or housing at night, when it is raining or when it is too hot.

Factors to observe in pullet management

You should observe the following factors when managing pullets:

- Do not expose pullets to increasing day lengths from 8-20 weeks of age as this can stimulate the pullets to start laying eggs at prematurely
- Isolate or cull abnormal or sick birds that have poor development of feathers and vaccinate.
- Visit the pullets often for close supervision and identification of diseases which need immediate attention
- Where possible, construct roosts either along the sides of the house walls or in the middle of the house to reduce soiling of the litter
- Feed the birds on growers mash which contain 16-17% D.C.P
- Green vegetation which growers can peck to keep themselves busy is hanged at various points in the house
- Soluble grit (oyster shells) should be provided towards the end of grower's stage.

Management of Layers

Layers are birds which are kept for eggs. They start laying eggs at the age of 20-21 weeks. In the first 1-2 weeks the eggs produced are very small in size but they normalize from the third week onwards. You should manage them as follows:

- Vaccinate them every six months against new castle and fowl typhoid.
- Provide enough floor space, roosts, feeders and drinkers
- Ensure each hen receives 120gms of layers mash feed per day
- Keep the litter as dry as possible especially if you practice the deep litter system;
- Collect eggs twice a day at noon and in the evening
- Hang green leaves in the poultry house to keep the birds busy and prevent cannibalism.
- Cull the hens which do not lay or which have cannibalistic behaviour.

Management of Table Birds

These are birds which are raised for meat. There are three types of table birds, that is:

- **Broilers** : these are raised for meat and are marketed when they reach a live weight of between 1.45 -2.75kg depending on the most profitable time of production. Broilers normally convert food into meat at a ratio of about 2:1. This depends on correct management practices and nutrition.
- **Capons**: these are cocks which are castrated at about 110-150 days. They weigh between 3-3.5kg live weights.
- **Roasters**: these are chicks which are slaughtered when they are between 90-150 days old

The management practice of table birds is similar to that of pullets and it includes:

- From the age of 5-6 weeks you should give them broiler mash. This feed is a high energy food that promotes rapid growth.
- Give less broiler mash to birds which are older than 10 weeks
- Do not use hooks to catch table birds due to their great weight
- Give anticoccidial drugs to avoid economic losses by coccidiosis
- Apply disease prevention and control programmes and monitor your flock closely.

That brings you to the end of this section on poultry management. As a way of reflecting on what you have learnt, complete the following activity.



Activity 4.3

Management of Pullets, Layers and Table Birds (Time: 20 mins)

List at least 3 differences between layers and table birds.

Type of Chicken	Main Differences Between Layers and Table Birds
Layers	1. 2. 3.
Table Birds	1. 2. 3.

Compare your answers with those given at the end of this unit.

In the next and last section of this unit we shall discuss routine poultry management practices.

4.4: Routine Poultry Management Practices

As a poultry farmer, you will need to perform certain routine management activities to keep your chicken healthy and safe. These activities are:

- Poultry hygiene
- Debeaking
- Pasting
- De-toeing
- Vaccination
- Culling.

Let us discuss each activity in turn starting with poultry hygiene

Poultry Hygiene

The following are the directions for cleaning and disinfecting your poultry house:

- Remove all portable equipment;
- Remove litter. Do not store litter near the laying house;
- Thoroughly sweep down all dust and cob webs;
- Wash all the equipment and the lower walls and floor;
- Scrub with 5% hot washing soda or 0.3% hypochlorite solution;
- Treat earth floors with 1% formalin. Make sure you soak the floor thoroughly with this solution;
- Fumigate the closed house with potassium permanganate crystals and formalin;
- Keep the clean house empty for at least 2 weeks before restocking.

Debeaking

Debeaking is the partial removal of the beak of chicken. It involves shortening the upper beak which is used for pecking and breaking eggs. It is done at the age of 6-9 days in layers or in pullets 10-14 days old. Debeaking helps to control cannibalism and egg eating.

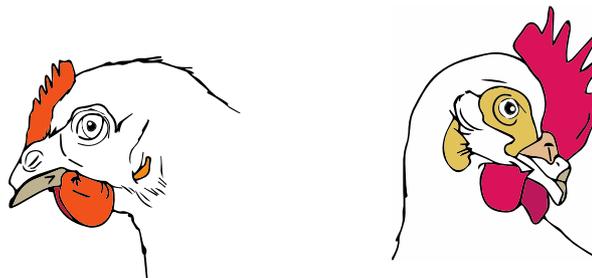


Figure 4.4: Debeaked chicken

Pasting

This is when the vent of a chick is blocked by faeces. It is caused by factors such as:

- Poor nutrition;
- Poor ventilation leading to droughts;
- Diseases that affect the normal functioning of the digestive track;
- Very high or very low temperature in the house;
- Depriving chicks of water between hatching and installation in the brooder.

You can treat pasting by softening the faeces with warm water and then removing it very gently. One important step in preventing pasting is making sure that the chicks in the brooder drink water before they start eating food. As each bird goes into the brooder, dip the beak into the drinker so they can get a small drink and also learn where their water source is. Other preventive measures include improving the brooder conditions such as temperature, ventilation, and feed.

Detoeing

This is the removal of the inside and back toe of cockerels at the outer joint. It is done using a hot blade to cut off and cauterize the toe. Detoeing of cockerels helps to prevent injury to the hens when the cock jumps and bushes on her with his feet astride during mating. If cocks have not been detoed, the nails should be blunted before allowing them to stay with the hens.

Vaccination and other Health Measures

All chicken should be vaccinated against the most common diseases in your area.. Table 4.1 below shows the vaccination regime and other health measures for chicken.

Table 4.1: Chicken vaccination regime

Day old	Mareks	Mode of administration	Mainly for commercial hatcheries
Day 10	Gumboro (1 st dose)	Drinking water	
Day 18	Gumboro (2 nd dose)	Drinking water	
3 weeks	New castle disease (1 st dose)	Eye drop or drinking water	
3 weeks (in hot spot areas)	Fowl pox	Wing web stab	
6 weeks (other areas)	New castle disease (2 nd dose)	Eye drop or drinking water	
8 weeks	Fowl typhoid	Intramuscular injection	
18 weeks	New castle disease (3 rd dose at point of lay)	Eye drop or drinking water	Repeat every 3 months
19 weeks	De-worming	Drinking water	Repeat every 3 months

Culling

Culling is the removal of unproductive birds from the flock. The factors that necessitate culling of birds are:

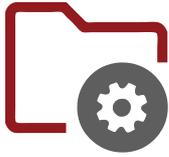
- Poor growth (stunted);
- Chronic diseases that render birds unproductive (injuries may be included);
- Old age, such birds have low production;
- Poor layers consume feed without laying and therefore they are uneconomical;
- Vices such as egg eating and cannibalism.

External and physical appearance is used in the culling process of layers. What characteristics should you look for in a layer in order to select it for culling? The following table compares the characteristics of good and bad layers to help you identify birds for culling.

Table 6.1: Characteristics of good and bad layers

Good Layer	Poor Layer
Combs and wattles are large, warm, waxy and red	The comb is small or shrunken, dry, scaly, pale and cold
Eyes – Bright orange and alert	Eyes – Dull and pale yellow
Beak – pale	Beak – yellowish in colour
The vent is oval (in crescent) Moist, reddish in colour and active	The vent is round, dry and pale in colour it is less active
Abdomen is soft, pliable and wide	Abdomen hard and sometimes full
The space between keel and pelvic bone is wide and can fit 3-4 fingers	The space between keel and pelvic bones is small and can only fit 1-2 fingers
Temperament. Alert and active	Temperature: Lazy and dull
Plumage : Dry and rugged feathers appear worn out due to frequenting the nest	Plumage: preened and glossy. Feathers are beautiful and smooth
Moulting starts late	Moulting starts early
Shanks are pale	Shanks are yellowish
Broodiness is rare	Broodiness is common

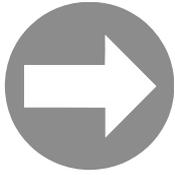
Congratulations for coming this far! You have come to the end of this section on routine poultry management practices. Find out how much you still remember by doing the following activity.



Unit Summary

In this unit you have learnt about the meaning of the term 'brooding' and the two methods of brooding, namely, the natural and artificial method. You have also learnt about the general management of chicken in the brooder, and especially how to prepare the brooder before the chicks arrive as well as how to manage the chicks in the brooder. Lastly, you have learnt how to manage pullets, layers and broilers once they graduate from the brooder to the poultry house.

In the next unit you will learn about poultry feed management.



Unit 5

Poultry Nutrition and Feeding

Introduction

Congratulations for coming this far! In the last unit you learnt how to manage poultry during the brooding phase and after they graduate to the poultry house. In this unit we shall discuss poultry nutrition and feeding. We shall discuss the nutritional requirements of poultry, the classification of feed ingredients, feed formulation and lastly the various systems of poultry feeding.



Unit Objectives

By the end of this unit you should be able to:

- Explain the nutritional requirements of poultry;
- Formulate poultry feed;
- Describe the different poultry feeding systems.

5.1 Nutritional Requirements of Poultry

Feed is the most important input in poultry production. Poultry need a balanced diet in order to produce eggs, meat and develop resistance to diseases. The nutritional requirements of chicken depend on their stage of development.

There are 3 stages in the life of a laying bird for which food requirements are different. These are:

- The starting and early growth stage
- The pullet stage
- The laying or egg production stage.

In the case of broilers, their food requirements differ at the starting and early growth stage, since they are expected to grow into soft, matures birds, in 3 months or less.

To provide a balanced diet, poultry feed must contain all the necessary nutrients. Which nutrients do you think are required by poultry? Think about it for 2 minutes and then complete the following activity.



Activity 5.1

Poultry nutritional requirements (Time: 10 mins.)

List down at least 4 nutrients that poultry require for normal growth and development

1. _____
2. _____
3. _____
4. _____

We believe your answer included the following nutrients:

- Protein
- Energy
- Mineral
- Vitamin.

Let us briefly discuss each type of nutrient in turn starting with protein.

Protein

Poultry require protein for growth and development of muscles and feathers. Normally 15-20% of poultry feed should be made up of protein. Protein requirements are high during the moulting and growing stage as young chicks continuously produce new feathers. Laying hens moult (lose feathers) after the first laying season and so require a diet high in protein to grow new feathers. Protein is also required for the synthesis of egg protein. There are two primary sources of protein for poultry feed. The first one is vegetable protein such as groundnut, soybean cake, and maize glutens. The second is animal protein sources such as fishmeal, skim milk powder, and liver meal.

Energy

As a rule, 60-80% of poultry feed should contain foods high in energy. Energy foods are important for the maintenance of body temperature, vital functions and for exercise. High energy foods can be easily formulated using cereals such as, maize meal, oats, barley, rice bran and wheat.

Minerals

Minerals are important for bone formation, eggshell formation and for optimal health status. The most important minerals are calcium and phosphorous. Examples of sources for minerals are: bone meal, limestone and burned eggshells.

Vitamins

Poultry require Vitamins A, B2, and D3 for normal growth and development. In birds under free range management, sunlight and green grass or green fodder normally provide Vitamin A and D, whereas Vitamin B may come from fresh cow dung. In birds under intensive management, multivitamins should be added to their feeds.

Water

Water plays a very important role in poultry nutrition. It is needed by the bird for digestion of feed, absorption of nutrients, and excretion of waste products and regulation of body temperature.

In addition to these nutrients, poultry feeds also contain salt and non-nutrient feed additives such as antibiotic, anticoccidiosis.

5.2: Poultry Feed Formulation and Ration

In this section you will learn about the points to consider when formulating poultry feeds and the types of rations that you should give to layers and broilers.

Principles of Poultry Feed Formulation

When formulating poultry feeds, you should be guided by the following principles:

1. Feeds must contain all essential nutrients in the right amount and proportion needed to meet the requirements of your poultry;
2. Chickens of different ages require different level of nutrients. Therefore when formulating feeds, you should be guided by the acceptable standards for the particular age of the bird;
3. The ingredients chosen for the preparation of poultry mashes must be palatable;
4. When selecting ingredients for preparation of poultry mashes, you should consider the nutritional value of each ingredient vis-à-vis the costs;
5. Chicken have no teeth to grind grains or oil cakes, hence all the ingredients should be crushed into the appropriate sizes in keeping with the age of chicken;
6. Micronutrients and non-nutrients feed additives should be chosen carefully and mixed up well for effective results;
7. Include agro-industrial products to minimize the cost and select a variety of ingredients to make good deficiency of one by the other;
8. While selecting an ingredient you should judge its optimum level of inclusion as many of the ingredients are likely to be dangerous at higher level;
9. Always avoid fungal infested ingredients;
10. Ensure that your feed has the correct carbohydrates /protein ratio required for the age of the bird. For example, chicks from the age of 0-8 weeks require a higher percentage of protein than that of carbohydrates. Birds from the age of 9-20 weeks on the other hand require a higher ratio of carbohydrate in order to provide them with energy;

Before you formulate poultry feed, you should first find out the nutritional requirements of the bird so that you can select the ingredients that provide those nutrients. Table 5.1 below gives two different methods of formulating layers mash.

Table 5.1: Methods of formulating layers mash

Method 1	Method 2
<ol style="list-style-type: none"> 1. Protein rich supplement: <ul style="list-style-type: none"> • Vegetable portion supplement 15-20% • Animal portion supplement 65-80% 2. Energy rich supplement cereals, millets 60-80% 3. Mineral supplement: <ul style="list-style-type: none"> • Calcium 5% • Standard mineral mixture 4. Vitamin supplement: <ul style="list-style-type: none"> • Standard vitamin AB₂ D₃ 	<ol style="list-style-type: none"> 1. Maize - 46 parts 2. Wheat - 20 parts 3. Fish meal – 6 Part 4. Ground nut cake – 15 parts 5. Sunflower cake – 5 parts 6. Calcite – 5 parts 7. Any standard mineral mix – 2.5 8. Dicalcium phosphate /bone meal – 0.5 9. Rovimix (vitamin AB₂D₃) @ 25.8gm/qH 10. Rovibe (B complex) @ 20gm /qH



Take Note:

Before you buy commercial feeds, you should calculate whether it is profitable based on the market price for eggs or meat/live birds. If the product price is lower than the price of feed consumed by the birds to produce it, it is not economical to offer commercial feeds.

Types of Rations

When calculating the rations for poultry feed you should consider the following two things:

- their maintenance requirements;
- their production requirements, that is, for egg or meat production

The following are the feed rations for different poultry birds:

- Broilers starter mash contains 21-22% protein. It is fed to broiler chicks of 3-6 weeks;
- Broiler finisher mash has 19-22% protein. It is fed to broilers over 6 weeks. It also contain more fat and xanthophylls pigments that aids in the development of the uniform yellow skin colour;
- Chick mash contains 21-22% protein or 16% digestible protein. It is given to layers from 1-8 weeks;
- Grower’s mash contains 15-16% digestible protein. It is fed to layers of 9-19 weeks;
- Layers mash contain 11-12% digestible protein. It is given to layers from 19 weeks and during the laying period. Each bird should receive 113g per day.

Table 5.2 shows the amount of feed in grams for birds at different ages.

Table 5.2: The amount of feed in grams at different ages.

Age (wks)	Intake /bird/day(g dry weight)	Average intake bird /day(g) dry weight)
1 week	12-15	13.5
2 weeks	15-21	18
3 weeks	21-35	28
4 – 6 weeks	35-50	42.5
7-15 weeks	55-60	57.5
16-27 weeks	68-80	74
28 weeks	100	100

In addition, you should take note of the following feeding practices:

- Provide fresh feeds and water two times daily.
- For bright yellow egg yolks, give layers some greens every day. This may be grass, legumes, vegetable wastes etc.;
- Laying hens also need calcium to produce eggshells. Therefore ensure that the feeds have some limestone, crushed eggshells, bone meal, or fishmeal;
- When introducing new feed rations, mix the two to ensure there is a gradual transition. Administer vitamins at this stage to reduce any stress on the birds that results from introduction of a new ration;
- Avoid variations in what you feed your chicken since this may ultimately affect the final product;
- Establish a reputable and dependable feed miller who can provide you with chicken feed of high quality.

It's now time for you to review what you have just learnt. To help you do this, complete the following activity.



Activity: 5.2

Poultry Feed Formulation (Time: 15 mins)

Tick whether the following statements about feed formulation and rations are True (T) or False (F)

	True	False
1. Vary the feeds you give to chicken as much as possible		
2. Provide fresh feeds and water only once a day		
3. Always avoid fungal infested ingredients		
4. For bright yellow egg yolks, give layers some greens everyday		
5. Introduce new feeds suddenly as need arises		
6. Give broiler finisher to chicks of 1-3 months		
7. Chickens of different ages require different level of nutrients		

Check your answers with those at the end of the course material.

Section 5.2: Poultry Feeding Systems

There are various poultry feeding systems used by farmers. In this section we shall describe each system in turn and consider its advantages and disadvantage.

The following are the main systems of feeding poultry used by farmers:

- **Wet – mash system:** in this system the ration is mixed with a little clean water and fed to birds.
Advantage: it reduces wastage of feed
- **Dry – all – mash system:** in this system all the feed ingredients are ground, mixed in the required dry proportion and fed as a single balanced mixture.
Disadvantages: it encourages more wastage than the wet mash. It also causes respiratory discomfort to the birds through dust from the feeds.
- **Pellet or crumbles system:** feeds are given in the form of pellets or crumbles. These greatly reduce unnecessary wastage.
Disadvantages: it is expensive if pellets or crumbles are fed as the sole source of poultry food. It also encourages feather pecking and cannibalism.
- **Dry-mash with scratch grain system/mash +grain:** birds are allowed to get dry mash from troughs and grains from the litter.
Advantage: keeps birds busy scratching litter in search of grains thus reducing bad vices like cannibalism. It is mostly practiced in deep litter system.
- **Green food system:** birds are fed with green crops such as cabbages, kale, Lucerne etc.
Advantage: it provides important vitamins and minerals and reduces the farmer's expenses for the purchase of vitamin supplements.
- **Restricted or controlled feeding:** it involves restriction in feeding pullets of age 6-20weeks, by feeding the birds twice per day normally at 10.00 pm and at 4.00pm instead of providing the feed throughout the day.
Advantages: reduction in feed cost; delayed sexual maturity but improved egg production along with a reduction in the number of small-scale land.

You have come to the end of this section on poultry feeding systems. To review what you have just learnt complete the following activity.



Activity 5.3

Poultry feeding Systems (Time: 15 mins)

1. Draw a line to match a poultry feeding system in Column A with its correct description in Column B.

Column A	Column B
1. Wet – mash system	<ul style="list-style-type: none"> • All the feed ingredients are ground, mixed in the required dry proportion and fed as a single balanced mixture.
2. Dry –all-mash system	<ul style="list-style-type: none"> • Birds are fed with green crops such as cabbages, kale,
3. Pellet or crumbles system	<ul style="list-style-type: none"> • The ration is mixed with a little clean water and fed to birds.
4. Dry-mash with scratch grain system/mash +grain	<ul style="list-style-type: none"> • Birds are allowed to get dry mash from troughs and grains from the litter.
5. Green food system	<ul style="list-style-type: none"> • Feeds are given in the form of pellets or crumbles which greatly reduce unnecessary wastages.

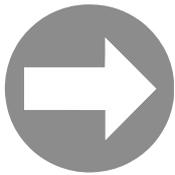
That brings you to the end of this unit. Let us now review what you have learnt.



Unit Summary

In this unit you have learnt about the various tools and products used to perform manicure and pedicure treatments. We hope you have noted that some of the products and tools can be used for both treatments. You have also learnt about the procedures to follow when performing a manicure and pedicure treatment.

You have now come to the end of this section. We hope you have found it interesting and that you are now well equipped with the knowledge you need to do a basic service in a professional manner.



Unit 6

Poultry Health Management

Introduction

Welcome to this unit on health management. In the last unit you learnt about poultry nutrition and feeding. We hope you noted the relationship between proper feeding and good health. In this unit we shall discuss the diseases and their management. We shall also look at the measures you can take to prevent and control these poultry diseases.



Unit Objectives

By the end of this unit you should be able to:

- Recognise the symptoms of poultry diseases in your flock;
- Take the necessary preventive and control measures to protect your birds.

6.1: Poultry Diseases

Poultry and especially chicks are at risk of getting diseases and infection from parasites. The following table gives you a list of poultry diseases and their symptoms and control.

Table 6.1: Poultry Diseases

Disease	General	Symptoms	Control
New castle	<ul style="list-style-type: none"> • A highly contagious and infectious disease of poultry caused by a virus. • The disease is endemic in Africa and is a killer sweeping unvaccinated poultry over large areas. However routine vaccination controls it effectively 	<ul style="list-style-type: none"> • A watery yellowish white diarrhea with an offensive smell. • Thick mucus discharge from mouth and difficult breathing. • Nervous symptoms of staggering with drooping wings and bending of neck. • Acute cases die suddenly 	<ul style="list-style-type: none"> • No treatment • Kill the whole flock and disinfect the house. • Vaccinate birds every six months

<p>Fowl pox</p>	<ul style="list-style-type: none"> • A contagious and infectious disease of poultry caused by a virus • 2. This is another killer disease. However routine vaccinations and strict hygiene controls it easily 	<ul style="list-style-type: none"> • Vesicles (tiny wounds) on wattle, comb and wing web. • Ulcers in the mouth • Excessive discharge from eyes and nostrils. The eyes get sleepy and stuck. • Difficult breathing 	<ul style="list-style-type: none"> • No treatment • Kill all the affected birds. • Vaccinate regularly • Wash and disinfect whole house and observe strict hygiene.
<p>Fowl typhoid and bacillary white diarrhea</p>	<ul style="list-style-type: none"> • There are highly infectious diseases of poultry caused by bacteria of the Salmonella group. • The two diseases show nearly the same symptoms. • The disease is transmitted to chicks from carrier hens through the egg, so testing and eliminating carriers is important or else the whole flock is sold off for eating. • Salmonellosis also affects human being and it is dangerous to eat raw eggs. 	<ul style="list-style-type: none"> • White yellowish or green yellowish diarrhea • Respiratory distress and dullness with dropping wings and sleepy eyes • Anemia – combs and wattles get shrunken and pale yellow • Sudden deaths are usual 	<ul style="list-style-type: none"> • Usually there is poor response to treatments although furazolidone and tetracycline antibiotics have been tried with some success. • Testing and killing affected birds. • Regular Vaccination. • Keep poultry houses clean, dry and well ventilated.
<p>Coccidiosis</p>	<ul style="list-style-type: none"> • It is a protozoan disease of poultry, calves, rabbits, kids and lambs. • It is caused by organisms of the Eimeria spp. • The organism attacks the linings of the alimentary tract (small and large intestines and liver) 	<ul style="list-style-type: none"> • Diarrhoea, dysentery and emaciation in all animal species. • Rough feathers, dullness and drooping wings in poultry. • Sudden deaths in rabbits and kids. • Apart from these, the symptoms are vague and general 	<ul style="list-style-type: none"> • There are many types of drugs (coccidiostats) available for treatment and prevention. • For prevention these drugs are often given in drinking water or feed for poultry and rabbits.

Marek	A highly contagious viral disease readily transmitted among chicken. It spreads quickly from bird to bird.	Enlarged feather follicles (leukosis). High mortality rate. Gross lesion in affected birds.	Vaccination to prevent and control.
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We hope you are now able to identify poultry diseases from their symptoms and take action to control the diseases. As a way of reminding yourself what you have learnt please complete the following activity.



Activity: 5.2

Poultry Diseases (Time: 20 mins)

Draw a line to match the diseases in the column A with their symptoms in Column B.

Column A	Column B
Coccidiosis	Viral disease that causes tiny wounds on the wattle and comb and ulcers in the mouth
Fowl typhoid	Viral disease that causes bird to have thick mucus discharge from mouth and difficult breathing
Fowl pox	Bacterial infection that causes anaemia, respiratory distress and sudden death.
New Castle	Protozoa disease that affects the linings of the alimentary canal and causes diarrhoea

Check your answers with those at the end of the course material.

6.2: Preventive and Control of Poultry Diseases

It is important to institute a strict health program to keep poultry free of disease. It is also important to note that poultry and poultry products can be a source of serious infection and death to human beings. Before you continue reading complete the following activity.



Activity: 5.2

Poultry Diseases (Time: 20 mins)

What steps would you take to prevent poultry diseases in your flock?
Write them down in the space provided below.

Now check if your answer included the following preventive measures.

Good poultry management requires you to do the following:

- Stop poultry from getting into contact with disease causing organisms;
- Stop the spread of disease in a given flock;
- Stop the spread of disease between human beings and poultry;
- Recognize disease conditions at an early stage;
- Ensure that all food and drink containers are kept clean;
- Keep poultry house clean and regularly refresh litter;
- Clean and disinfect any material or equipment being introduced into the poultry house.

You should always institute preventives measures that stop chicken from getting diseases by:

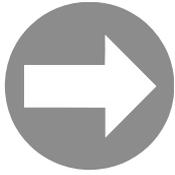
- Disinfect before you bring in new birds;
- Keep your poultry sheds clean at all times;
- Observing foot dipping and hand washing at the point of entry into the poultry house;
- Giving regular vaccination as required;
- Disposing used litter away from the poultry house;
- Avoiding any the build-up of droppings at all cost otherwise this greatly increase the risk of disease causing organisms;
- Controlling rodents by use of chemicals;
- Putting in place a quarantine system in the farm by doing the following:
 - Avoiding the introduction of mature birds to the farm
 - Isolating any sick birds from the rest of the flock
 - Treating all birds as soon as a disease is detected.
 - Not keeping different species of poultry together in one farm/house.

To detect early signs of disease in a flock, you should put in place a monitoring program, and check if the birds are healthy. When conducting a quick check on healthy birds you should look out for the following:

- Active and Alert
- No lameness
- No injuries or deformities
- No discharge from nostrils or eyes
- No stained feathers around the vent
- Have good plumage.

Isolate any bird immediately if it has any of these signs from the others for quick attention and treatment.

You have now come to the end of this unit on Poultry health management. Let us review what you have learnt.



Unit 7

Harvest Management and Record Keeping

Introduction

Welcome to the last unit of this course on poultry production. In the last unit you learnt about poultry health management. In this unit we shall look at how to prepare poultry products for the market and record keeping. As usual, let us start by reviewing the objectives of this unit.



Unit Objectives

By the end of this unit you should be able to:

- prepare your poultry products for the market;
- determine the information you need to record about your flock.

7.1: Preparing Poultry Products for the Market

As we mentioned earlier, poultry farming produces a number of products for the farmer. These are:

- Eggs;
- Meat; and
- Feathers.

In this unit we shall discuss how to prepare eggs and meat for the market. But before we start, complete the following activity.



Activity: 7.1

Preparing poultry eggs and meat for the market (Time: 15 mins)

Write at least 3 steps you would follow to prepare poultry eggs and meat for the market.

Eggs

- 1.
- 2.
- 3.

Meat

- 1.
- 2.
- 3.

Now compare your answer with the information in our discussion below.

Preparing Eggs

You should collect eggs at least twice a day from the nests. Once this is done, you should then prepare them as follows:

- Start by selecting and isolating eggs which are broken, deformed, soiled ones, and those with blood stains;
- If the eggs are dirty, clean them with a clean, dry sponge or cloth, and sell the eggs immediately. Cleaning eggs with water may disturb the natural protection of the shell and introduce infections to the egg.
- Eggs of different sizes are put in different trap with the sharp ends facing down, so that the air space faces upward;
- Eggs should then be delivered to the consumers as soon as possible.



Figure 7.1: Eggs for sale

Preparing Chicken Meat

The preparation of chicken meat has three main steps, namely, dressing, plucking and drawing. Let us look at each in further detail.

Dressing chicken

Once you slaughter a bird, hang it with its head facing downwards in a cool place for about 24 hours.

Plucking

- Remove the feathers immediately after killing the bird, because it is easier to do it when the body is still warm.
- Hold the bird firmly on a sheet of paper and pull the feathers down towards the head. Pluck 2 or 3 feathers at a time.
- Remove the feathers and hair by turning with a piece of cloth or paper
- Use a piece of cloth to clean the bird.

Drawing

- Lay the bird on its back and cut off the head;
- Make a slit is along the underside of the neck and pull the skin towards the body;
- Cut off the neck close to the body;
- Remove the crop and wind pipe;
- Dislodged the entrails by pushing your fingers through the neck opening;
- Enlarge the vent with a knife and pull out the entrails;
- Remove the bitter gall bladder from the liver, and then remove and put aside the liver, heart, gizzard and neck;
- Using a damp cloth, wipe the bird both inside and outside;
- Make a slit around each drumstick to expose the tendons, and then pulled them out;
- Cut the feet off and discard them;
- Twist and break the legs;
- The carcasses can then be sold to consumer through hotels, and supermarkets etc.

We hope you now understand how to prepare your chicken eggs and meat for the market. Next let us look at the information you should record about your flock.

7.2: Record Keeping

It is very important to keep records of production and sale. Poultry records should be kept over a period of up to 20 weeks (for layers). Before you continue reading do the following activity.



Activity: 7.1

Activity: Record Keeping (*Time 15 mins.*)

List in the space provided below the information that you need to record in a poultry business.

Compare your answers with the information in our discussion below.

There are two types of records that are kept by poultry farmers. These are rearing records and laying records. Let us consider each in further detail.

a) Rearing Records

The information in rearing records should include the following:

- The number and cost of chicks purchased
- Quantity and value of poultry feed (chick, grower, layers, broilers rations, grit and grain.
- Mortality and value of birds (mortality should not exceed 5%).
- The number and value of birds sold
- Capital investment on buildings and equipment
- The quantity and value of eggs sold
- Depreciation of the buildings and equipment
- Depreciation of the birds.

These records help you to diagnose the weak areas in management which account for high costs of production.

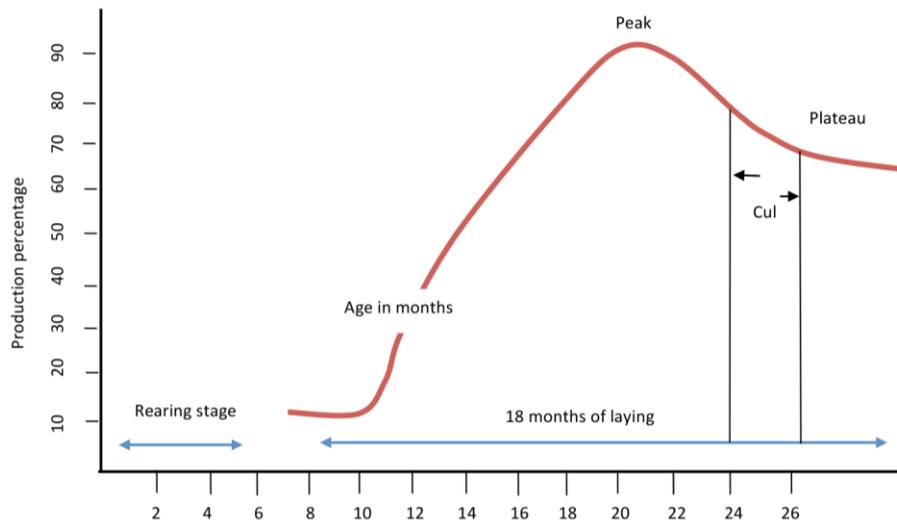
b) The Laying Records

The laying period extends from 20 weeks to the time when the flock is sold. The economic life of laying bird varies between 18 to 26 months depending on the breed, standard of management, health etc. Figure 7.1 illustrates the trend of egg production within the 18 months of laying. As you can see from this chart, egg production and quality fall with the advancing age.

It is useful to record and analyze the following parameters on the performance of the flock:

- Record egg production every week. A good layer may lay :
 - 170 to 180 eggs in 1st year
 - 130 in 2nd year
 - 100 in 3rd year.

Calculate the margin of eggs over feed (monthly) gross margin at the end of flock's production life.



Congratulations! You have come to the end of this unit on harvest management and record keeping. Let us review what you have learnt.



Unit Summary

In this unit you have learnt we have discussed harvest management, and particularly how to prepare your eggs and meat for the market. Next we looked at the information that you should keep about your flock. We saw that the information you collect depends on whether you are rearing birds for meat or for eggs. All in all the information you collect will help you to identify weak areas and analyse the performance of your flock.

You have now come to the end of this course on poultry production. We hope you have found it interesting and informative. We wish you good luck in poultry business!

Answers to Activities

Activity 1.2

Economic Value of Poultry

Write three reasons why chicken keeping is an important economic activity

- Provides income from the sale of chicks, meat and fertilized and unfertilized eggs;
- The feathers are used to make stuffing for pillows mattresses and quilts
- It supplement other incomes from livestock and crops
- Poultry droppings are used as livestock (ruminant) feed, as it is a rich source of non-protein nitrogen and provides protein
- Poultry manure increase soil fertility and can be sold as fertilizer
- Poultry droppings make excellent slurry for biogas production plants
- The by-products of a hatchery are used to make livestock protein supplements.
- It can generate foreign exchange earnings through the export of poultry products

Activity 2.1:

Qualities of a good poultry house

Which of the following are NOT good qualities of a chicken house? Identify them with a circle.

- Well ventilated house
- Dark and dump
- Easy to clean
- Difficult to access
- Economical to construct
- Leaking roof with big open cracks in the walls

Activity 2.2.

Sizing a Poultry House

1. The floor space of a poultry house should allow 3-4sq feet per bird. If you want to keep 1000 birds, how much floor space would you allow in your design?

The answer is 3,000 to 4,000 sq feet.

Activity 2.3:
Poultry Housing Management System

Draw an arrow to connect a poultry housing management system with its unique feature.

Housing management system	Features
Extensive or free range system	Birds confined in arks or folds which are moved daily to fresh ground
Battery cage system	House surrounded by a wire mesh enclosure that allows birds to run freely during the day.
Fold system	Birds confined in a building and stay in doors for the whole of their life
House and run system	Birds are kept inside a cage throughout their laying period
Deep litter system	Birds roam freely in fenced ground with a simple house to provide shelter at night

Activity 3.1

Poultry Breeds

1. The following birds are all poultry breeds except?

- Quail
- Parrot
- Turkey
- Chicken
- Ducks

2. Which of the following characteristics are true of light poultry breeds? Tick the correct ones.

- ✓ Nervous and get upset by sudden movements
- They eat more,
- ✓ Mature early and get into production earlier
- They go 'broody' or try to incubate their own eggs
- ✓ Are smaller in body hence cheaper to maintain
- ✓ They have an inferior carcass
- They are quieter

Activity 3.2

Incubation Practices

1. Which of the following sign tells you that an egg is fertilized during candling?
Tick the correct answer.
 - A ring of blood around the embryo
 - Visible blood veins with a dark spot in the centre
 - A dark cloud around the centre of the egg
2. Which of the following eggs are NOT suitable for incubation? Tick the correct answers
 - ✓ Eggs more than 5 days old
 - Fertilized eggs
 - ✓ Eggs with abnormalities such as blood spots or double yolks
 - Eggs with smooth shells
 - Fertilized eggs
 - ✓ Cracked eggs
3. What is the difference between natural incubation and artificial incubation?
Write your answer in the space provided below.
Natural incubation is carried out by broody hens while artificial incubation is carried out by machines.

Activity 4.2

Broader management

1. List 4 things you should check in the brooder before the chicks arrive.
 - I. There is enough light
 - II. The temperature is at least 32° to 35° C
 - III. There are sufficient feeders and drinkers for the number of chicks
 - IV. The litter is warm and it has absorbent qualities
2. List 4 things you should check when collecting chicks:
 - I. That all the chicks are uniform
 - II. That the chicks are alert
 - III. That the chicks do not have any deformities
 - IV. That the chicks do not have signs of infection
3. List four things that you should do to ensure that chicks are comfortable in the brooder.
 - I. Ensure they have clean drinking water and the correct feed to eat
 - II. Ensure that the temperature is well regulated and the ventilation is good
 - III. Ensure that the chicks are secured from pests, cats, dogs and thieves
 - IV. Ensure that they are vaccinated against diseases

Activity 4.3

Management of Pullets, Layers and Table Birds

List at least 3 differences between layers and table birds

Type of Chicken	Main Differences Between Layers and Table Birds
Layers	Are reared for their eggs Feed on layers mash Some species make good brooders
Table Birds	Are reared for meat Feed on chick mash Can be categorized into broilers, capons and roasters

Activity 4.4

Poultry vaccination and other health measures

Rearrange the column with age of birds in weeks to match with the right vaccination in the first column.

Vaccination or Health Measure	Age in weeks
Vaccination against Gumboro	10&18
Vaccination against Fowl pox,	3 weeks
Vaccination against New castle	3,6&18 weeks
Vaccination against Fowl typhoid	8 weeks
Deworming	19 weeks

Activity 5.2

Poultry Feed Formulation

Indicate with a tick (☐) whether the following statements about feed formulation and rations are True (T) or False (F)

	True	False
1. Vary the feeds you give to chicken as much as possible		<input type="checkbox"/>
2. Provide fresh feeds and water only once a day		<input type="checkbox"/>
3. Always avoid fungal infested ingredients	<input type="checkbox"/>	
4. For bright yellow egg yolks, give layers some greens everyday	<input type="checkbox"/>	
5. Introduce new feeds suddenly as need arises		<input type="checkbox"/>
6. Give broiler finisher to chicks of 1-3 months		<input type="checkbox"/>
7. Chickens of different ages require different level of nutrients	<input type="checkbox"/>	

Activity 5.3
Poultry feeding Systems

Draw a line to match the poultry feeding system in Column A with its correct description in Column B.

Column A	Column B
1. Wet – mash system	<ul style="list-style-type: none"> All the feed ingredients are ground, mixed in the required dry proportion and fed as a single balanced mixture
2. Dry –all-mash system	<ul style="list-style-type: none"> Birds are fed with green crops such as cabbages, kale,
3. Pellet or crumbles system	<ul style="list-style-type: none"> The ration is mixed with a little clean water and fed to birds.
4. Dry-mash with scratch grain system/mash +grain	<ul style="list-style-type: none"> Birds are allowed to get dry mash from troughs and grains from the litter.
5. Green food system	<ul style="list-style-type: none"> Feeds are given in the form of pellets or crumbles which greatly reduce unnecessary wastages.

Activity 6.1
Poultry Diseases

Draw a line to match the diseases in the column A with their symptoms in Column B.

Column A	Column B
Coccidiosis	Bacterial infection that causes anaemia, respiratory distress and sudden death.
Fowl typhoid	Viral disease that causes bird to have thick mucus discharge from mouth and difficult breathing
Fowl pox	Protozoa disease that affects the linings of the alimentary canal and causes diarrhoea
New Castle	Viral disease that causes tiny wounds on the wattle and comb and ulcers in the mouth