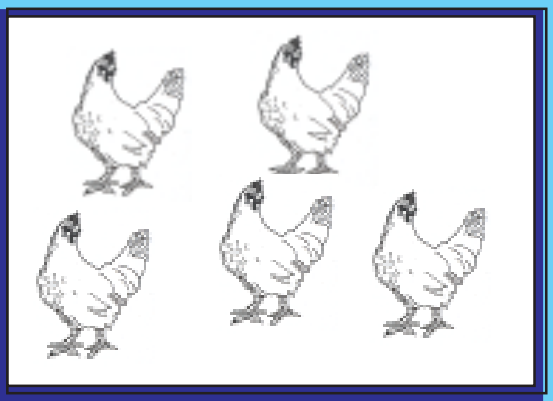
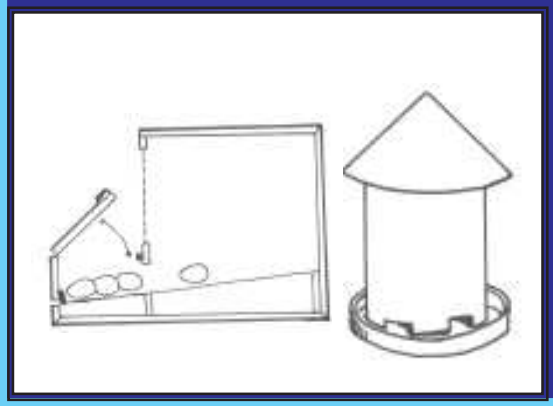
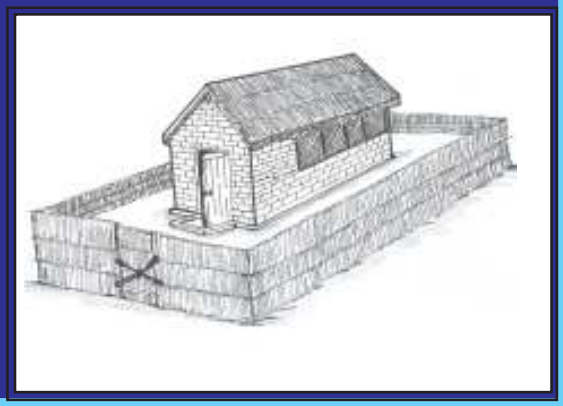
MINISTRY OF AGRICULTURE

PROMOTION OF POULTRY FOR EGG PRODUCTION

DAN CHURCH AID







Income Generating Activity

IMPLEMENTATION MANUAL

Preface

In Malawi poultry production is important for small farm families. Eggs and meat from such production give not only cash but also nutritious food and manure for crop production.

Studies in the central region of Malawi have shown that low production and high mortality are common in poultry rearing. Losses can be reduced and production improved by using better-applied technology and management practices, which also will result in a better total economy of the production.

This booklet "PROMOTION OF POULTRY FOR EGG PRODUCTION AS AN INCOME GENERATING ACTIVITY" presents technical information for small scale poultry farms engaged in egg production as an income generating activity. Knowledge from literature and results from participatory rural appraisal exercise have been compiled together with practicals on traditional techniques and methods.

The main target users of this booklet are women groups engaged in small-scale poultry raising for egg production as an income generating activity. The information contained in this booklet can be of use to both beginning and experienced poultry raiser when confronted with problems which arise. The manual is also meant for advisors in poultry production.

The manual was prepared by Richard Alick Gad Mgomezulu, a local consultant engaged by Dan Church Aid.

The author is grateful for contributions of the following persons and organizations:
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CONTENTS

INTRODUCTION

This manual describes practical solutions for running small-scale poultry units for egg production. It covers in detail the deep litter type of system only.

The breeds of poultry used today demand high standards of management and environment. If these requirements are not fulfilled the enterprise might loose money.

Attention is therefore given to planning management systems, housing, equipment, feed, health, hygiene, and record keeping.

The manual has been produced for use of extension workers and farmers. The straightforward, concise text is accompanied by numerous drawings and diagrams, which clearly illustrate important points.

How to use the manual

The manual will give you an advice on how to start and build up a poultry enterprise. It will also help you to reduce mistakes.

You can use the manual to:

- plan the housing and get the right equipment
- make an economic analysis of your chicken enterprise and
- as a reference book for management, animal health, feed mixing and record keeping.

You can use this Manual to check on your methods and to improve performance.

CHAPTER 1.
PLANNING AN EGG PRODUCTION ENTEPRISE

Points to be considered before starting an egg production enterprise.

- Is there a market for eggs? How many eggs can you sell at what price?
- Is there transport for delivery of eggs and for bringing in feed?
- Is the site well drained on high ground and is there a windbreak and some shade?
- Is there a reliable and sufficient water supply?
- Is the money to build the poultry house available?
- Is this the best use for money, or are there other more profitable ways of spending the money?
- Are there suitable building materials available locally?
- Is feed available? How much can you grow and what will you have to buy?
- Is it possible to use the manure in your garden or can you sell it ?
- Do you know enough about poultry keeping in an intensive system? This manual will help you.
- Is it possible to vaccinate the birds and get medicine for common diseases?

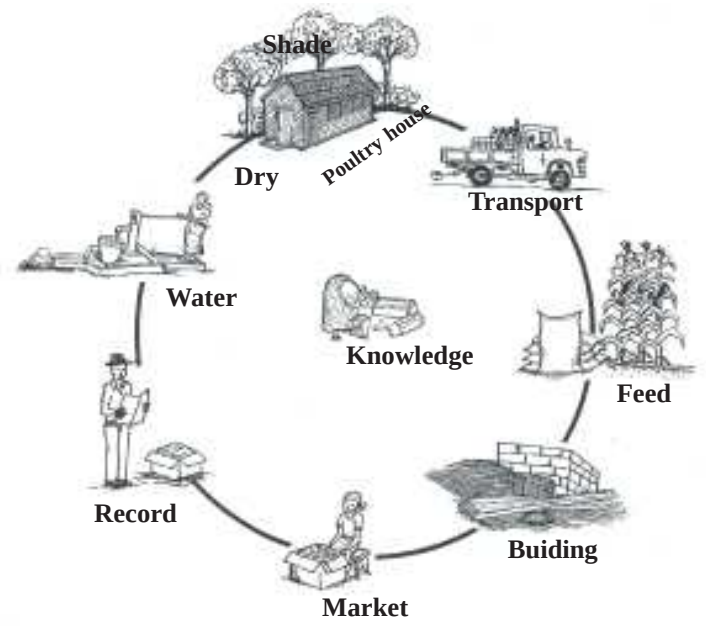


Figure 1. Things you require to establish a poutry

Remember:

- Start on a small scale to test if poultry production is something for you. Are you interested and have you got enough time to give attention to the birds? If you start small you can test the whole system including housing, management and marketing before developing a large unit.

PLANNING FOR POULTRY PRODUCTION

Management and environmental needs at the different stages in the life of poultry must be carefully considered.

The cycle starts with day old chicks in brooders and continues with pullet rearing. Pullets become layers for egg production.

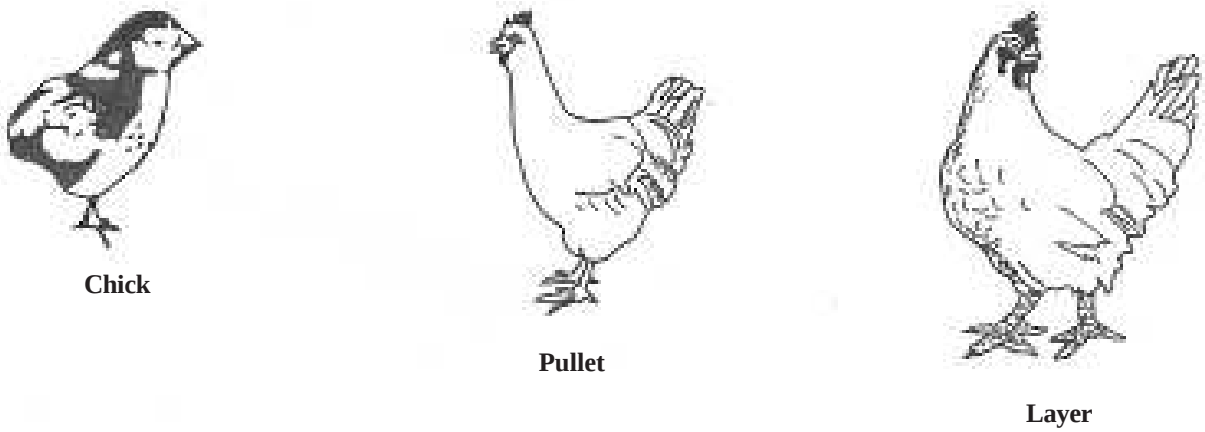


Figure 2. Cycle of a layer from day old to end of laying period

CHAPTER 2.
POULTRY HOUSING

2.1 Choice of type of chicken house

You can choose what housing type to use depending on your resourcefulness, managerial skills and prevailing conditions in a given area. Common poultry houses used by commercial egg producers in Malawi are:

- Deep litter system
- Battery cage

However, the deep litter system only will be covered in this booklet. The raised slated chicken house will also be partially covered.

2.2 Space Requirement

Table 1 below gives details of space requirement for each age category.

Table 1. **Recommended space requirement per bird in a chicken house**

Age (weeks)	Space Requirement
4 – 8	10 birds/m^2
8 – 20	4 birds/ m^2
20 +	3 birds/ m^2

Therefore from 20 weeks of age onwards, a khola measuring 8 m x 4.5 m will sufficiently house 100 chickens while a khola measuring 11m x 6 m will sufficiently house 200 chickens.

2.3 Site Selection

Choose a place for your khola that is

- Close to the dwelling house for easy monitoring and protection from thieves and predators
- Well drained place
- Shady place to keep the khola cool in hot season hence plant some trees around.
- Planning of buildings should be done such that flow of waste material is from the young to the old chickens because older chickens are more resistant to diseases.
- The brooder house should be located at least 90m from the chicken house where order birds are kept.
- Clear out the bush around it, not less than 3 metres to avoid snakes, rats and mice etc., but cut short other grass around to reduce dust.

2.4 Specifications of a deep litter system

i. This is a system, as the name suggests, where the birds are kept on the floor that is covered with litter. This type of house can be made of compressed mud, bamboo, burnt or un-burnt bricks. The birds are thus enclosed in a house where adequate production conditions are provided. Food and water is provided for ad libitum consumption.

ii. The house walls in height can range from 50 – 100cm to window level depending on weather conditions in the area.

iii. The windows or open sides above walls should be 100 – 150 cm wide depending on the height of walls above.

iv. The open sides should be covered with wire netting for ventilation and to keep predators i.e. wild cats, birds of prey and rats away.

v. The open sides should have curtains made of plastic or sacks to protect birds from rains, sun and draught.

vi. The floor should be at least 20 cm above outside ground level to prevent dampness – the floor can be made of compressed mud or concrete.

vii. The roof should have an overhang (about 50 – 80 cm) to keep away rain and sunrays.

viii. The litter is used to absorb all moisture from spilled water and droppings.

ix. The roof can be made of thatch or sisal sheets or iron sheets depending on the resourcefulness of the farmer.

x. The height of the house should be up to 3.0m.

2.5 Management of deep litter houses

i. Types of litter. Choice of litter material is based on types of material available and costs. Litter can be made of wood shavings, rice hulls, groundnut hulls (broken), saw dust, maize cobs, maize stover (chopped). The most absorbent litter material should be used.

ii. Litter should always be fresh, dry and free from mould. Good litter should not make a ball when squeezed in the hand.

iii. A depth of 8 to 10 cm is recommended when putting litter in the house and litter should be replenished from time to time.

iv. Overturn or rake the litter at least a minimum of once a week to improve aeration and quality of litter. This will keep the litter dry and improves sanitation since the litter becomes more absorbent.

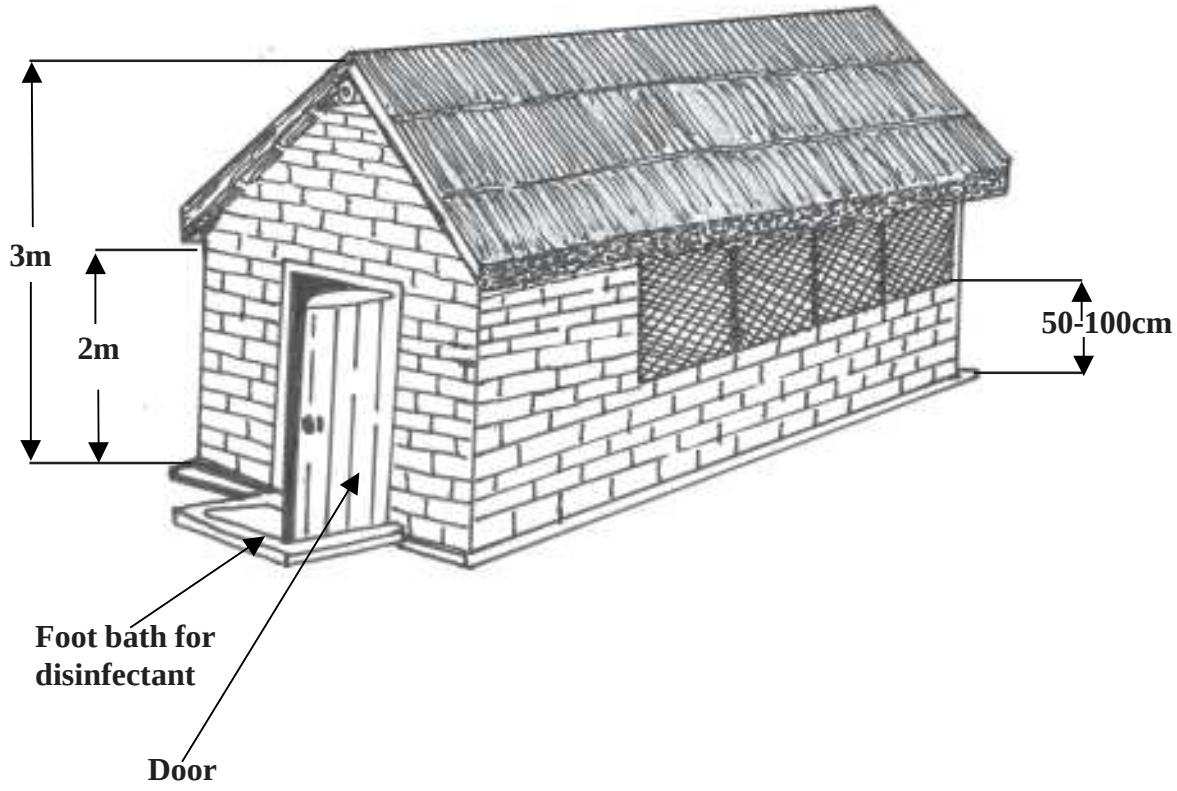
v. Litter should also be used in the nests for layers and kept at a minimum depth of 5 cm to prevent egg breakages.

vi. The litter should be kept dry to avoid ammonia build up.

vii. Always keep the chicken house well ventilated.

viii. Remove and discard all old litter after each batch of chicken flock.

A. **SPECIFICATIONS FOR DEEP LITTER HOUSE**



B. **DEEP LITTER HOUSE IN A GRASS FENCE**

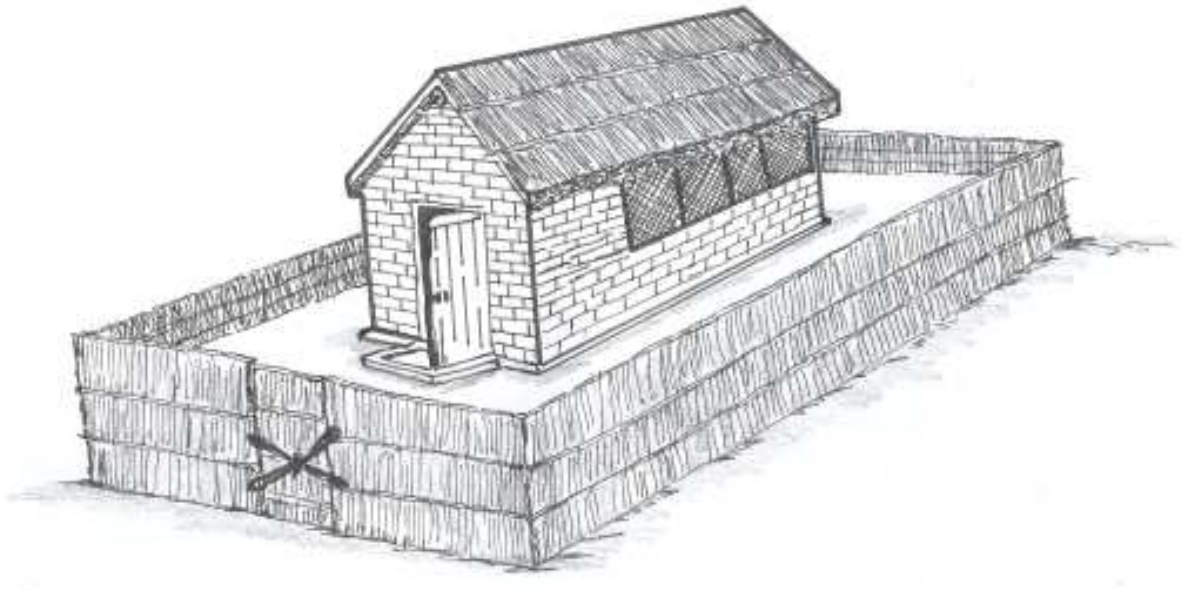


Figure 3. Deep litter house

2.6 Specifications for a slatted chicken house

- The slatted chicken house can be made of timber, timber off-cuts or bamboos. Usually this type of chicken house rests on a platform which is supported by pillars. Pillars should be made of bricks and cement mortar to hold bricks together. Straight upright blugam poles with diameter of 80 -100mm should be imbeded vertically and constructed together with brick pillars.
- Brick pillars should be erected in such a way that the distance between them is 2 m. Straight blugam poles with diameter of 80 -100mm should rest horizontally on pillars width-wise to support slats. You may use straight blugum poles with diameter not less than 50mm, 50mm x 50mm x 50mm timber or bamboos as slats.
- The height of the platform should be 50 - 60 cm from the ground to provide good ground clearance for easy removal of droppings below the chicken house. Slats should be fixed with 5 inch nails to the horizontal poles and should be spaced 7.5mm apart to allow passage of dropings to the ground.
- The chicken house should have a provision for a feed store.
- The lower wall can be made of timber, timber off-cuts or bamboos and should be between 80 cm and 100 cm in height from the platform.
- The upper wall should be made of wire mesh and should be between 90 cm and 120 cm in height.
- The height of the entire wall should be 2 m from the platform.
- The total height of the sllated chicken house from the ground should be between 3.8 and 4.7 m.
- The roof overhang should be 0.5 m from the eves and on the gable sides to keep away rains and sunrays.
- The roof can be made of thatch or sisal sheets or iron sheets depending on the resourcefulness of the farmer.
- A fence should be constructed around the chicken house to keep away stray chickens, passersby and dogs that may bring disease problems such as Newcastle disease.
- Layers should be transferred to the slatted house at the age of 17 to 18 weeks. This means that you have to have a separate house to raise your chickens to this age.
- Equipment required in the slatted chicken house is the same as the equipment for the deep litter house. However there is no need to place perches and litter in the slatted house.
- Put a ladder on the entrance to enable you get into the house without problems.
- Figure 3 b below shows a sillated chicken house.

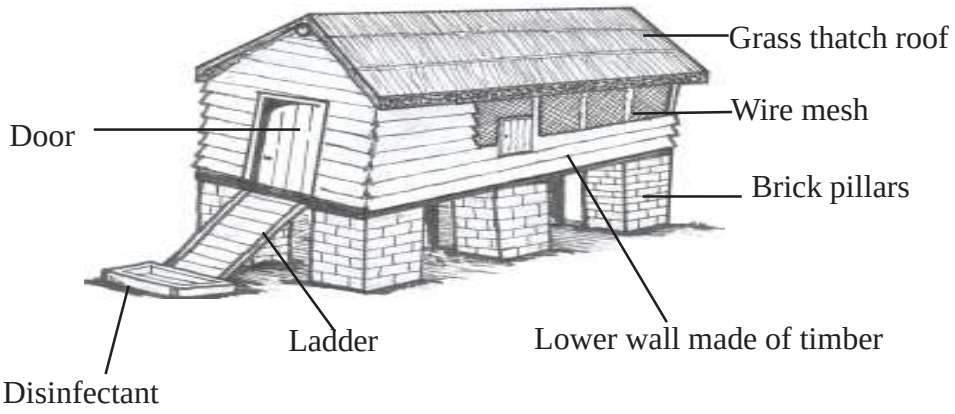


Figure 3 b. Slatted chicken house

CHAPTER 3.
CHICK AND PULLET REARING

3.1 Qualities of a good chick

Only good quality chicks should be reared for egg production. Such chicks will survive and eat well thereby ensuring maximum yields in terms of egg production. All chicks kept should meet the following criteria:

i. Chicks should come from healthy parents
ii. Chicks should be uniform in size and colour
iii. Chicks should have dried and fluffed down
iv. Chicks should look alert and active
v. Chicks should be free of unhealed navels, navel infections and should not have pasted vents
vi. Chicks should not have crooked legs, defective heads or eyes and crooked beaks.
vii. Chicks should be from one flock source to fill the house.

3.2 Preparations before chicks arrive

It is important that farmers should always be ready for any batch of chicks that arrives at the farm. The following points should always be taken into consideration:

i. Order your chicks in advance and specify the dates you require them
ii. Always use a reputable hatchery or source of your birds. In Malawi you can purchase day old chicks from Charles Stuart in Lilongwe or Blantyre.
iii. Have your house ready. The house should be adequate for the number of birds you have ordered.
iv. Have the heating system ready in the house
v. Test it before the chicks arrive to ensure that it is working and can provide adequate amount of heat.
vi. Have adequate number of feeders and drinkers (waterers).
vii. Provide adequate litter in the house.

3.3.Construction of a heated brooder house

Materials:

You require poles or bricks for the construction of the lower portion of the house. Thatching grass or iron sheets are required for the roof.

Construction:

i. Construct the bottom part of the house using bricks or poles smeared with mud. This should be about 1.5 m high.
ii. Finish off the upper part of the house with poles that will support the roof.
iii. This open space between the wall and the roof is to allow free movement of air in and out of the house.
iv. Thatch the roof with either thatching grass or iron sheets.
v. The brooder house should be away from other chickens houses, about 90 cm. Away.

3.4 Equipment for the Brooder house

The brooder:

- Sources of heat can be electricity, coal or charcoal, oil, gas. The type of source of heat used will depend on the availability and cost of the fuel required.
- When charcoal burner is used, there is need to put chicken wire netting around the burner about 15cm from the stove to prevent the chicks from being physically burned by the hot stove or actual fire.

Brooder guards:

- Brooder guards should be put around the brooder to enclose the heated area. This can be made of cardboard or hard paper from cartons.
- The brooder guard helps to confine the chicks to the heated area for warmth.
- As soon as the chicks have learnt where to find the source of supplementary heat the guards should be expanded to allow greater area inside them.
- Guards should be used for about 6 – 9 days after which they can be removed

Hover:

- This is a sheet of metal usually iron sheet that is put over the stove to reflect and distribute the heat back to the ground to warm the chicks.
- The hover also conserves the heat so that it is not lost to the atmosphere.

Litter:

- The floor of the brooder house should be covered with 6 – 9 cm of litter material.
- The litter material serves to absorb moisture and to insulate the floor for comfort.
- It is not advisable to use fine sawdust or chopped grass. These can be inhaled by the chicks, which may cause respiratory complications.
- Cover litter with paper or cloth until the chicks have learnt to eat feed only.

Feeders:

- Inadequate feeder space causes uneven and slow growth.
- To make feed easily available to the chicks feed can be put in temporary feeders such as the inverted chick box lids or egg trays.
- Feed should also be put in feed troughs at the same time as in the box lids.
- Temporary feeders may be removed as soon as the chicks have learnt to eat in the troughs. Provide each chick with 5 cm of feeder space

Waterers

- Chicks should be provided with water 2 – 4 hours prior to feed.
- Distribute waterers evenly in the house so that chicks do not move more than 2.5 metres from any location to reach water.
- Keep the waterers adjusted to the height that is equal to the top of the chicks' backs.
- Always adjust water level to prevent spillage
- Water should also be provided before feed is given. Be sure that the chicks have drunk the water.
- Chicks should drink soon after being placed under the brooder
- The water provided should be clean.
- Provide 1.5 cm of drinking space per chick.

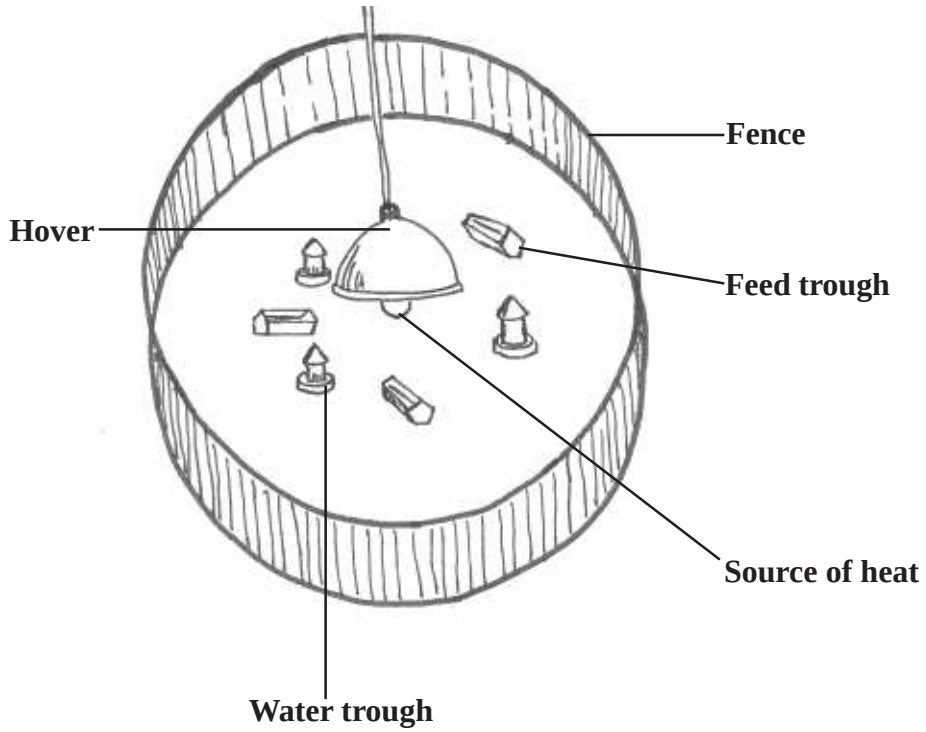


Figure 4. Setup of the heated brooder

3.5 Construction of a heatless brooder

Circle: Draw a circle , with 1 m diameter on the ground. Roll wire mesh (12–18 mm) to follow the shape of the circle. Leave an opening of 250 mm at the front. The net should be 300 mm high.

Stakes: Cut 20 stakes 300 mm long and fix them to the net. The stakes should be about 150 mm apart. Wrap thin, soft free branches around the top and bottom of the net and stakes to keep the brooder together

Without net: If you do not have any net, make a round frame of stakes and thin , soft tree branches.

Thatching: Cover the wire mesh with grass, inside and out, to make a thick warm wall. Use more thin branches to wrap around the inside to hold the grass tightly in place.

Roof: Make a thatch roof that fits well over the grass walls. There should be no gaps where cold can get in. The roof can be hung from a beam so that it can be raised and lowered easily for control of temperature.

Construction of a hut

A small round hut brooder for 50 chicks

- Draw a circle 1 m in diameter
- Roll wire mesh around the shape
- Leave an opening 230 mm at front
- Cut 20 stakes 300 mm long.
- Fix stakes to the net 150 mm apart.

- Wrap thin soft tree branches around top and bottom of the net and stakes.
- Cover the wire mesh with grass.
- Use thin branches to hold the grass in place.

- Make a thatched roof that fits well over the grass walls.
- Leave no holes where cold wind can get in.

Chick guard

- Draw a circle with 2 – 2.5 m diameter around the brooder.
- Roll wire mesh 600 mm high to follow the shape of the circle.
- Clad with bamboo, brown paper or grass.
- The chick guard should be closed

3.6 Chick arrival or placement

i. Where possible, collect the birds as early as possible when it is still cool. This also gives you ample time to observe the birds during the day.

ii. Chicks should be placed in the brooder house 6 to 12 hours after hatch to prevent dehydration.

iii. Count the number of chicks that have arrived

iv. Check the condition of birds on arrival. Cull all sick, weak and deformed chicks if any.

v. Check that brooders are working and are at the correct temperature. Brooders can be electrified.

vi. Do not expose the chicks to drafts.

Table 2. below gives recommended brooder temperature schedule.

Table 2. **Recommended brooder temperature schedule**

Age in days	Temperature (^oC)
1 – 7	32.2
8 – 14	29.4
15 – 21	26.6
22 – 28	23.9
29 – 35	21.1
36 to end of lay	21.1

Check the temperature using a thermometer placed at the edge of the hover and 5 cm above the litter. The most important and practical guide is to observe the behaviour pattern or action of the chicks.

i. Chicks that are distributed evenly under the brooders indicate that the temperature is right

ii. Chicks crowded together indicate that it is too cold

iii. Chicks pushed away from the centre of the brooder indicate that the temperature is too high

iv. Chicks grouped together on one side indicate a draft

v. During periods of stress or vaccination reactions, increase the brooder temperature by approximately 2.8 ^oC above normal recommendation for age involved until birds are back to normal. Fig.5 below illustrates how to use your chicks as a guide for the correct brooding temperature.

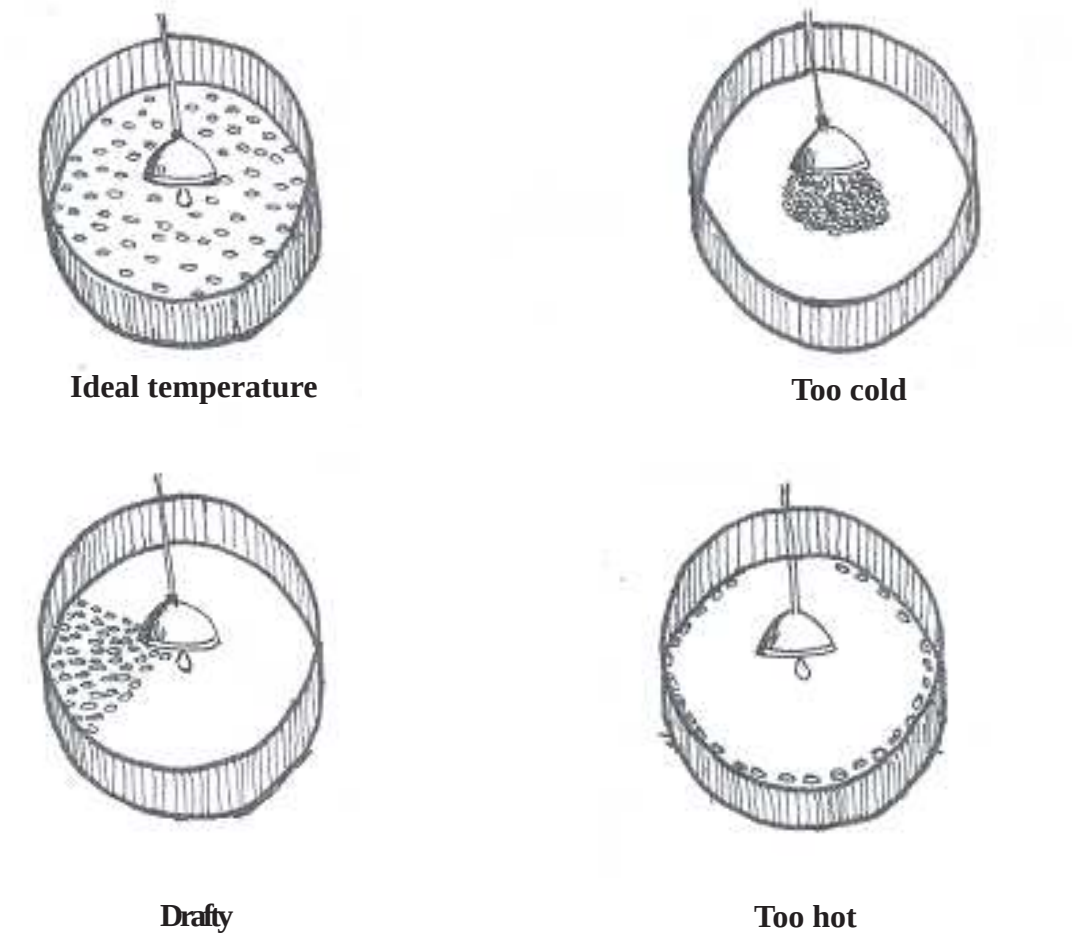


Figure 5. Chick behaviour pattern as an indicator of brooder temperature

It is important to maintain good temperatures in the brooder and chicken house for the following reasons.

i. Too high temperatures reduce feed consumption. This will in turn reduce growth rate. Temperatures higher than 28^{o}C lead to smaller eggs and poorer shells i.e. soft shells.

ii. Too low temperatures increase feed consumption in order to maintain a good body temperature

iii. Too high temperatures result in increased water consumption hence wet droppings. This in turn results in an environment conducive to development of coccidiosis.

iv. Too much heat can lead to heat stress and birds can die from heat prostration.

3.7 Basic Planning Data for Chicks and Pullets

Floor space: The floor space needed in the brooder for 50 chicks or pullets is as follows:

Age	Area
0-3 weeks	1.0 m^2
4-8 weeks	5.0 m^2
9-18 weeks	8.0 m^2

Feeders: The chicks are fed from troughs or tube feeders by hand. The distance to the nearest feeder must not exceed 2 m (pullets 3m) from any point in the house. Troughs can be accessible from one side or from both sides. The trough space needed for 50 chicks or pullets is:

Age	Length of one sided trough	Length of two sided trough
0-4 weeks	1.2 m	0.6 m
5-8 weeks	1.8 m	0.9 m
9-18 weeks	5.0 m	2.5 m

The number of tube feeders needed per 50 chicks or pullets containing at least one day'sconsumption of feed, and with about 300 mm diameter is as follows:

Age	Number of feeders
0-4 weeks	1
5-18 weeks	2

Drinkers: The distance to the nearest fount should not exceed 2 m (pullets 3 m) from any point. One fount should contain at least one day's consumption of water for 50 chick or pullets as shown below.

Age	Water consumption	Fount diameter
0 - 4 weeks	4 litres per day	100 mm
5 – 8 weeks	10 litres per day	300 mm
9 – 18 weeks	15 litres per day	300 mm

If drinking troughs are used the recommended minimum linear water space for 50 chicks or pullets is:

Age	Length of trough
0 – 4 weeks	0.33 m
5 – 18 weeks	0.66 m

3.8 General recommendations:

- The brooder must be near a dwelling house
- Look after the chicks first thing in the morning. Visit them during the day.
- Chicks should always have access to feed and water.
- Noise and sudden movements can stress chicks. Be quiet and careful.

Health: The brooder house should be placed at least 90 m from the buildings for adult fowls to prevent transmission of diseases.

Vaccination: Ask the veterinary Officer for a vaccination programme for endemic diseases. The general recommendation is to vaccinate the chicks against Newcastle disease and mareks disease at one day old, and to vaccinate layer chicks against Fowl pox at 4 – 6 weeks of age.

Prevention: To ensure good health:

- avoid wet litter at all times
- clean feed troughs and water containers several times a day, and give the birds fresh water and feed.

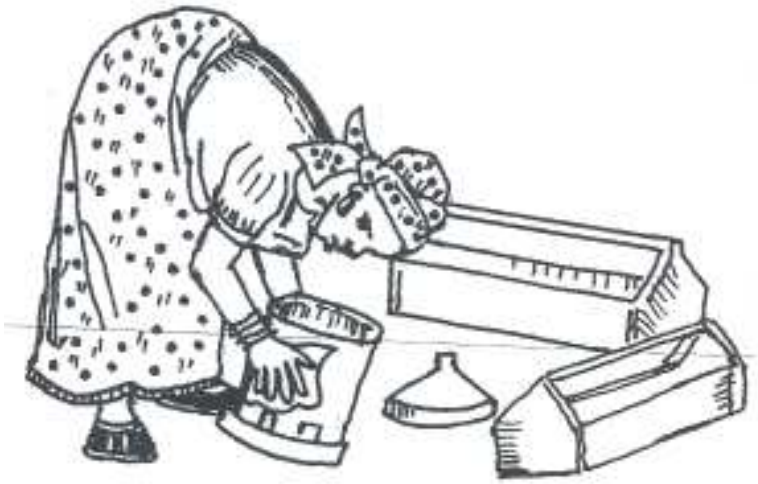


Figure 6. Clean containers before use to minimise contamination of drinking water and feed

- burn or bury diseased chicks to avoid disease transmission to healthy birds.

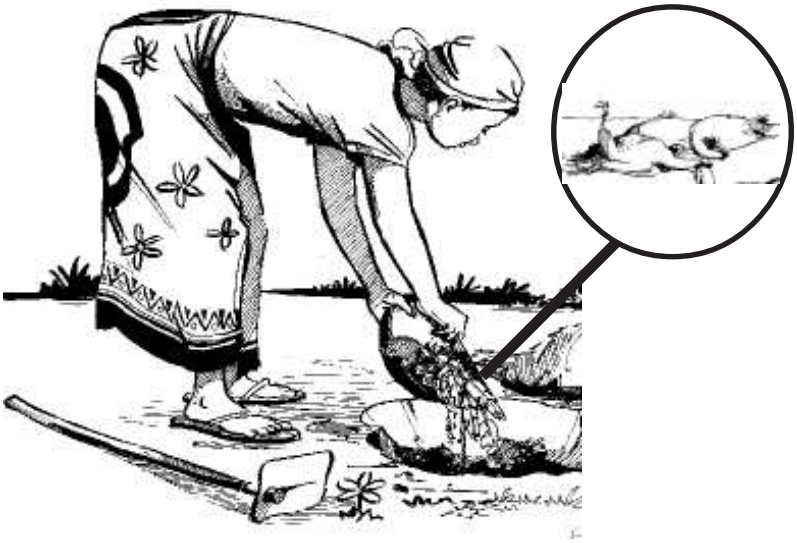


Figure 7. Bury diseased chicken to avoid disease transmission to healthy birds

- Keep rats, dogs, snakes and birds out of the brooder.

CHAPTER 4.
POULTRY HOUSING EQUIPMENT

In all poultry housing for laying hens, drinkers , feeders, perches and laying nests need to be placed.

4.1 Drinkers

4.1.1 Choice of drinkers

- Chickens drink more water than the feed they eat (they spend more time drinking than feeding), hence drinkers should be provided
- It is very important to supply enough and above all cool, clean and fresh water to chickens.
- These drinkers may be of:
    - Upside – down fixed bottles (Figure 8a.)
    - Small clay pots
    - Simple round metal (tinsmithed) (figure 8b.)
    - Plastic bowls
    - Old tyre
    - Bamboo drinker (Fig 8 c)
- It is advisable that drinkers with reservoirs are provided to maintain clean water. These may be like the
    - Upside –down fixed bottles
    - Plastic bowls
    - Tinsmithed (round metal) ones

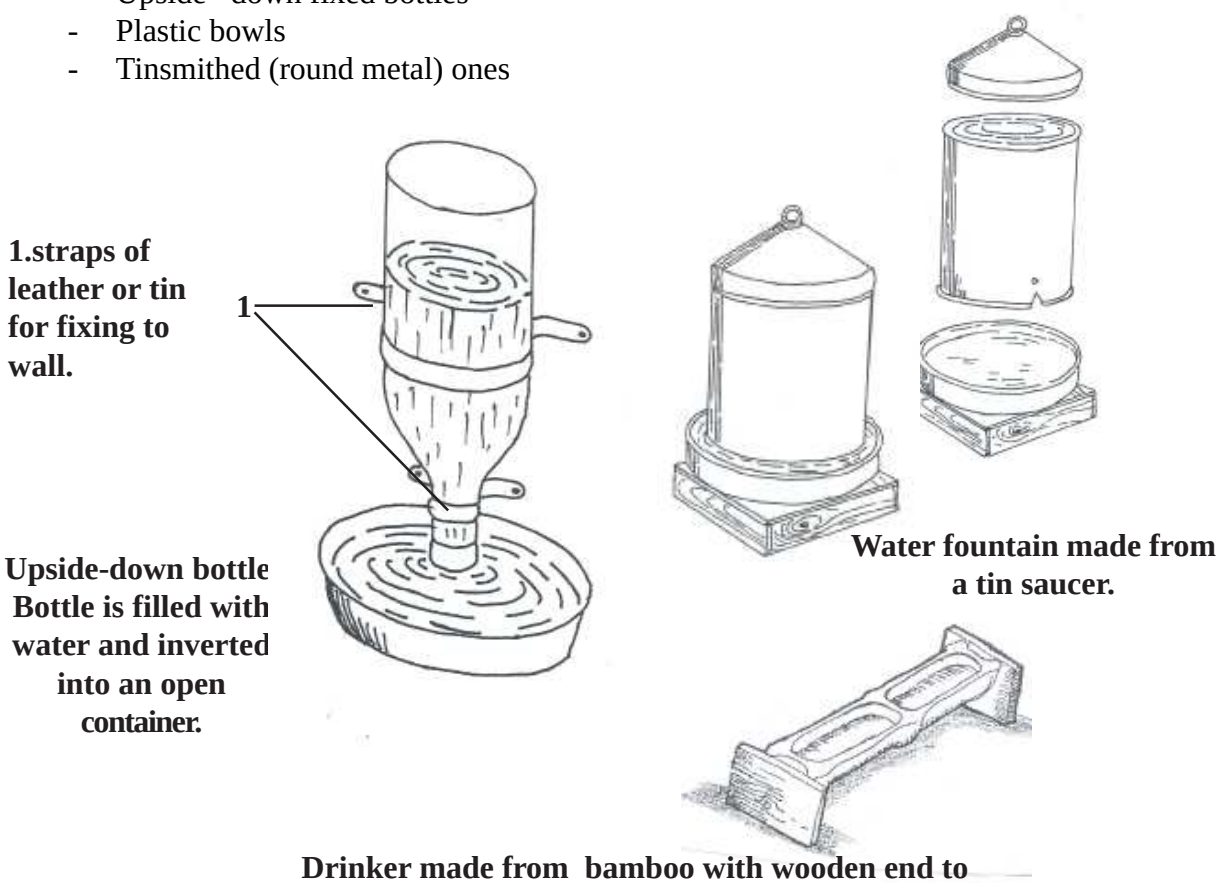


Figure 8. Examples of types of waterers and materials used

4.1.2 Points to consider when installing drinkers

- Make sure that enough drinkers are provided at different locations about 3 –5m apart
- Clean the drinkers daily
- Make sure that the drinkers are not leaking to avoid wet litter/floor.
- Make sure the litter is always dry round the drinkers.
- Hung drinkers on stones or tied to the roof by a long string/rope.
- If drinkers are suspended then move them to new spots (places) daily
- Table 3 below shows recommended drinker space per bird

Table 3. Recommended average drinker space requirement per bird

Age (in weeks)	Space (in cm) per bird
0 – 6	1
6 – 18	2 – 2.5
More than 18	3 - 5

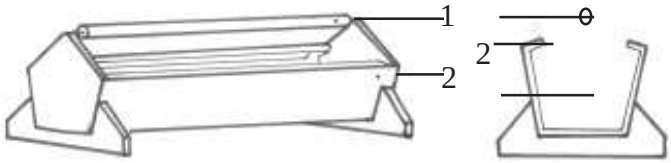
4.2 Feeders

- Feeders should be safe to the chickens
- These should be provided for economical use of feed and to keep the feed clean
- Feeders can be either round or rectangular (see figure 9 b and c)
- The may be made of wood. Old tyres, pots and tins can also be used as feeders
- Make sure there are enough feeders
- If they are rectangular allow 10 cm space per bird for feeding during the day but if all birds need to eat at the same time then more space is required, approximately 4 cm per bird.
- With round dishes space per bird is considerably less
- Table 3 below shows recommended feeder space requirement per bird.

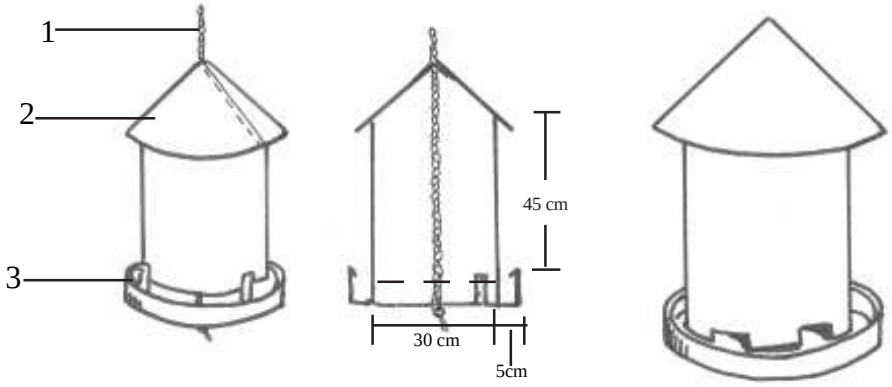
Table 4. **Recommended feeder space requirement per bird**

Age (weeks)	Feeding space per bird	
	Rectangular	Round dish
0- 16	4	1.5
6 – 18	8	3
18 -	1 0	4

Feed trough made from bamboo



Feed trough on platform. 1. spinner, 2. lip, 3. trough.



Hanging metal feeder. Such a feeder with a tray of 40cm in diameter is sufficient for 10 mature layers 1. hanging wire, 2. cover: sheet metal cone, 3. tray: sheet metal.

Figure 9. Different designs of feed troughs made from different materials

4.3 Perches

- Chickens like to rest or spend the night perching on high places, hence perches should be provided.

- Perches should be slates of 5cm by 5 – 7 cm and should be well fixed
- Perches should be placed 35 – 60 cm apart and should be 100 cm high.
- Allow 15 –25 cm space per bird on the perches.
- Put a wooden board underneath perches to catch droppings which could cause the litter too wet. This board can be cleaned weekly.
- The board can be placed at about 75 – 80 cm high
- Chickens excrete half (50%) of their droppings while perching
- The droppings from the board can be used as manure dried and mixed with ash or incorporated into compost manure hips

‘

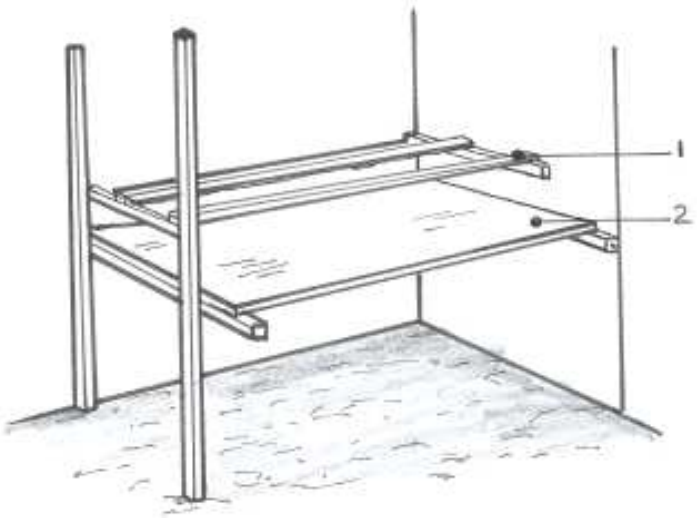


Figure 10. Perch with droppings board. 1. perch, 2. droppings board needs cleaning daily

4.4 **Nest Boxes**

- They are for hens to lay in their eggs
- Hens like laying eggs in more protected places, hence nest boxes are important
- Nest boxes can be made of wood, bamboo, reed or grass
- One nesting box measuring 30cm x 30cm and 40cm high is enough for every 5 layers.
- To keep eggs clean and safe from cracks put in some dry litter such as grass and wood shavings.
- For the litter to keep well in the nest box make a little partition about 10 –15cm high in front of the box.
- Figure 11 below shows different types of nesting boxes.

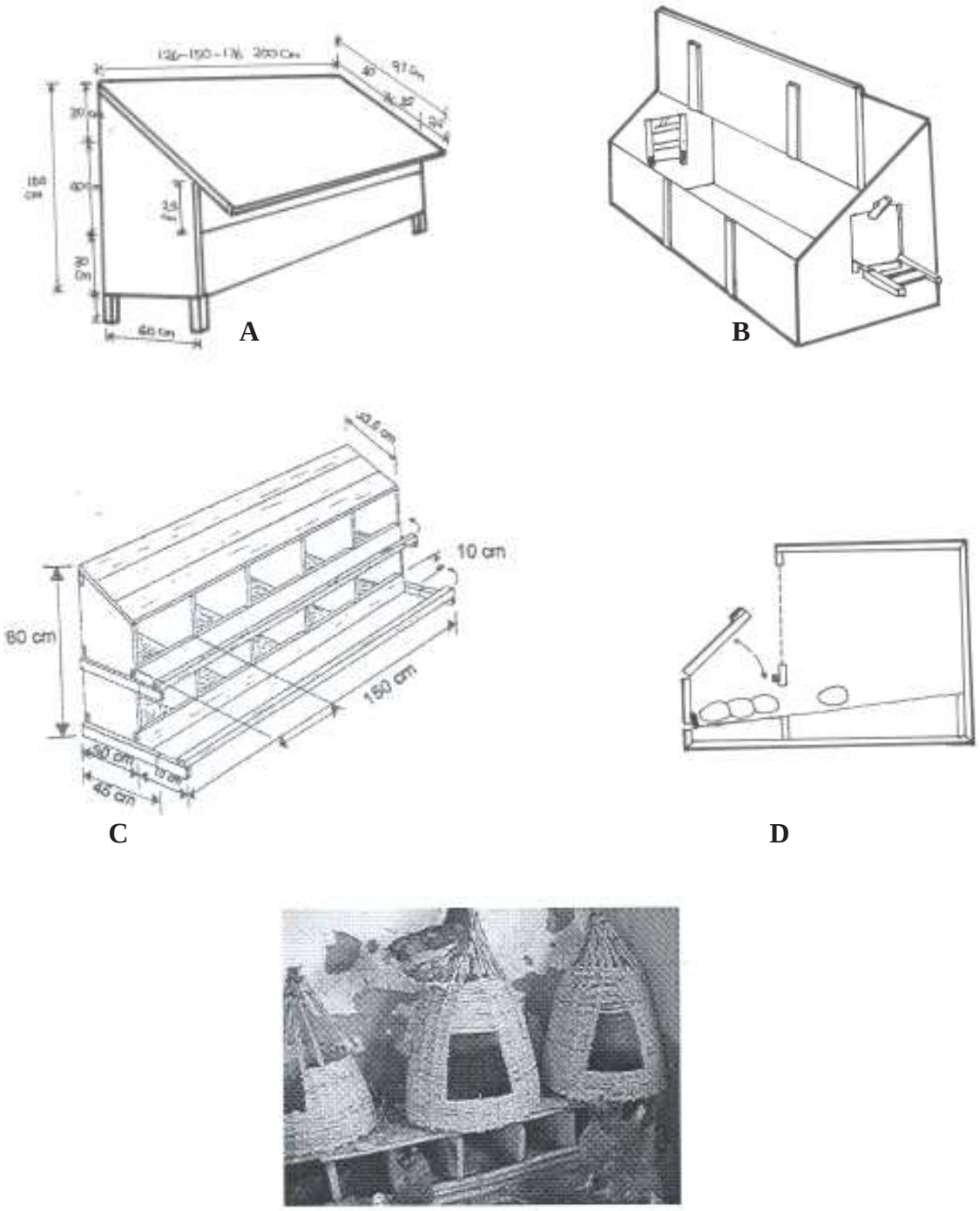


Figure 11. Different examples of laying nests. A, B and C are communal nests. D is a roll-away nest and E is a laying nest made of reed or bamboos.

4.5 General Poultry Management

4.5.1 Feeding

- Layers follow a strict three feed programme
  - Chick mash 1 - 8 weeks
  - Growers mash 8 – 18 weeks of age
  - Layers mash 18 weeks to end of lay.
- Where possible layers should be provided with grit in feeders
- At the same time of moving to laying house, the diet of the birds should contain a high level of calcium (3 – 4%).
- Supplementation of calcium may be supplied in form of calcium grit.

4.5.2 Water

- This is very critical especially in hot areas.
- Lack of water may result in reduced egg production and possibly death
- Provide clean water ad libtum

4.5.3 Light

- Light is very necessary for birds' upbringing especially layers
- Ample light is required for feeding and watering of the birds
- Increased lighting (photoperiod) in the chicken houses has been reported to increase egg production by 20%.
- Artificial day should be 16 – 18 hours light.

4.5.4 General hygiene

- Keep and maintain well ventilated khola
- Keep walls of deep litter kholas well plastered and if possible white washed to keep away parasites
- Maintain leak proof roofs
- Maintain dry litter/floors by also maintaining unleaking drinkers
- Stir and add clean litter regularly
- Clean the drinkers and feeders daily
- Provide safe drinking water
- Provide fresh feed everyday
- Do not allow strangers enter the kholas to avoid introduction of diseases such as Newcastle disease
- If possible provide disinfectant at the khola entrance
- Remove old litter timely.

CHAPTER 5.

ON FARM FEED MIXING AND FEEDING OF LAYERS

5.1 On Farm Feed Mixing

Due to high prices of commercial feed, farmers are encouraged to formulate and mix own feed at the farm. This should make use of available feed ingredients. The following procedure should be followed in feed formulation/ mixing.

i. In poultry feed formulation you need to know what the chicken requires to grow properly.
ii. A chicken needs energy feeds such as maize, maize bran, rice bran; protein feeds such as soybeans, groundnut cake, sunflower meal, fish meal, meat and bone meal; Mineral supplements such as Monocalcium Phosphate, Phosphate, lime, mineral premixes; Vitamin supplements such as vitamin premixes, amino acids (DI-methionine, lysine) and additives e.g. salt, coccidiostat.
iii. Identify the local ingredients available in the area. These could be maize, maize bran, rice bran, cassava, soyabeans, groundnuts, sunflower, beans, pigeon peas, cotton seed cake etc.
iv. Know the restrictions of each available feed eg. raw soybeans, contain antinutritional factors called tripsin inhibitor and rice bran contain too much fibre which inhibit growth.
v. Soya beans should be roasted on an open fire until brown or develop small cracks.
vi. Never overheat or over roast soybeans as the protein will be denatured.
vii. Fish meals is expensive therefore use as little as possible if readily and cheaply available.
viii. Determine what ingredients can be provided from your farm.
ix. You are encouraged to grow crops such as maize, soybeans, pigion peans, groundnuts, sunflower which you can use in your feeds for poultry.
x. Determine other ingredients required which you need to buy. These include methionine, salt, vitamin-mineral premix, lime or monocalcium phospahe, coccidiostats.
xi. Know the nutrient requirements of different poultry ages and groups.
xii. Consult a poultry Specialist or tables called Nutrient Requirements of Poultry for details. An example of nutrient requirements of different categories of poultry is indicated below.

Category	ME-Kcl/kg	CP (%)	CF (%)	Lysine (%)	Methionine (%)	Calcium (%)	Total phosphorus
Chicks	2000	20	5	1.0	4.5	1.0	0.7
Growers	2700	16	5	0.8	0.32	1.0	0.7
Layers	2700	16	5	0.7	0.20	2-3.5	0.8
Layers (HE)	2800	17	5	0.75	0.30	2-3.5	0.8
Broiler strater	3100	22	35	1.2	0.50	1.0	0.8
Broiler finisher	3200	20	35	1.0	0.45	1.0	0.7

ME- Kcl = Metabolizable energy measured in kilocalories
CP = Crude Protein
CF = Crude Fibre

xiii. Decide which ingredients you will use to meet the category of your birds

xiv. Let's say you want to make a 22% crude protein ration

xv. Decide the fixed ingredients required

xvi. For example, let's say you need 0.3% salt, 0.3% vitamin/mineral premix, 2.0% monocalcium phosphate, 1.5% lime and 0.1% DL-methionine.

xvii. The above fixed ingredients total 4.2kg

xviii. The other ingredients required should therefore supply 100 –4.2 = 95.8 kg

xix. Decide what ingredients you will use for the remaining 95.8%

xx. Let's say you have maize meal (8% CP), maize bran (11% CP), fish meal (67% CP), and soybean (37% CP) to use.

xxi. Maize meal and maize bran will be used as sources of energy while soybean meal and fishmeal will be used as sources of protein.

xxii. Decide the proportions of mixing the maize and maize bran and the fishmeal and the soybeans.

xxiii. Let's say 9 parts maize will be mixed with 1 part maize bran and 5 parts soybeans will be mixed with 1 part fishmeal.

xxiv. Using Pearson Square Method, the farmer will need 48.33 kg of maize meal, 5.37 kg maize bran, 35.08 kg soybeans and 7.02 fish meal before use.

xxv. Roast the soybeans before use

xxvi. Take a portion (about 1 kg maize meal and mix with the fixed ingredients).

xxvii. Mix thoroughly and then add the mixture of maize meal, maize bran, soybean meal and fish meal.

xxviii. Mix using a drum mixer or automatic mixer if available.

xxix. When these are not available, put the mixed ingredients on a cement floor.

xxx. Put the ingredients in layers on top of each other and mix a small part at a time.

xxxi Please note that thorough mixing is very important.

xxii. Feed the ration ad libitum.

The final 22% CP ration will be as follows:

Ingredient	Kg
Maize meal	48.33
Maize bran	5.37
Soybeans	35.08
Fish meal	7.02
Salt	0.30
Premix	0.300
MCP	2.00
Lime	1.500
Dl-methionine	0.100
TOTAL	100 KG

The following table shows three different formulae for layers mash that you may use to mix home made layers mash.

Feed ingredients	Layers 1 (Kg)	Layers 2 (Kg)	Layers 3 (Kg)
Maize meal	694	714	482
Maize bran	-	-	320
Fish meal	100	70	120
Soya bean meal	150	150	50
Limestone flour	40	50	15
Bone meal	10	10	8
Vitamin mineral premix	2	2	2.5
Iodised salt	2	2	2.0
Lysine	1.5	1.5	1.5
Methionine	0.5	0.5	0.5
Crude Protein Content (%)	18.2	16.5	15.3

5.2 Feeding Layers

Layers follow a strict three feed programme. It is essential that good quality feed is provided.

Chickens should be fed chick mash from the age of 1 to 8 weeks. They should be fed growers mash from 8 to 18 weeks of age. From the age of 18 weeks to end of lay, chickens should be fed layers mash. Feed should always be offered to birds ad libitum (without restrictions) to ensure adequate feed intake.

A chicken will approximately consume feed as follows:

Chicks (0 - 8 weeks of age) : 36g of chick mash per day

Growers (9 -18 weeks of age) : 72g of growers mash per day

A laying chicken will consume approximately 115g of layers mash per day.

Where possible, layers should be provided with grit in feeders. Once chickens have started laying (from age of 18 weks), their diet should contain a high level of calcium (3 -4%). Calcium supplementation may be supplied in form of calcium grit.

Avoid wasting feed by using well designed feeders. Fill only to half of the trough capacity. Feeders should be adjusted to height of the bird’s neck.

Never let the birds become hungry, or fed irregularly. This will reduce egg production.

Feed should be changed according to age:

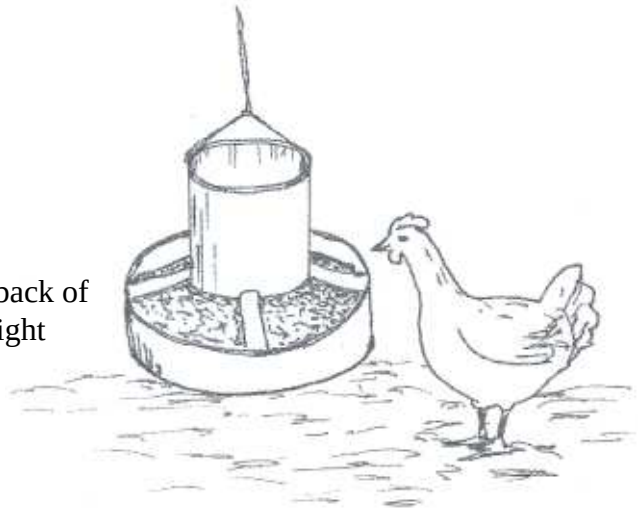
• Chick mash up to 8 weeks

• Growers mash from 8 weeks to 18 weeks

• Layers mash from 18 weeks onwards.

Abrupt changes from one type of feed to another is harmful to chickens. If possible change feed gradually over a few days. If is important to have some old feed stored when you start with a new mixture to avoid abrupt changes in feeding

Rim of feeder and back of bird at the same height



Feed requirement for chickens

Feed type	1 chicken	100 chickens	250 chikens
Chick mash - total	2.0 kg	200kg	500 kg
Growers mash - total	5.0 kg	500 kg	1250 kg
Layers mash per month	3.5kg	350 kg	875kg

How to change feed type		
Day 1	Chick mash	
Day 2	3/4 Chick mash	1/4 Growers mash
Day 3	1/2 Chick mash	1/2 Growers mash
Day 4	1/4 Chick mash	3/4 Growers mash
Day 4	Growers mash	

CHAPTER 6
KEEPING EGG QUALITY

- When eggs are produced for human consumption, they should be kept as clean as possible.
- Eggs should be collected as frequently as possible, at least three times per day.
- Eggs should be of conventional shape (oval)
- Eggs must withstand handling (strong shells)
- Shell colour is a reflection of the breed or strain used
- Most people prefer brown to white egg shells.
- Do not keep eggs for a long time to prevent them becoming stale
- Test eggs by placing them in water. Those that float are likely to be old and unsound.
- Do not store eggs in smelly soundings because they easily take in smells.
- Use of clean nesting boxes is prerequisite to clean eggs.
- Always provide nests to layers

CHAPTER 7.
CULLING HENS

Culling hens refers to the identification and removal of non-laying or low producing hens from a laying flock. Unless the birds are diseased, they are suitable for marketing or home consumption. The following topics will address the culling process.

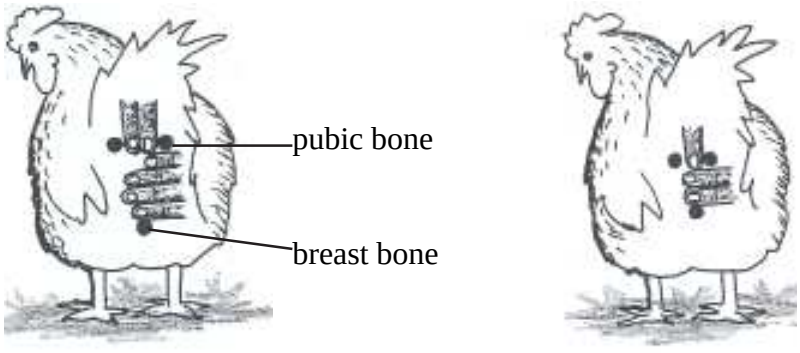
Removing the inferior birds reduces the cost of producing eggs, reduces the incidence of disease, and increases the available space for more productive hens. Hens eat feed whether they are laying or not. Removing the cull birds will make more feed and space for more productive birds.

Individual sick birds should be culled as soon as noticed. They cause a great risk to other birds.

Avoid the temptation to separate sick birds and give them special treatment. They still may infect the rest of the flock.

The following table and figure 12. below give guidelines on how to detect non-layers.

LAYING	NOT LAYING
1. Comb large and glossy red	1. Comb shrinked and dull red
2. Pubic bones thin and pliable. Possible to place 2 fingers between the bones	2. Pubic bones thin and stiff. Possible to place 1 finger between the bones
3. Possible to place 4 fingers between the pubic bones and end of breast bone	3. Possible to place only 2 fingers between pubic bones and end of breast bone



laying bird

non-laying bird

Drawing from "The Tropical Agriculturalist POULTRY" by A. J. Smith. Courstesy of Macmillan Press Ltd

Figure 12. Detection of a non-laying bird

CHAPTER 8.
COMMON POULTRY DISEASES

There are many poultry diseases that affect poultry. However, the commonest poultry diseases in Malawi include Newcastle disease, Coccidiosis, Gumboro and Infectious Coryza. These affect all types of chickens: village chickens, broilers and layers.

8.1 Newcastle disease

- Caused by a virus that attacks the gastro-intestinal, respiratory and nervous systems of birds of any age.
- May spread to blood, river and reproductive tract, then to the brain.
- The germs are spread during breathing and in faeces.
- The disease occurs from August/September to December/January during the hot months.

Clinical signs

- Various combinations of respiratory signs – incoordination and neck twisting and inability to stand.
- Respiratory signs include snuffles, frothy air sacs, decreased gain, deaths and increased carcass condemnation
- In layers, signs are followed by a reduction or stoppage of laying for 7 – 21 days.
- 10 – 100% birds may die within a few months in village chickens and a few days in commercial systems.

Figure13. Some clinical signs of Newcastle disease

Prevention

- Good management: cleaning and disinfection of houses.
- Good hygiene: Infected birds should be killed and premises disinfected
- Vaccination: Layers should receive 2 to 3 doses of vaccine at 14 and 28 days, then just before they start laying.
- If you use Lasota vaccine, it is recommended that you vaccine your laying flock every three months.

Treatment

- There is no treatment for Newcastle disease
- Avoid stress and make sure birds have plenty of water.
- Slaughter all birds and leave the farm empty for several weeks.
  Disinfect the kholas before restocking.

Vaccination programme

AGE	DISEASE	VACCINE/DRUG	NOTES
Day 1	Mareks		Usually at hatchery
Day 9	Gumboro	Bursine-2	In drinking water
Day 16	Newcastle	V4/Hitchner/Lasota	In drinking water or eye drop
Day 18	Worms	Piperazine	In food or water
Day 19	Newcastle	V4/Hitchner/Lasota	In drinking water or eye drop
Day 21	Gumboro	Bursine-2	In drinking water
Day 21	Worms	Piperazine	In food or water
Day 28	Newcastle	V4/Hitchner/Lasota	In drinking water or eye drop
Day 40	Newcastle	V4/Hitchner/Lasota	In drinking water or eye drop

8.2 Coccidiosis

- Coccidiosis is caused by a parasite that multiplies and lives in the lining of the gut.
- It may affect birds under 10 weeks of age and is spread from bird to bird by eating contaminated food, water and litter.
- It is therefore, important especially under village conditions where cleaning of houses may not be practiced, that prevention and control methods are known.

Clinical signs

- Weight loss, paleness and few deaths are clinical signs of the disease
- Droppings become watery, blood appears in the droppings.
- The birds stand with their heads down, drooping wings and ruffled feathers.
- There is blood diarrhoea.
- On post-mortem examination, intestines are inflamed.

Prevention and control

- Good management – keep litter dry at all times
- Check and remove dump litter and replace with new one.
- Check and remove leaking waterers and replace with new ones.
- Clean drinkers and feeders regularly

- Avoid overcrowding
- It may be necessary to put coccidiostat in feed for first 6 weeks. Some feeds have these mixed already
- Do not mix young and old birds, as older ones will infect young ones.
- For batches, clean and disinfect between batches.

Treatment

- Give birds sulpha-based drugs such as Triple Sulpha or Anticoc
- Amprolium is available, but birds may not respond any longer due to resistance.

8.3 Gumboro

- This disease is known as infectious bursal disease (IBD)
- Many intensive and semi-intensive flocks experience losses of 10- 50% especially in broilers
- This will become increasingly important to smallholder farmers who want to go into commercial production
- The occurrence of this disease may also coincide with Newcastle disease and so can easily be confused by field staff and farmers who may call it 'Chigodola '.

Clinical signs

- Affected birds become depressed, stop eating and may drink excessively making the litter wet.
- Birds sit on their cloaca and have a yellowish diarrhoea.
- 10 – 50% of the bird population may die within a few days.

Picture from "Intervet - Important Poultry Diseases. Courtesy of Intervet International BV.

Prevention and control

- Good management and good hygiene
- Clean and disinfect the house between batches or under village conditions, move birds to another temporary house while disinfecting the chicken house
- Leave the house empty for at least a week after cleaning
- Use Bursine –2: a dose of live vaccine given orally at 10 days old followed by a second dose at three weeks of age

Treatment

- There is no treatment for this disease. Once the disease has occurred the virus is difficult to get rid of.
- Avoid stress
- Make sure litter is dry

8.4 Infectious Coryza

Infectious coryza is highly contagious disease as the birds remain infected for a long time.

Clinical signs: First signs are sneezing and then larger swelling around the eyes. The birds also get a thick liquid around the nostrils and eyes. Mortality from Coryza is low, but egg production will drop.

Prevention: Poor housing, poor ventilation and damp litter can cause this disease. Therefore, keep the birds in good quality housing, under proper management and hygienic conditions.

Treatment: There is no real treatment for this disease, but giving the birds one of the Sulpha drugs may help. Consult veterinary personnel for assistance

Vaccination: Layers could be vaccinated when they are 12 weeks old and again at 15 weeks of age. This vaccine is injected into the back of the bird's neck.

8.5 Fowl Pox

This disease affects birds of all ages, but it usually affects birds between ages of 6 and 12 months.

Clinical signs: The disease spreads quite slowly. It sometimes develops over 2 – 3 months. Half of the flock may die from the disease. The disease can develop in two ways:

- On the skin: White bumps like blisters grow on the wattles and comb. The bumps grow in size. When the disease has developed, the bumps break open. The comb and wattles develop raw bloody patches. This is the common form of the disease.
- In the mouth ant throat: birds get white patches at the corner of their beaks. These spread to the tongue and inside the mouth. The patches can grow together and spread to the throat. Some birds then die because they cannot breath.

Prevention: Control mosquitoes and lice. Overcrowded birds are likely to get fowl pox.

Treatment: There is no treatment for Fowl Pox.

Vaccination: It is possible to vaccinate chickens any time between 3 and 12 weeks of age.Vaccinate layers before they start laying eggs. If they are vaccinated later, egg production will drop.

8.6 Mareks Disease

It is a virus disease that cripples and kills poultry, especially growing birds.

Clinical signs: The first sign is when the bird starts "drooping" a wing or a leg. The wing or leg becomes paralysed and cannot be moved. The dead bird will often have a very large liver. The figure below shows some clical signs Mareks disease.

Picture from "Intervet" - Important Poultry Diseases. Courtesy of Intervet International BV.

Prevention: Do not mix birds of different ages as the disease spreads from older to younger birds

Vaccination: Vaccine is given when the birds are one day old. Therefore buy chickens already vaccinated from a reputable hatchery eg. Charles Stuart in Lilongwe or Blantyre.

8.7 Chronic Respiratory Disease

Chronic Respiratory Disease appears similar to a cold, but is more serious and can kill more birds if it is not treated.

Clinical signs: The birds are listless, look uncomfortable and squat with their tail feathers down.

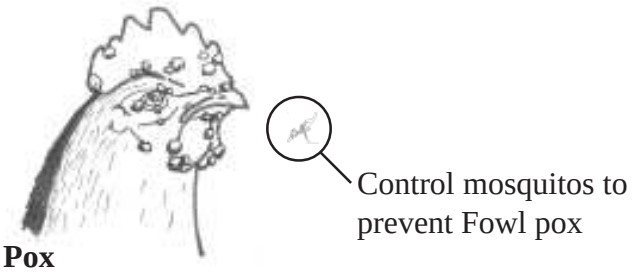
They have running noses, sneeze and in serious cases there is blood in their droppings.

Prevention: Do not allow the birds to get chilled.

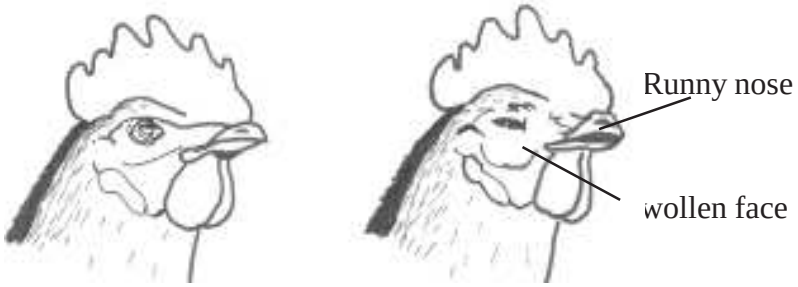
Treatment: Treat with terramycin powder in drinking water.

8.8 Other diseases

There are many other diseases. It may be difficult to tell one disease from another. Some can only be identified after laboratory tests.



Fowl Pox



Infectious Coryza

Normal layer Layer with Infectious Coryza

Coccidiosis

Clinical signs of coccidiosis include blood mixed with droppings, drooping wings. Chickens will usually not eat.

Figure 14. Clinical signs of Fowl Pox, Infectious Coryza and Coccidiosis

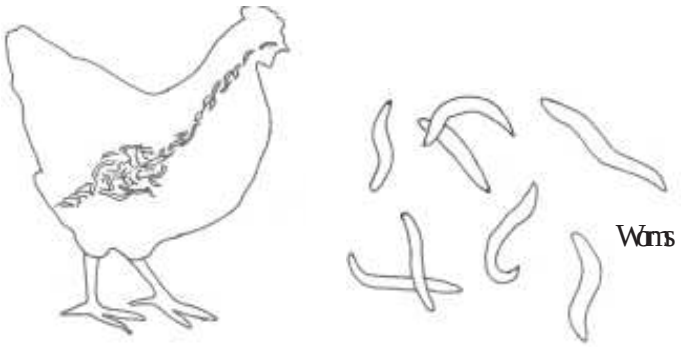
8.9 Internal Parasites

Worms

Clinical signs: Round-worms and tape worms can affect chickens. Chickens with worms are weak. They don't grow properly. Sometimes they have diarrhoea and worms can be seen in their droppings

Prevention: Keep the ground well drained. Make sure there is enough sunlight. Sunlight kills worms. Earthworms, snails, beetles and grasshoppers carry worms. To control these creatures treat the run with chemicals.

Treatment: Give chickens dewormer. Ask your supplier for details. Consult your local veterinary personnel for assistance.



Internal parasites live inside the chickens. All internal parasites are worms. They often cause yellow and frothy diarrhoea; anamia, general weakness, depressed appetite.

Coccidiosis causes blood diarrhoea. Clinical signs include depressed appetite, chickens stand with their wings drooped to the floor and their heads pulled back into their body, and with the eyes

Figure 15 Clinical signs of internal parasites

8.10 External Parasites

Lice

Clinical Signs: Various types of lice are found on birds. All cause great irritation to birds, loss of blood and anaemia. Layers with lice scratch a lot and egg production drops.

Prevention: Avoid overcrowding and pay attention to cleaning and good sanitation.

Treatment : Dust chickens with actellic dust. Follow instructions on the label.

8.11 Mites and Tampans

There are several kinds of bloodsuckers, but red mites and tampans are the most dangerous. They hide in cracks by day and come to feed on the birds at night. Mites can kill chickens.

Prevention: The chicken houses should have smooth inside walls that have no cracks to lodge mites and fowl ticks.

Treatment:

- Spray chicken houses with insecticide such as Fendona. Follow the instructions on the label
- Make houses which are easily cleaned, well ventilated and not too dark.
- Clean and creosote the poultry houses between different batches of poultry.
- Paint the house with old engine oil regularly

External parasites live outside the chickens. They suck blood and cause irritation

Biting Lice

Various types of lice are found on birds. They include body lice, head lice and shaft lice.
They all cause great irritation to birds, loss of blood and anaemia. Layers with lice scratch a lot and egg production drops.

Red Mite

Tampan

Mites and Tampans are blood suckers. They hide in cracks by day and come to feed on the birds at night. Mites can kill young chikens.
Clinical signs of Mites include swelling legs, loss of weight, anaemia and pulling out of feathers due to itching.

Flea

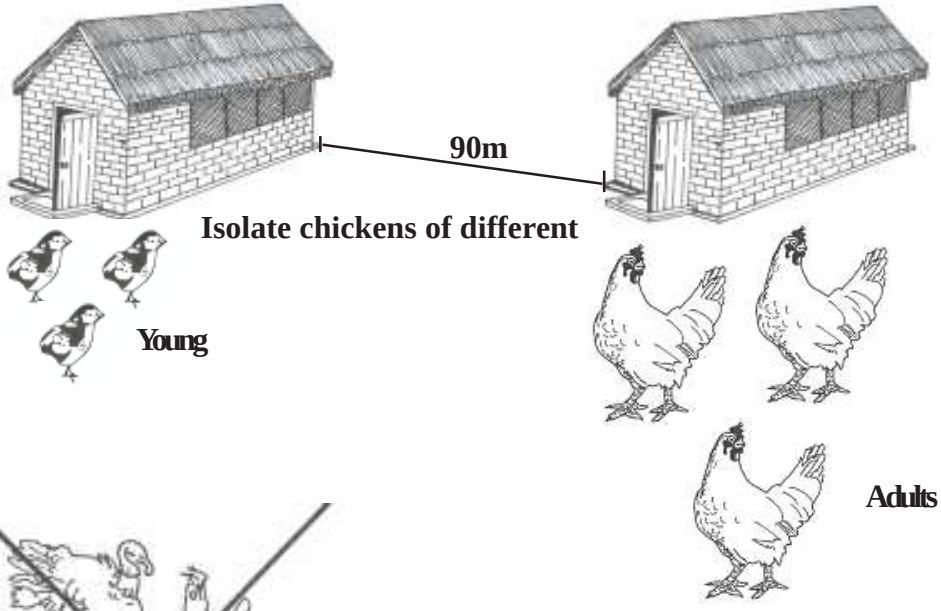
Fleas bite through chicken skin to suck blood. Chickens with fleas scratch their bodies a lot and are restless. Sometimes fleas look like black spots on the face of birds.

Figure 16. Clinical signs of external parasites

CHAPTER 9.
HOW TO KEEP CHICKENS HEALTHY

Proper housing

Stir and add clean litter regularly to keep it dry



Isolate chickens of different

Do not mix chickens with other

Cull sick birds

Separate sick chickens from healthy chickens

Healthy chickens

Sick chickens

Vacinate chickens against major diseases (Newcastle diseases, Fowl pox, Infectious Coryza)

CHAPTER 10.
RECORD KEEPING

Accurate records should be kept on number of birds, type of breed (strain), feed intake, morbidity, mortality, sales, drug and vaccinations administered. Records must be complete and accurate, clear and concise.

To make the system work:

- One person should be responsible for record keeping.
- Keep all records in one place
- Use a filling system
- Write the records every day
- Calculate the totals every month
- Weigh the feed

Egg producers should always keep records for the following reasons:

- Compare present with past flock
- Compare income with expenditure
- Establish deviations in production trends
- Identify and settle management problems

For satisfactory record keeping there is need for

a) Cash book

Money received				MoneySpent (Payment)			
Date	Item	K	t	Date	Item	K	t
	Eggs at				Pullets purchased		
	Spent layers at				Chicks purchased		
	Manure at				Vaccine purchased		
					Dewormers purchased		

(b) Production Records

Breed ..... Year .....

Daily Layers Record Supplier ..... Month .....

House number .....

Date of arrival .....

Age at arrival .....

No. at beginning of month .....

No. weeks of lay at beginning of month .....

Day	Eggs laid	Birds	Dead	Culls/ sales	Chick feed/kg	Grower feed/kg	Layer feed/kg	Remarks
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
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31								

Average number of birds ..... (for use in bird per day calculation)
Number of marketable eggs .....(number laid less number broken)

Chick feed ....kg at .....per kg.....	Eggs per bird per day ..... Value ..... K
Growers feed ....kg at .... per kg	Feed per bird per day .....Value K....
Layers feed ....kg at ... per kg	Profit (eggs value minus feed cost) .....
Total feed ...kg Total cost	Total for khola per month Profit (egg value minus feed cost): K .....

CHAPTER 11.
MARKETING EGGS

Proper marketing of eggs is prerequisite for good egg marketing. Marketing means satisfying customers' needs. It begins with the production of eggs and ends when the customer buys them. If no body wants to by your eggs, you cannot make a profit and group members will soon loose interest. Therefore ways have to be found to satisfy the customers, and to sell enough to make a profit.

The following principles should be adhered to for successful egg marketing.

Product (eggs)

- The eggs need to be of good quality
- They should be clean
- They should be readily available
- Store unsold eggs in a cool place
- Properly pack eggs to attract customers
- Never expose market eggs to awful flavours/odours.

Place

The place where the eggs are sold should be central, easy to find and clean, with good display and storage facilities. Eggs need to be stored under clean and cool environment to avoid spoilage.

Price

The price of eggs must be reasonable, competitive and displayed clearly. Consider special prices to attract customers. You may grade (separate eggs into weight classes) and peg egg prices against grades.

Promotion

You may promote egg sales through advertisements on the radio, in newspapers etc.

Plan

The operations of the egg production enterprise should be flexible. The group's plans should be reviewed regularly and changed if necessary.

People

Entrust the selling of eggs to members of the group who are polite and honest, and that can provide good service

CHAPTER 12.
CHECKLIST FOR GOOD POULTRY MANAGEMENT PRACTICES

1. Always have house and all required equipment ready before arrival of chicks at the farm.
2. Make order well in advance to ensure delivery on required days
3. Purchase day old chicks from a reputable and reliable hatchery
4. Purchased day old chicks from a hatchery that is certified free from Mark's disease and Mycoplasma and Salmonella.
5. Ensure that your day old chicks have been vaccinated against Marek's Disease at the hatchery.
6. Check the quality of day old chicks purchased before placing them in the house.
7. Never rear deformed chicks that are lame, paralysed or with crooked beaks, curled toes.
8. Avoid stress when transporting chicks from hatchery to the farm.
9. Where possible transport chick during early morning hours.
10. When stressed, provide your chicks with supplementary minerals and vitamins.
11. If you plan t buy grown-up pullets, make sure that they are coming from a disease free flock. Consult the local veterinarian in your area.
12. Always provide adequate heat during brooding period.
13. House your birds using recommended bird densities. Always avoid overcrowding your birds.
14. Follow and carryout effective vaccination programmes. Always follow manufacturer's instructions when administering vaccines or any drug.
15. Always provide adequate number of drinkers and feeders.
16. Always provide birds with clean drinking water.
17. Always provide feed with the right amount of nutrients.
18. Have feed quality occasionally checked for quality and presence of toxins and contamination.
19. Only purchase feed from reputable feed millers.
20. When mixing own feed, incorporate cocciostat to prevent coccidiosis
21. Prevent and control ectoparasites (external parasites) such as ticks, mites and lice.
22. Deworm the birds for endoparasites (internal parasites) such as worms.
23. Make chicken houses rodent proof. Check for any holes in the roof, outside the houses and make sure doors are firmly closed. Use baits or traps to kill rodents when noticed.
24. Always observe bird growth, behaviour, feed consumption any abnormalities in order to provide prompt remedial measures.
25. Send any sick or suspected bird for diagnosis at a veterinary laboratory.
26. Burn or bury all diseased chickens.
27. Provide disinfectant dips for both workers and vehicles entering the farm premises.
28. Observe a strict no visitor policy to the poultry houses
29. Always keep birds of one age at a time in one house.
30. Disinfect all poultry houses between batches. Formaldehyde can be used as fumigant.
31. Clean all equipment during disinfections
32. Cover open sides walls of kholas with wire mesh to prevent losses from predators and thieves.
33. Insulate the house in hot weather to prevent heat stress
34. Hygiene and bio-security must be a way of life for a poultry farmer.

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