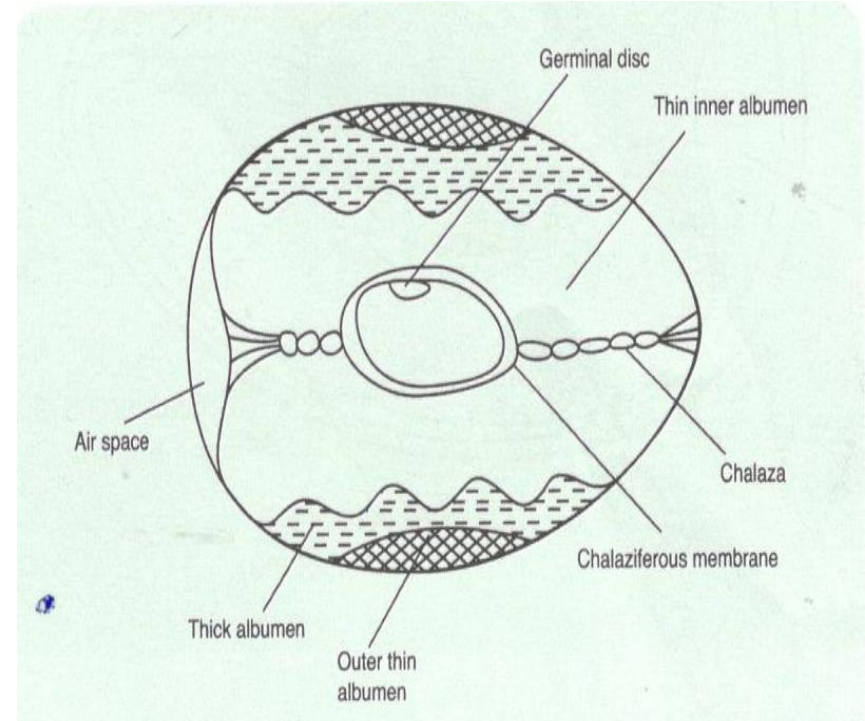
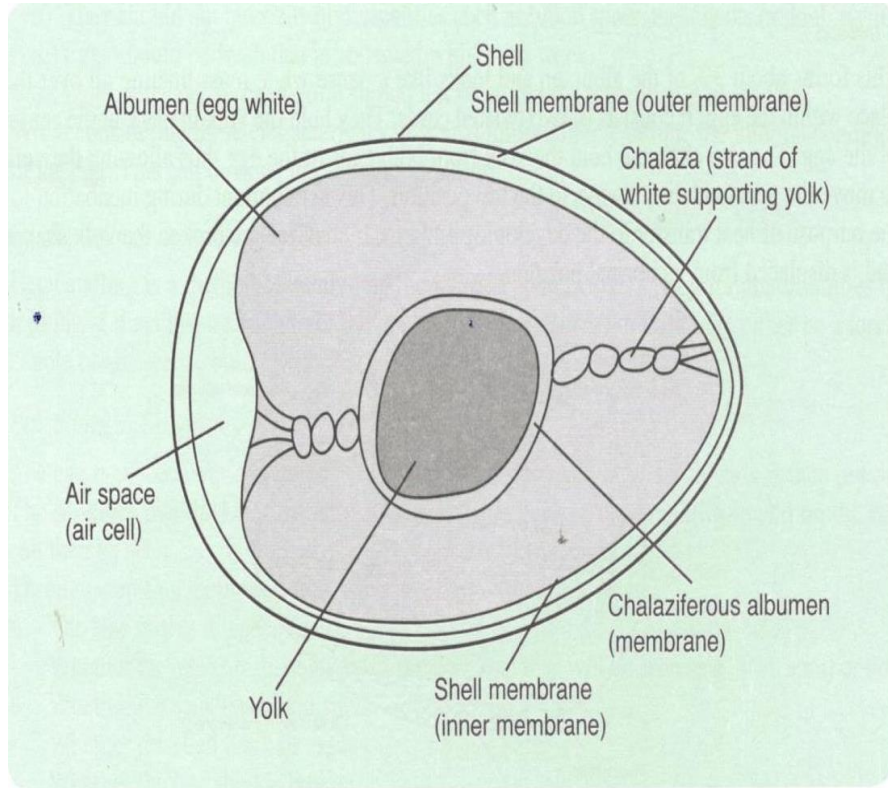


# **1. LIVESTOCK PRODUCTION 5 (POULTRY PDODUCTION)**

12-May-21

# Parts of an egg

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1. **Shell-** It is the outer covering of the egg consisting of calcium and phosphorus compounds which make it hard.

### **Functions.**

- i. It gives the egg its shape.
- ii. Protects the inner parts of the egg.
- iii. It allows gaseous exchange because it is porous.
- iv. Prevents entry of micro-organisms.

2. **Shell membrane-** It forms the inner lining of the shell.
  - It is made up of two membranes (inner and outer) whose contact is not easy to identify.
  - They separate at the broad end to form air space/air sac/air cell.

### **Functions.**

- i. Outer and inner membranes separate to form air space. The air trapped is used by the developing embryo during incubation.
- ii. Determine the egg shape.
- iii. Protect inner parts of the egg.

3. **Air space/air sac/air cell-** It is formed at the broad end of the egg enclosed by two membranes.
- It is used for gaseous exchange.

### **Formation.**

- It is formed immediately the egg is laid.
- The body temperature in a hen is higher than outside.
- Once the egg is laid the lower temperature on the outside causes the contraction of the egg contents creating the space which fills with air.

4. **The yolk-** It is yellow in colour and spherical.
- It contains nutrients (i.e. vitamins, fats, minerals and proteins).

### **Functions.**

- i. Stores nutrients for the embryo.
- ii. Carries the germinal disc which develops into the embryo.

5. **Albumen/Egg white.**- it is jelly-like colourless fluid when fresh and turns white when cooked.

### **Functions**

- a) Surrounds the yolk
- b) Stores food for developing embryo/ chick.
- c) Acts as a shock absorber.

6. **The chalaza-** It is a white dense mass of fluid.

- It consists of two twisted cords.

### **Functions.**

- i. Hold the yolk in central position of the egg
  - ii. The two chalazae hold the yolk from both ends of the egg ensuring the egg yolk/ germinal disc always move to the top position.
- This is important during incubation for the purpose of heat transfer to the developing embryo.

# Incubation of eggs

6

- **Egg incubation** is the embryonic development of a fertilized egg into a chick under correct conditions which will ensure that a chick is finally hatched.

## **Selection of eggs for incubation.**

- Eggs selected for incubation should have the following characteristics:
  1. They should be fertile.
  2. They should be of medium size (55-60 grams).

3. They should have smooth shells.
4. They should be oval in shape.
5. They should be free from any cracks in the shells.
6. They should be clean to ensure that the pores are open.
7. They should not have any abnormalities e.g. blood spots, meat spots, or double yolk.
8. They should be fresh i.e. collected within one week.

## Study question.

List the qualities of shell considered when selecting eggs for incubation.

1. Texture/smoothness.
2. Absence of cracks.
3. Cleanliness.
4. Oval in shape.

## Egg abnormalities

### A. Internal abnormalities.

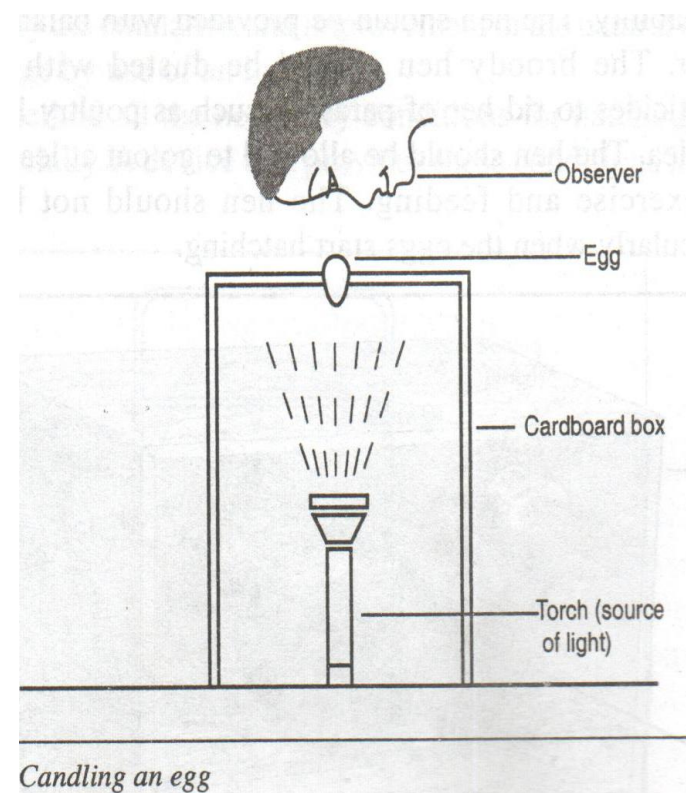
1. Blood/meat spots within the yolk.
2. **Double yolks**- two yolks surrounded by one membrane.
3. **Egg within egg**- two complete yolks each with its own membrane seen in one egg.
4. Yolkless eggs

### External abnormalities.

- i. Thin shelled eggs.
- ii. Thin cracks on the shell.
- iii. Very porous shells.

## EGG CANDLING.

- This is a method of examining the internal conditions of an egg for abnormalities by looking at it against strong light in a dark room.





## Procedure of egg candling.

- The egg is placed over a hole made on a cardboard box.
- A light under the box is then put on.
- The observer then looks at the egg against the light below

## Reasons for candling.

- i. To check egg abnormalities.
- ii. To monitor chick development during incubation.
- iii. To check whether the egg is fertile.

- It is done at least twice during incubation i.e. after 5-7 days/ 1 week to check for fertility (if fertile, blood veins will be seen), and on 18<sup>th</sup> day to confirm the presence of a chick.
- On 18<sup>th</sup> day the following are observed:
  - i. A large dark section of developing chick.
  - ii. A small clear section of air space.

### **What is observed through candling.**

1. The size of air space/ cell.
2. Whether the egg is fertile or not. If it is fertile, the germinal disc will be seen as a black spot.
3. Whether the yolk has blood spots.
4. Whether the shell has hair cracks.
5. Whether the egg shell is broken.
6. Whether the shell is very porous

### **Conditions that reduce hatchability.**

1. Presence of cracks.
2. Double yolks.
3. Having no yolk.
4. Meat/Blood spots.
5. Rough shell.
6. Unfertilized egg.
7. Very small/tiny eggs.
8. Eggs older than one week.

### **Causes of soft shelled eggs.**

1. Lack of calcium in the feed.
2. Diseases e.g. Newcastle.

# Methods of incubation.

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## A. NATURAL INCUBATION.

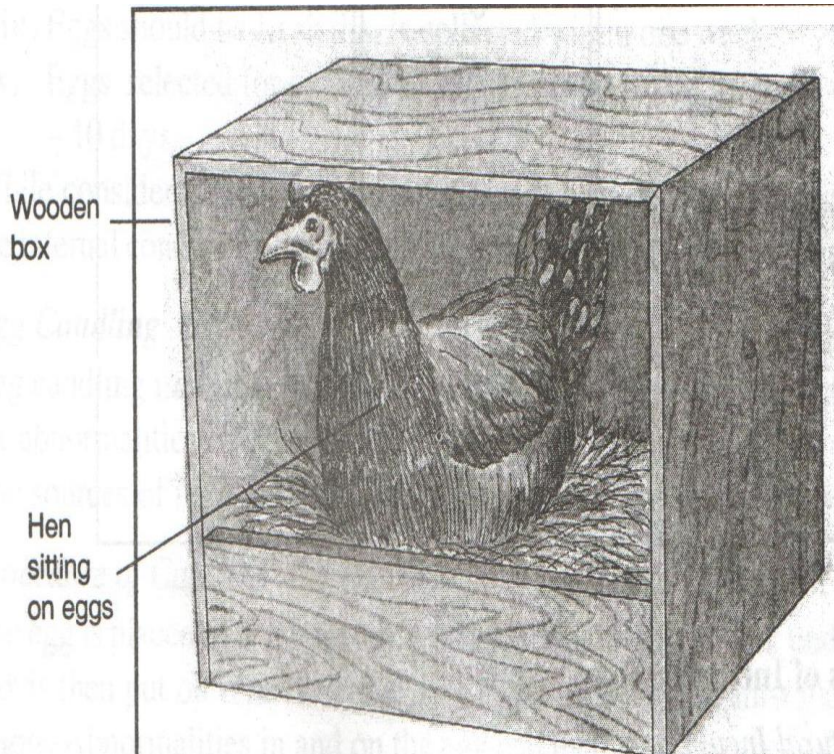
- This is where a hen is allowed to sit on eggs to provide optimum conditions for embryonic development/hatching.
- It is done through a broody hen.

## Signs of broodiness in hen/poultry.

1. The hen stops laying eggs.
2. The hen continues to stay in the laying nest after laying
3. The hen plucks off her feathers which she uses in the incubation nest.
4. The hen becomes aggressive and produces a characteristic sound when approached in the nest.

## Preparation and management of natural incubation.

- ✓ A nesting box (made from half debe, carton box, karai or wooden box) should be provided to a broody hen.
- ✓ The nesting box should be dry, spacious to allow movement of the hen and placed in the well ventilated place.
- ✓ The nesting materials e.g. dry grass, sawdust and wood shavings should be placed in the nest. This helps to maintain warmth in the nest.
- ✓ The hen is given an adequate number of eggs (about 10-15) to sit on.
- ✓ The broody hen should be provided with balanced feed and water.
- ✓ The broody hen should be dusted with appropriate insecticides to control parasites (e.g. louse or stick fast flea).
- ✓ The broody hen should be allowed to go out at least once a day for exercise and feeding.



## Qualities of a good laying/ nesting box.

- i. Should be dimly lit/dark.
- ii. It should be spacious.
- iii. Should have dry beddings to keep it warm.
- iv. Kept in secluded parts of the house.

## Advantages of natural incubation.

1. A small-scale farmer who cannot afford the incubator can multiply the flocks using this method.
2. It is less laborious and there is no need of turning the eggs and checking the temperatures.
3. Little skill is required.
4. The margin of risk is reduced.

## Disadvantages of natural incubation.

1. Only few chicks can be hatched at a time by one hen.
2. The farmer cannot plan when to incubate.
3. Diseases can easily be transmitted from infected hen to chicks after hatching.
4. Hens can only be used when broody.

## B. ARTIFICIAL INCUBATION

- ✓ In this method, all the conditions necessary for hatching are provided artificially in a device called **incubator**.

### Conditions necessary for artificial incubation.

1. **Temperature-** it is necessary for embryonic development.
  - It should be maintained at 37.5-39.4 degrees celcius.
  - Lower or higher temperatures would kill the developing embryo.
2. **Fresh air/ ventilation-** there should be enough fresh air circulation because oxygen is necessary for embryonic development.
  - Ventilation facilitates gaseous exchange and helps to control humidity.
3. **Relative humidity-** it should be maintained at 60%.
  - Low humidity causes the embryo to lose moisture and die.
  - High humidity lowers hatchability and leads to production of bigger chicks which look marshy.
  - It is maintained by placing a damp cloth or water in a tray within an incubator.

## Incubator

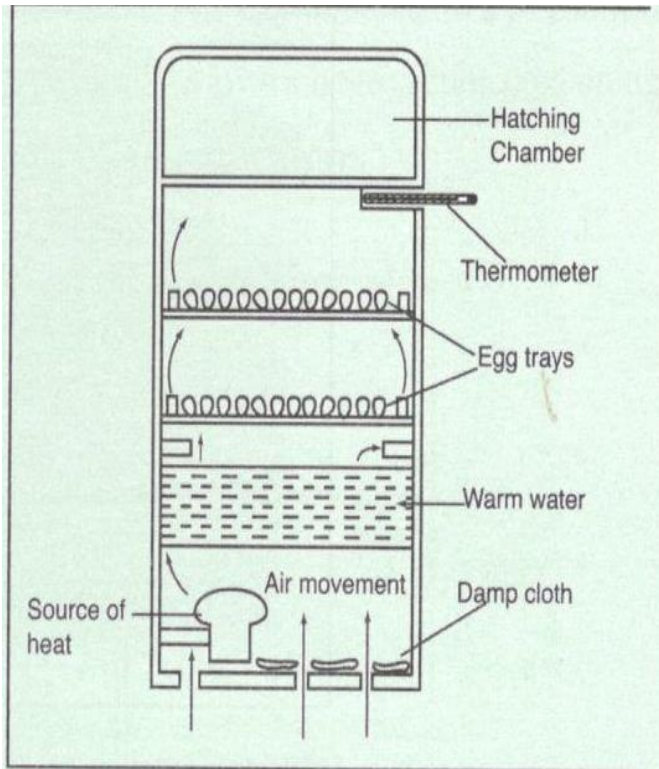


Fig. 1.5: Structure of a simple incubator \*

## Incubator

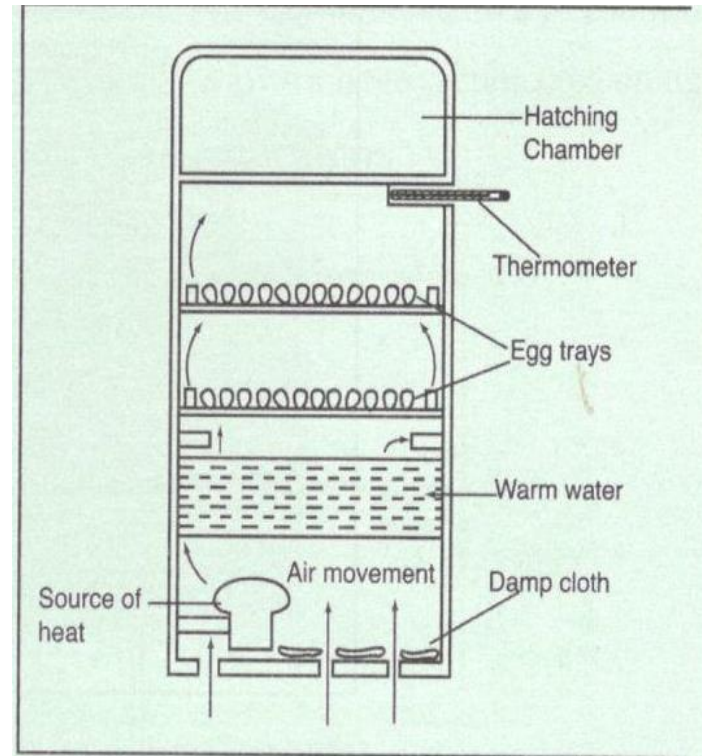


Fig. 1.5: Structure of a simple incubator \*



4. **Egg turning-** this is done along the axis of the egg at 45 degrees from vertical and each time in different directions.
    - This is to avoid the germinal disc sticking onto the egg shell leading to lack of hatchability.
    - Wrong turning of the egg may result in breakage of blood vessels.
- Preparation and management of artificial incubation/ incubator.**
- ✓ Clean and fumigate/ disinfect the incubator before putting the eggs and put it in a clean room.
  - ✓ Set well selected eggs.
  - ✓ Turn the eggs after every 6-8 daily but in the first 24 hours and the last 3 days the eggs should not be turned.
  - ✓ Remove any infertile egg on the 5<sup>th</sup> day and any broken egg.
  - ✓ Add water/ place a damp cloth to maintain humidity.
  - ✓ Maintain the temperature at the appropriate range.
  - ✓ Ensure that there is proper ventilation.
  - ✓ Transfer the eggs into the hatching compartment after 19<sup>th</sup> day.

## Advantages of artificial incubation.

1. Many chicks can be hatched at a time.
2. It is possible to plan when to hatch.
3. It is easier to control diseases and parasites.
4. The incubator is usually ready when required.

## Disadvantages of artificial incubation.

- i. The incubator is expensive to buy hence capital investment is high.
- ii. It requires more labour
- iii. It requires more skill than natural method.
- iv. It involves high risks of damaging all the eggs or embryos if management is poor.

## Sources of chicks

- When sourcing from day-old chicks the following factors are considered:
  1. The reputation of the supplier.
  2. Time taken from the hatchery and the farm.
  3. Type of chicks available.

## Examples of reputable hatchery.

1. Muguku poultry farm, Kikuyu.
2. Lake chicks hatchery, Kisumu.
3. Kenchick poultry hatcheries, Athi River.
4. Stockplan hatcheries, Mombasa.
5. Stigma suppliers, Nairobi.

# BROODING

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- Brooding refers to rearing of chicks.

## Methods of brooding

### A. NATURAL BROODING.

- The hen is allowed to take care of the chicks.
- The hen provides warmth and protection to the chicks.
- Feeds and water are provided to the hen and chicks.
- The hen stays with the chicks until they are ready to take care of themselves.

## Advantages of natural brooding.

- i. It is cheap.
- ii. It requires less labour.

## Disadvantages of natural brooding.

- i. It is only possible when hens go broody.
- ii. It lowers egg production during brooding.

## B. ARTIFICIAL BROODING.

- ✓ In this method, chicks are kept in a structure called artificial brooder for 6-8 weeks after hatching.

### Preparation of the brooder before arrival of the chicks.

- ✓ The brooder should be made ready 2-3 days before the arrival of chicks.
- ✓ All equipment should be functioning.
- ✓ Newspapers should be spread on the floor of the brooder. This prevents the chicks from eating the litter.
- ✓ Some feeds should be spread on the newspapers and some placed in the feeders. This helps the chicks to know where the feeder is after they eat up all the feeds on the newspapers.
- ✓ After the chicks have learnt where to eat from the newspapers are removed.
- ✓ The brooder and the equipment should be thoroughly cleaned and disinfected before the arrival of chicks.

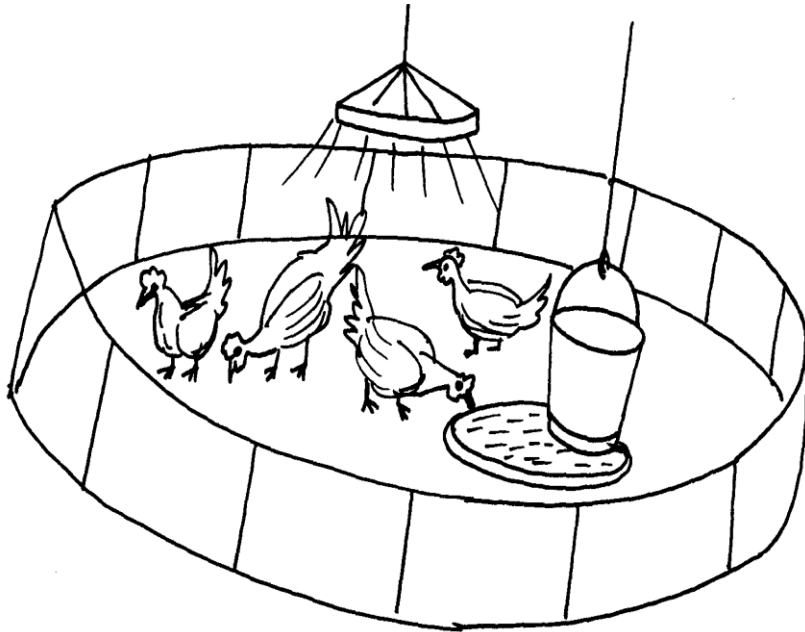
- ✓ When the chicks arrive and seem to be weak or suffering from stress, they should be persuaded to start drinking and glucose should be put in water.

### **Management after arrival of chicks.**

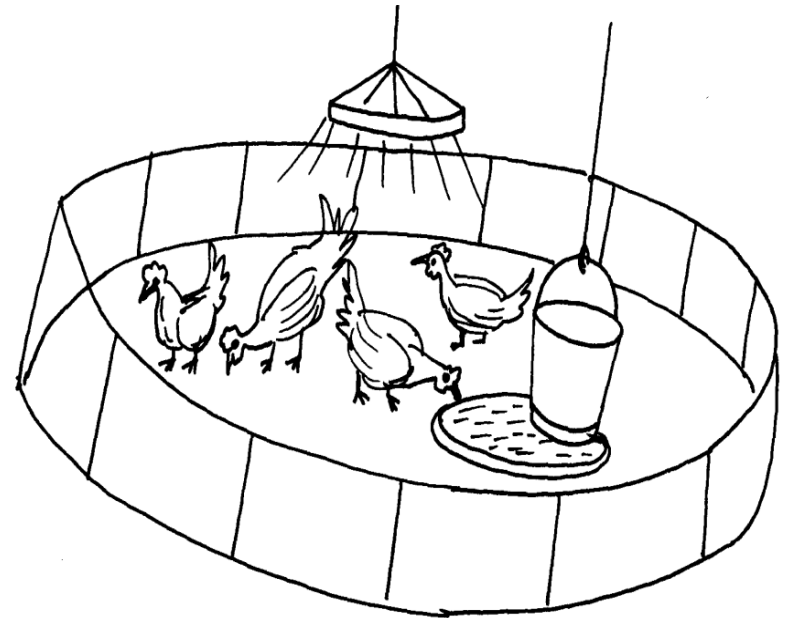
- ✓ When the chicks arrive they should be fed on chick mash for 8 weeks.
- ✓ The feed must be kept as clean as possible.
- ✓ The feeders should be kept clean everyday.
- ✓ Should be provided with plenty of clean water.
- ✓ Chicks should be vaccinated against gumboro disease after 2 weeks, newcastle at 3-4 weeks of age and fowl typhoid at 7 weeks of age.
- ✓ Coccidiosis disease controlled by giving coccidiostats to chicks through water or feed.
- ✓ The chicks should be dusted with appropriate chemicals to control external parasites.

- ✓ Roosts for the chicks to perch on are introduced in the 6<sup>th</sup> week.
- ✓ Grit/ sand is also given to help in digestion of the feed.
- ✓ In the 7<sup>th</sup> week growers mash is introduced gradually which is mixed with a ration of chick mash.
- ✓ The amount of chick mash is reduced gradually while increasing the amount of growers mash.
- ✓ When the chicks are 8 weeks old they are removed from the brooder.
- ✓ In the 9<sup>th</sup> week chicks are feed on growers mash only.

## Brooder



## Brooder

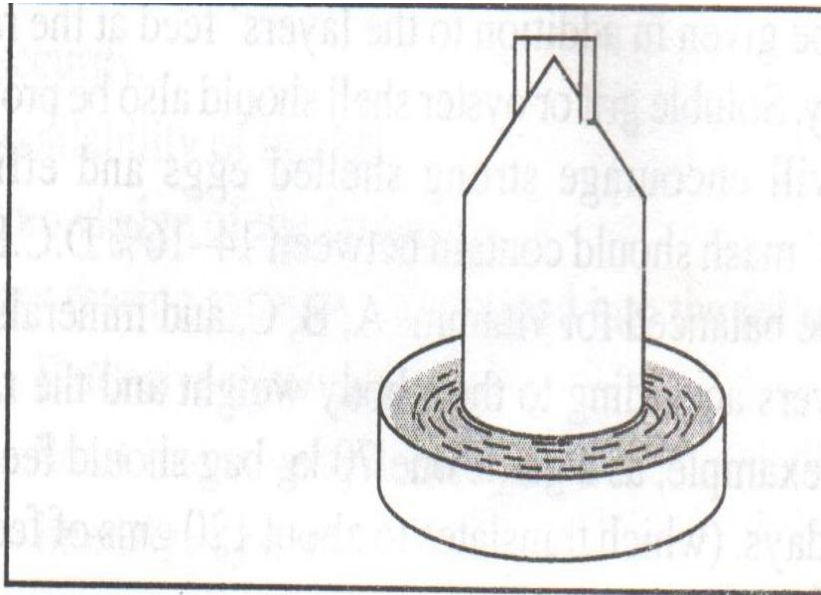




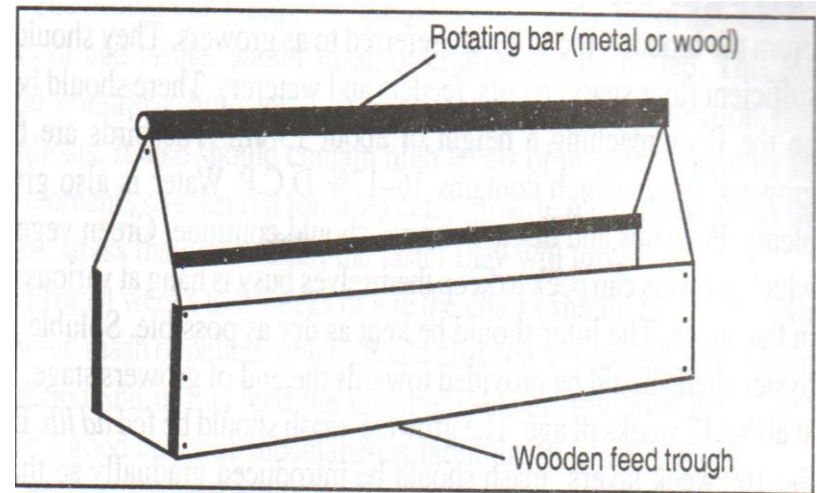
## Requirements/ qualities of artificial brooder.

1. **Litter** – it is made from wood shavings/saw dust to maintain warmth, absorbs moisture and keep the chicks busy preventing cannibalism.
2. **Proper ventilation/ fresh air.-** should have holes on the walls for ventilation to allow proper gaseous exchange.
3. **Equipment-** they include:
  - a) **Feeders-** should have adequate feeders to allow for proper feeding without overcrowding.
    - They should be made in a such a way that the chicks do not step or defecate on the feeds.
    - To check whether the feeder are enough the farmer observes whether the chicks are feeding without overcrowding.

- b) **Waterers-** should have adequate waterers to allow for proper watering of chicks without overcrowding.
  - They should be kept clean and made in a such a way that the chicks do not step or defecate on them.
  - They should have the pointed top on which the chicks cannot perch.
- 5. **Well lit-** to allow chicks to see feeds and water.
- 6. **Shape of the brooder-** It should be round to avoid overcrowding at the corners which may cause suffocation.
- 7. **Heat source-** heat sources e.g. electric bulbs, lantern, kerosine and gas burners should be provided and controlled to maintain correct temperatures within the brooder.
  - There should be a wire guard round the heat source to prevent the chicks from being burnt when they crowd around it.
  - The temperature should be maintained at the optimum range.
- 8. **Dim light-** Dim or dull lights are recommended because too bright light has blinding effects on chicks and influence toe pecking.



*Fig. 1.8: Chicken Waterer*



*Fig. 1.7: Wooden feed trough*

## Methods of checking temperature in the brooder

1. Use of a thermometer.
2. Checking the behavior of chicks.
  - ✓ When the chicks move away from the heat source then the temperature is high.
  - ✓ If they overcrowd around the heat source then the temperature is low.
  - ✓ If they overcrowd at one side then there is draught from the opposite side.
  - ✓ When temperature is optimum then the chicks are evenly spread all over the brooder floor.

## Behavior of chicks under heat stress.

- i. They move away from the heat source.
- ii. Opening/ spreading of wings.
- iii. They lie flat on their bellies.
- iv. Drinking a lot of water.
- v. Opening of beaks.

## Causes of high mortality of one day old chicks.

- i. Coldness/chillness.
- ii. Too much heat.
- iii. Lack of feeds and water.
- iv. Parasites and diseases.

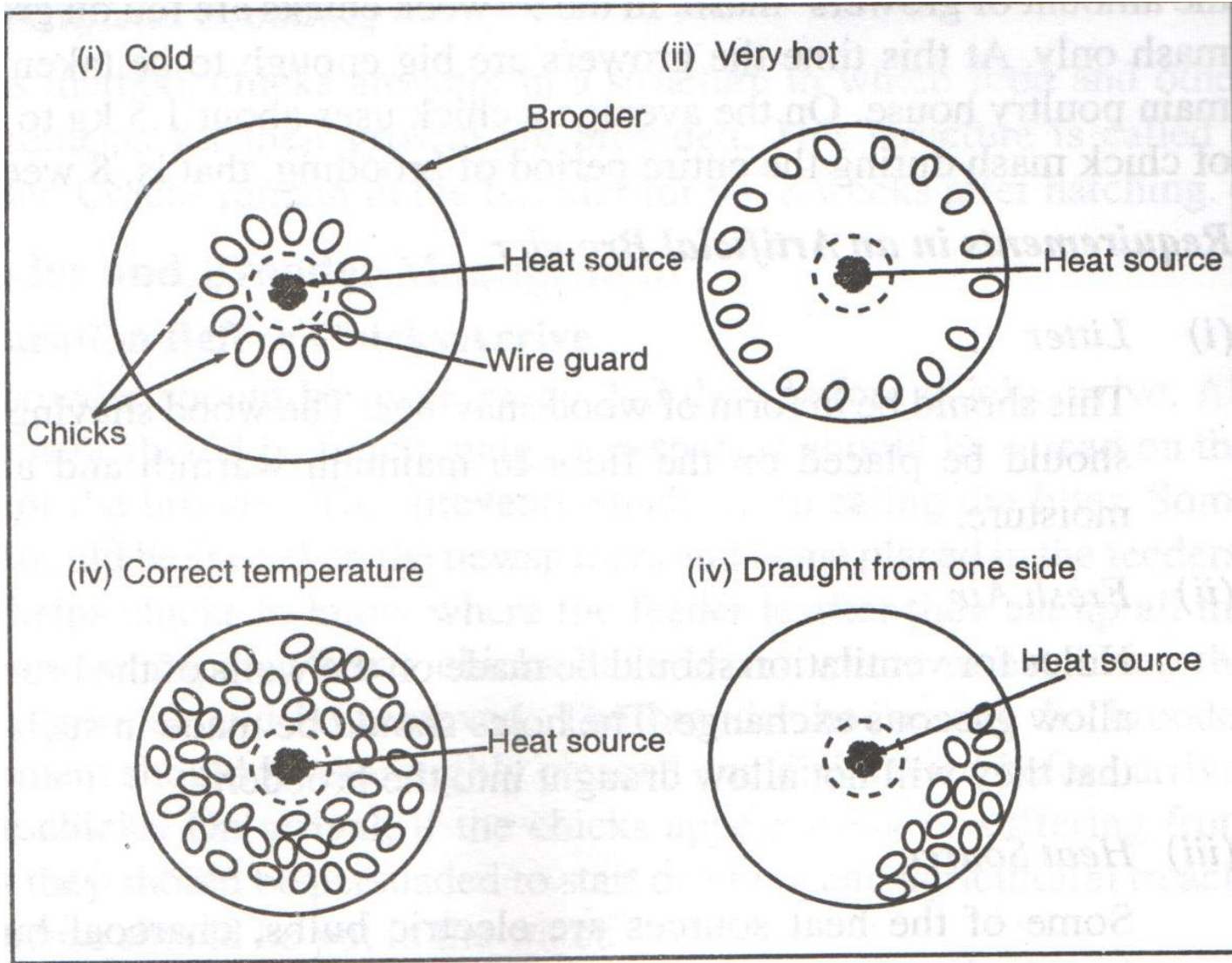


Fig. 1.6 Chick behaviour with heat variation

# Study question

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## *1. Describe preparation of a brooder before the arrival of chicks.*

- Prepare a brooder 2-3 days before the arrival of chicks.
- Wash and disinfect the brooder.
- Ensure that the brooder has round corners.
- Ensure that it is well ventilated but draught free.
- Ensure that the brooder is spacious.
- Spread litter on the floor.
- Spread newspapers on the litter.
- Provide enough clean feeders and waterers.
- Sprinkle some feeds on the newspapers when the chicks arrive.
- Provide dim light/right temperature.
- Provide a wire guard around the heat source.

## *2. Describe management of chicks in the brooder.*

- On arrival supply water mixed with glucose.
- Feed chicks on fresh chick mash.
- Provide clean water.
- Provide adequate feed.
- Vaccinate the chicks if they were not vaccinated in the hatchery.
- Clean and disinfect the brooder occasionally to control parasites and diseases.
- Remove any dead chicks and properly dispose them off.
- Check and maintain the appropriate range of temperature in the brooder.

- Dust against ectoparasites.
- Deworm against endoparasites.
- Provide coccidiostats in water/feed to control coccidiosis.
- Provide dim light to avoid toe pecking.
- Introduce roosts from 6 week.
- Gradually introduce growers marsh from 7<sup>th</sup> week.
- Isolate and treat sick chicks
- Properly dispose off dead chicks.
- Provide grit to chicks.
- Keep proper records.
- Debeak at 8-10 weeks of age.
- Change the feeds gradually.



# growers/pullets (between 9<sup>th</sup> week-point of lay) in a poultry house.

33

- Feed the growers on growers mash.
- Supplement with grains.
- Hang greens in the house to keep them busy and to provide vitamins.
- Introduce soluble grit during the last week to provide calcium important for shell formation.
- Provide feed and clean water *ad libitum*.
- Vaccinate against diseases.
- Dust against ecto -parasites.
- Drench against endo- parasites.
- Control predators.
- Provide enough waterers and feeders.
- Clean and disinfect the waterers and feeders regularly.
- Provide enough space/avoid overcrowding.
- Keep litter dry by regular turning/ scattering grains on the floor for the birds to scratch.
- Provide enough roosts and perches for birds to perch on.
- Introduce layers mash gradually from 18<sup>th</sup> week.

# Management of layers in a poultry house.

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- ✓ Provide enough space.
- ✓ Keep the litter dry.
- ✓ Hang greens for exercise, provide vitamins and prevent cannibalism.
- ✓ Scatter some grains on the floor for exercise and turning of litter.
- ✓ Provide enough roosts and perches for birds to perch on.
- ✓ Provide enough feeders and waterers.
- ✓ Keep the equipment clean.
- ✓ Provide layers mash or pellets and clean water *ad libitum*.
- ✓ Supplement with grains, vitamins and minerals.
- ✓ Provide soluble grit or oyster shell which encourages strong shelled eggs and efficient digestion.
- ✓ Collect eggs twice a day (at noon and evening).
- ✓ Dispose off broken eggs.
- ✓ Debeak when necessary.
- ✓ Provide enough grit.
- ✓ Cull poor layers and cannibals.
- ✓ Isolate and treat sick birds.
- ✓ Vaccinate against newcastle and fowl typhoid diseases every 6 months.
- ✓ Avoid stress factors.
- ✓ Dust against ectoparasites.
- ✓ Deworm against endoparasites.
- ✓ Keep proper records.
- ✓ Provide enough laying nests.

## Causes of low egg production in layers.

1. Overcrowded housing.
2. Fighting / pecking.
3. Lack of adequate clean water.
4. Parasite infestation.
5. Inadequate feeding.
6. Old age.
7. Broodiness.
8. Inadequate waterers/feeders.
9. Presence of predators /strangers.
10. Sudden changes of feeds.
11. Sudden noise.
12. Sudden change in weather.
13. Disease infestation.
14. Inferior/poor feeds.
15. Inadequate laying nests.

## Management practices that ensure maximum egg production.

- Proper feeding
- Provision of enough laying nests
- Proper housing
- Parasite and disease control
- Regular collection of eggs
- Provision of correct light intensity
- Protection from predators
- Debeaking to stop cannibalism
- Provision of greens to keep them busy and for exercise

## Categories of poultry feeds

- i. Chick marsh
- ii. Growers marsh
- iii. Layers marsh
- iv. Broiler starter marsh
- v. Broiler follow on
- vi. Broiler finisher

# Management/rearing of broilers in a poultry house.

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- Feed the chicks on broiler starter mash.
- The feed should contain coccidiostat to control coccidiosis.
- Provide enough feed with high level of proteins, vitamins and mineral salts and clean water which are essential for rapid earlier growth..
- Gradually introduce broiler finisher mash.
- Have the correct stocking rate.
- Ensure proper ventilation
- Maintain hygiene in the house.
- Dust against ectoparasites.
- Deworm against endoparasites.
- Vaccinate against common diseases e.g. new castle.
- Dispose off dead chicken properly.
- Provide adequate waterers and feeders.
- Keep the litter dry and free from dust.
- Ensure adequate supply of greens and grains.
- Isolate and treat sick birds.
- Keep proper records.

## Practices that help in control of parasites and diseases in a poultry house.

- ❑ Vaccination against diseases.
- ❑ Dusting against ecto parasites.
- ❑ Deworming against endo parasites.
- ❑ Treating sick birds.
- ❑ Isolating sick/dead birds to prevent the spread of diseases.
- ❑ Washing and disinfecting waterers and feeders.
- ❑ Keeping the litter dry.
- ❑ Providing a foot bath at the entrance to prevent infections.

## Measures observed to prevent disease outbreak in poultry house/ Management practices that ensure proper hygiene in poultry house.

- ❑ Provide a foot bath at the entrance.
- ❑ Screen the poultry house against dust and wild birds.
- ❑ Remove any dead birds and dispose off properly.
- ❑ Control visitors into the poultry houses.
- ❑ Regularly clean and disinfect feeders and waterers.
- ❑ Ensure that the feed is free from pathogens.
- ❑ Isolate/cull sick birds.
- ❑ Treat sick birds.

# POULTRY REARING SYSTEMS.

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## Factors affecting the choice of a rearing system.

- i. Availability of land for rearing.
- ii. Topography of land to facilitate drainage.
- iii. Availability of labour.
- iv. Availability of appropriate equipment.
- v. Availability of capital.
- vi. Security.
- vii. Availability of market.
- viii. Knowledge of the farmer.

□ The rearing systems include:

- A. Extensive system.
- B. Semi-intensive system.
- C. Intensive system.

### **A. Free range system.**

- ✓ This is an extensive system where the hens are allowed to move freely in a fenced ground with a simple house to provide shelter at night.
- ✓ Laying nests are also placed in this house.
- ✓ Feed and water troughs are placed outside but protected from rain by a simple shelter.

## Requirements of free range system

- a) **Land-** it must be large, well drained and with trees for shelter. The external fence is required to prevent the birds from straying.
- b) **Runs-** these are partitioned areas within the land to facilitate rotation. This reduces disease and parasite build up.
- c) **House-** it should be constructed to provide shelter and an area for laying nests.
  - ✓ The house can be movable or constructed at the centre of the runs.



### **Advantages of free range/ extensive system.**

1. Less feed is used since birds pick insects and vegetation from the ground.
2. Manure is evenly spread within the runs which facilitate vegetation to regenerate.
3. Cannibalism and egg eating are reduced because the birds are not crowded and are free within the runs.
4. It requires low capital investment.
5. Birds can pick grit from the soil hence there is no need of providing them with grit.
6. Birds have plenty of exercise thus helping to keep good health.

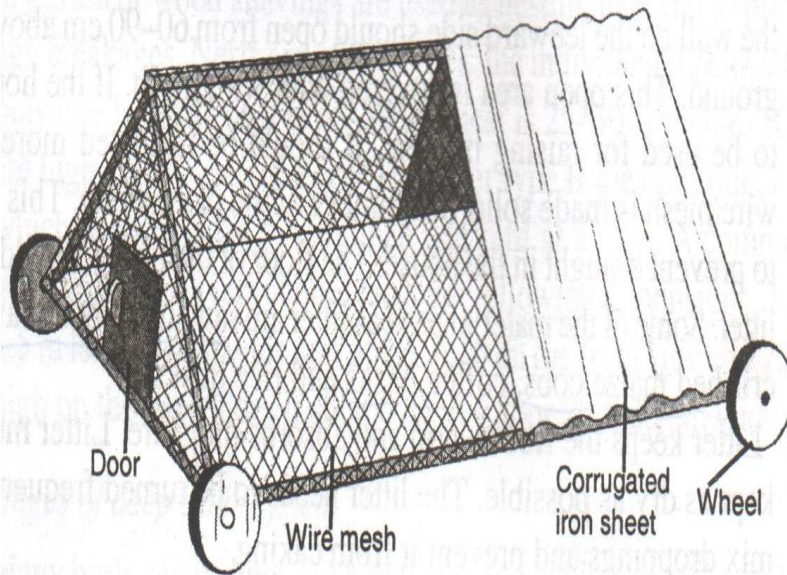
### **Disadvantages.**

1. Requires a lot of land which may not be available if many birds have to be kept.
2. Birds can be stolen or eaten by predators.
3. Eggs can get lost in the runs.
4. Eggs can get dirty.
5. It is difficult to keep proper records/ close supervision for individual birds.
6. Breeding programme is not easy to follow.
7. The range can be easily infested with diseases and parasites/ may lead to parasite and disease spread.
8. Birds can cause damage to crops if the perimeter fence is not properly constructed.

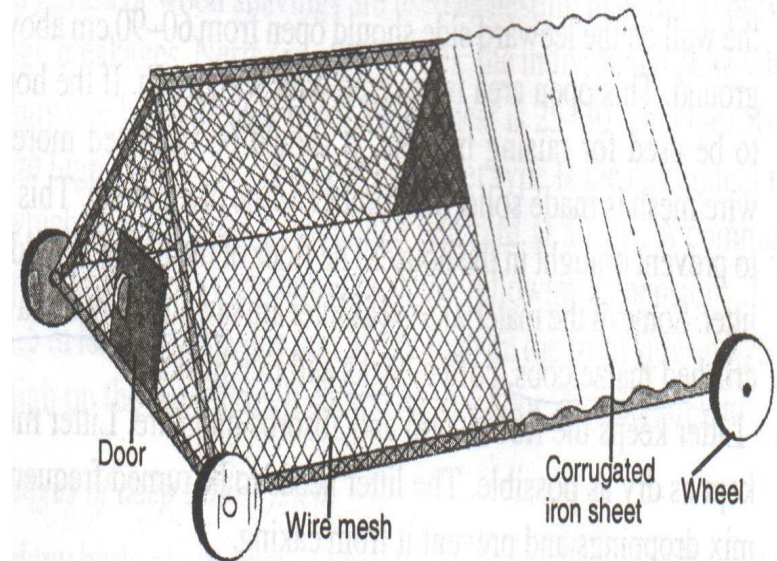
## B. Semi-intensive system/fold system.

- ✓ In this system birds are confined in movable structures called **folds/arks.**
- Folds are moved daily to:
  - i. Reduce build up of diseases and parasites.
  - ii. provide fresh grass.
  - iii. Avoid accumulation of droppings.
  - iv. Allow even spread of manure which facilitate vegetation regeneration.
- For easy the movement the folds/arks are fitted with wheels.
- One part of the part of the fold is covered with corrugated iron sheet/ metal/ plastic/grass (thatch) for shelter and laying/for laying nests.
- The other part is covered with wire mesh for:
  - i. Sunning/basking and,
  - ii. feeding on vegetation.
- The feeders and waterers should be placed on the open side of the fold.

## Fold system/ semi-intensive system



## Fold system/ semi-intensive system



## Advantages of fold/semi-intensive system.

1. Less feed is used as birds eat vegetation.
2. There is even distribution of manure/droppings.
3. Requires less feeding/Birds pick grit from the soil.
4. Reduces the build up of parasites and diseases.
5. Protects birds from predators.

## Disadvantages of fold system.

1. Few birds are kept per fold/ accomodates few birds.
2. It requires a lot of labor to move folds from one place to another.
3. It is difficult to keep production records for individual birds.
4. Egg eating and cannibalism are very common.
5. Damage/breakage of the fold due to frequent movements.

### c. INTENSIVE REARING SYSTEMS.

- In this system, birds are confined in houses or structures throughout the laying period.
- All the necessary requirements are provided in the structures.
- There are two intensive rearing systems, namely:
  - i. Deep litter system.
  - ii. Battery cage system.

#### i) Deep litter system.

- In this system, birds are totally confined in a house and stay indoors for the whole of their lives.

### Requirements of a deep litter system

1. Site- the area where the house is built should be well drained.
2. House- it should have the following features:
  - a) A roof which is leak proof.
  - b) The wall on the leeward side should open from 60-90cm above the ground for ventilation. The open area is covered with wire mesh
- The wire mesh is made solid with timber, stone or concrete to prevent draught in the house.

- c) The floor of the house should have litter 15-30 cm deep made from sawdust, wood shavings, crushed maize cobs, coffee husks and rice husks.
    - Litter keeps the floor warm and absorbs moisture.
    - The litter should be kept as dry as possible, turned regularly to mix droppings and prevent it from caking.
    - Grains are thrown on the litter. As the birds scratch for
  - When new litter is introduced, it should be mixed with a little of the old so as to introduce bacteria which help the litter to rot
  - The floor space requirement should be 1 square metre per 2-3 birds.
3. **Feeders and waterers-** they should be enough and kept clean. They should be placed at various points in the chicken house so that chicken do not crowd and contaminate the feed and water.

4. **Roosts and perches-** they are timber frames on which birds perch. They should be moveable so that droppings do not accumulate too much at certain points causing dampness.
5. **Nests-** they are laying boxes.
  - Laying nests should have the following requirements:
    - i. Large enough to accommodate the bird
    - ii. Kept in a secluded place
    - iii. Kept dark to avoid vices
    - iv. With dry nesting materials
    - v. With lockable doors

## Advantages of deep litter system.

1. Many birds can be reared in a small area hence allowing high stocking rate.
2. There is no loss of eggs.
3. There is fast accumulation and collection of manure.
4. It requires less labour in collecting eggs, and turning the litter.
5. Birds are safe from predators and thieves.
6. The system can be used in rearing breeding stock.

## Disadvantages of deep litter system.

1. The incidence of cannibalism, egg eating, feather plucking and toe-pecking are common.
2. There is likelihood of parasite and disease accumulation in the litter.
3. It is difficult to keep record of individual birds.
4. Litter may be difficult to find in some areas.
5. Eggs may get dirty especially if laid on the floor or if the nesting boxes are not clean.
6. Litter can contaminate water and food.

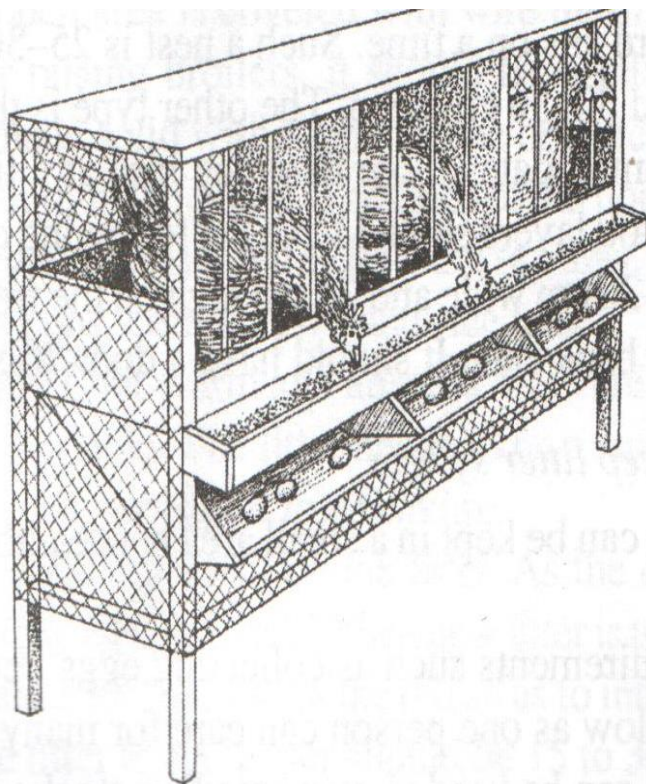




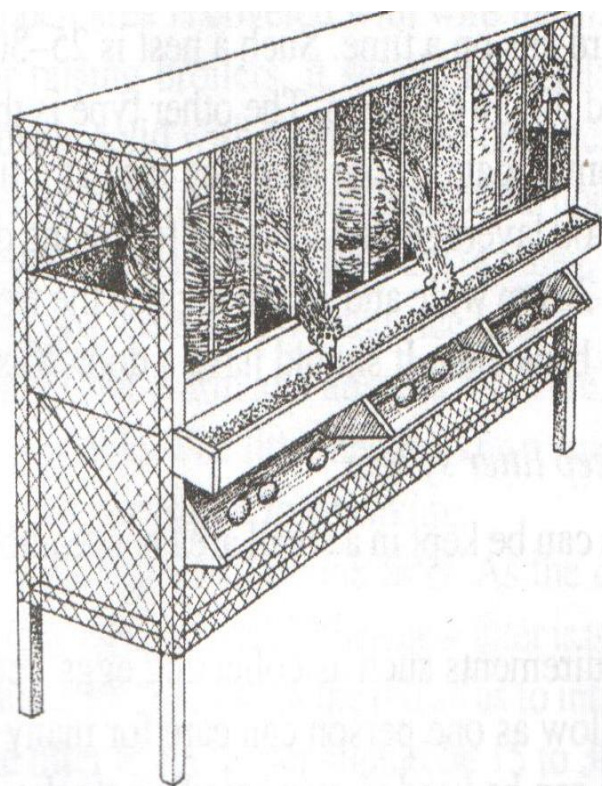
*Fig 1.11: Deep litter system.*

ii. **Battery cage system.**

- In this system birds are confined in wire mesh cages throughout the laying period.
- The cages are arranged in rows which are built over one another to form tiers.
- The cages have slanting floors to allow rolling of eggs to the tray. The eggs are collected from a tray behind the tiers.
- The lowest tier is normally 60-90cm above the ground to allow for easy cleaning.
- Feeders and water troughs are placed on the front side of the cages.



*Battery cage system*



*Battery cage system*

## Advantages of battery cage system.

1. There is higher egg production due to less energy wastage by birds.
2. Accurate egg records can be kept because it is easy to know which bird has laid.
3. Cannibalism and egg eating are controlled.
4. Eggs are clean because birds do not step on them.
5. The system can easily be mechanized.
6. Birds do not contaminate food and water.
7. Handling is easy as hens are restricted to a small place.
8. Broodiness is discouraged as the birds do not reach the eggs.
9. A large number of birds can be kept in a small space hence higher stocking rate.
10. Sick birds can be detected easily and isolated for treatment.
11. Wire floors prevent re-infestation of parasitic worms and coccidia.
12. There is no bullying during feeding.
13. There is low labour requirement.

### Disadvantages of battery cage system.

1. It requires high initial capital hence very expensive.
2. It requires high level of management or technical knowledge.
3. In case of disease outbreak, spreading is very fast.
4. Birds develop bruises on combs, breast and toes as they stick their necks out to eat and walk on the cages.
5. The birds do not have enough room for exercise.
6. The system is not good for brooding purposes.

### STRESS IN POULTRY.

- Stress is any cause of discomfort in birds.

### Causes of stress in poultry.

1. Any sudden change e.g. change of feed.
2. Presence of strangers and predators e.g. mongoose in the poultry house.
3. Handling of birds e.g. during vaccination, culling, debeaking etc.
4. Sudden noise e.g. passing of tractor or thunder.
5. Sudden change of weather e.g. from warm to cold weather.
6. Diseases and parasite infestation.
7. Lack of food and water.

## Control measures of stress.

1. Keep the poultry house quiet by building it away from road where people and vehicles pass.
2. Insulate the poultry house to maintain uniform temperature.
3. Control diseases and parasites.
4. Change of routine program should be gradual.
5. Provide enough feed and water.

## POULTRY VICES.

- A vice is abnormal behavior in birds and include egg eating and cannibalism.

### a) Causes of egg eating

1. Presence of broken or soft-shelled eggs.
2. Bright light in the nests allowing the birds to see the eggs.
3. Idleness.
4. Inadequate nests forcing birds to lay eggs on the floor.
5. Lack of minerals e.g. calcium making the birds to look for them from elsewhere.
6. Inadequate feed.

### Control of egg eating.

1. Collect the eggs regularly.
2. Making the laying nests dark.
3. Debeaking perpetual egg eaters.
4. Keeping the birds busy by supplying green leaves.
5. Feeding the birds on balanced diet/ ration
6. Scatter the grains on the litter to enable birds to scratch for them.
7. Provide enough feed.

- b) **Cannibalism-** this is a condition where birds peck each other.

### Causes of cannibalism in poultry

1. **External parasites-** a bird may want to remove a parasite e.g. flea from combs of others.
2. **Overcrowding-** this makes the birds see others closely and it is easy for them to detect what to peck at.
3. **Bright light-** this makes the toe of chicks shine leading to toe pecking.

4. **Prolapse-** it occurs when the cloaca does not retract after laying egg hence the cloaca is pecked at by others.
5. **Mineral deficiency-** unbalanced feed makes the birds to try to get minerals elsewhere.
6. **Introduction of new bird in a flock-** this causes fighting leading to cannibalism after injury.
3. Provide birds with balanced feeds.
4. Birds should be kept according to age.
5. Control external parasites.
6. Keep the birds busy by hanging green leaves or vegetables in the house.
7. Debeak hens which peck others.
8. Cull perpetual cannibals.

### **Control of cannibalism**

1. Avoid bright light in the house.



## MARKETING OF POULTRY PRODUCTS.

### 1. Eggs

#### a) Sorting and grading of eggs.

#### Factors to consider when sorting eggs for market.

- i. Cleanliness- eggs should be kept clean by wiping them using a damp clean piece of cloth.
- ii. The size of the egg- large eggs have higher market price than small ones. Sorting should be done into 3 grades, small, medium and large before marketing.

- iii. Candling quality- eggs of high candling quality are preferred.
- iv. Egg color- some consumers prefer brown eggs to white eggs.
- b) Packaging of eggs- they should be packed in trays with their broad end facing up to maintain gaseous exchange.
- c) Marketing of eggs- they are sold directly to consumers or through cooperative societies.

## 2. Chicken meat.

### a) Methods of killing birds-

1. Dislocating the head- the hen is starved for 12 hours to avoid the carcass from turning green.
  - The legs of the bird are held firmly with the left hand the head is twisted backwards and downward with a sharp thrust.
  - The bird is then hung by the feet so that blood may drain from the body.

2. Killing with a sharp knife- the legs and wings are held firmly and the neck is cut instantly.
  - The bird is then hung by the feet in order to allow blood drain.

## Procedure of dressing chicken for sale.

- ✓ Lay the bird on its breast on the table.
- ✓ Pull and cut off the skin of the neck at the point where the neck enters the body.
- ✓ Cut the neck from the head at the point of dislocation/ the cut.
- ✓ Turn the carcass on its back.
- ✓ Grasp and gently pull the crop
- ✓ Insert the index finger as far as possible into the body cavity through the opening left after removing the neck and crop.
- ✓ Work around the finger close to the body to loosen the organs from the ribs and the back.
- ✓ Turn the bird and hold the abdomen with the left hand.

- ✓ Make a horizontal cut between the vent and the keel bone to expose the intestines.
- ✓ Insert a finger into the abdomen through the cut and loop around the vent to close the intestines.
- ✓ Hold the intestines away from the vent and then cut around with the bowels still attached.
- ✓ Insert the right hand into the abdominal opening gently grab the gizzard and pull it out accompanied with other internal organs.
- ✓ Cut the skin around the shank to remove the sinus just below the hocks and pull them out strongly from the body.
- ✓ Detach the shanks.
- ✓ Pack the carcass in polythene paper for sale.

## Routine management practices in poultry.

1. **Parasite control-** Done:
  - i. By dusting, spraying or dusting the poultry house.
  - ii. Through deworming.
  - iii. By replacing the litter to prevent the parasite build up.
2. **Debeaking-** Done to prevent cannibalism and egg eating.
3. **Feeding-** Provide feed *ad libitum*.
4. **Disease control-** Done by use of antibiotics, vaccination and keeping the poultry house clean.
5. **Egg collection-** Done regularly to prevent egg eating in birds.

5. **Culling-** Refers to removal of unproductive birds from the flock.

**Causes of culling in poultry/factors that necessitate culling.**

- i. Poor growth.
- ii. Poor laying/production/yield.
- iii. Old age.
- iv. Vices.
- v. Poor health/Chronic diseases/parasite and disease attack.

**Ways of differentiating between a poor and good layer.**

- They include:
  - i. Observation of the physical characteristics.
  - ii. **Trap nesting-** a nest is built in such a way that when the hen enters to lay it does not come out.
- Those that enter to lay are marked thus those not marked are poor layers

# Observing physical characteristics.

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## Good layer.

1. Combs and wattles are large, warm, waxy and red.
2. Eyes are bright and alert.
3. The beak is pale.
4. The vent is oval, moist, reddish and active.
5. Abdomen/breast is soft.

## Poor layer.

1. Combs and wattles are small, cold, dry and scaly.
2. Eyes are dull and pale yellow.
3. The beak is yellow in colour.
4. The vent is round, dry and less active.
5. The abdomen/breast is hard.

## Good layer

6. The space between the keel and pelvic bone is wide i.e. can fit 3-4 fingers.
7. Temperament (It is alert and active).
8. Plumage/feathers are dry and rugged.
9. Moulting starts late.
10. Shanks are pale.
11. Broodiness is rare.

## Poor layer

6. The space between the keel and pelvic bone is narrow i.e. can fit 1-2 fingers.
7. Temperament(It is lazy and dull).
8. Plumage/Feathers are beautiful/glossy.
9. Moulting starts early.
10. Shanks are yellowish.
11. Broodiness is common.



## Marketing of eggs

### Practices carried out on eggs in preparation for marketing.

- i. Checking out the abnormalities/candling.
- ii. Selecting eggs of the right size/weight.
- iii. Cleaning/wiping the dirt.
- iv. Sorting and grading.

### Factors to consider when sorting and grading (selecting) eggs for marketing.

- i. Size of the egg.
- ii. Colour of the eggs.
- iii. Cleanliness of the egg.
- iv. Shell quality/ texture e.g. broken or rough.
- v. Candling qualities e.g. freshness
- vi. The shape of the eggs.

## Desirable qualities of marketable eggs.

1. Large/heavy.
2. Brown.
3. Clean.
4. Smooth shelled.
5. Oval/normal shaped.
6. Fresh.