

**BONGA UNIVERSITY
COLLEGE OF AGRICULTURE AND NATURAL RESOURCES
DEPARTMENT OF ANIMAL SCIENCE**

Lecture notes

Practical in animal science I

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Definition of terminologies related to non-ruminant farming

Artificial insemination: Artificial insemination is the placing of sperm in the female reproductive tract by other than natural means

Cannibalism: Cannibalism is the act of eating another member of the same species. Seen in poultry and swine

Capon: Capon is a male chicken whose reproductive organs have been removed or rendered inactive while the individual is still young

Castrate: Castrate is to remove the testes of the male or to render them inactive; alternatively, an animal whose testes have been removed or rendered inactive

Creep feed: Creep feed is used to provide special feed for the young piglet; also, the feed provided for the young within a special enclosure

Swill Feeding: feeding kitchen wastes/ leftover

Farrowing: the act of giving birth for the pigs

Incubation: is the management of fertile egg to ensure the satisfactory development of the embryo to produce normal chick. **(Natural and Artificial)**

Equipments in poultry and swine farm

Ark: a low semi circular field-shelter for pigs

Beak-trimmer (Debeaker): Equipment used to trim/ cutting the beaks of birds; works on electricity.

Bolt cutters: used to remove tusks of boars to avoid injuries to sows and attendants

Brooder guard: as the name suggests, guards the chicks from straying too far away from the heat source.

Brooder: Equipment used to provide warmth to the chicks. in simple words, is an artificial hen (mother) which provides warmth for the chicks to eat and drink during the first 3 to 4 weeks of age.

Burdizzo: Burdizzo is an instrument used for bloodless castration which clamps off the tissue connecting the testis to the rest of the body.

Candler: This equipment produces a beam of light which is used to get an idea about the internal quality of eggs without breaking

Crates: Box-like equipment made of metal or plastic meshwork which is used to hold and carry birds.

Drinkers: equipment in which water is given to the birds

Egg filler flats: an instrument used to hold the eggs. It can be made of plastic or paper pulp. Holds about 30 eggs.

Feeder: equipment in which feed is given to the birds

Foggers: In very hot weather, an instrument called foggers is used to spray fine mist of water directly on to the face of the birds

Hatcher: equipment used for hatching of chicks

Incubator (setter): special equipment for the incubation of eggs. Replace a broody hen

Nests: a place where the chickens lay the eggs

Pig-shed: a larger pig-house

Sprayers: are used for disinfection of building, birds, men, material and surrounding areas, as and when required.

Sty: a small pig-house, usually with an outdoor run or a pig confinement

Vaccinating Syringe: a syringe for giving the vaccine for the animals

Weighing Balance: A balance is a necessary requirement for weighing feed, birds at market etc.

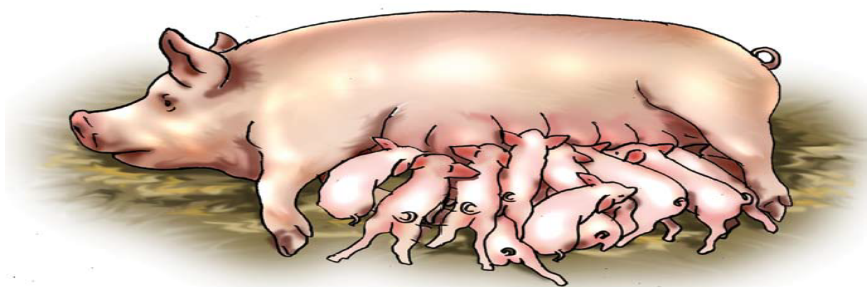
Pig farming and farm management management

The advantages of the pig farming are:

The pig has got highest feed conversion efficiency than any other class of meat producing animals

The pig can utilize wide variety of feed stuffs viz. grains, forages, damaged feeds and garbage and convert them into valuable nutritious meat.

They are prolific with shorter generation interval. A sow can be bred as early as 8-9 months of age and can farrow twice in a year. They produce 6-12 piglets in each farrowing.



Swine Housing

Elements for a good housing of pigs

- ✓ *Separate house for breeding boar/pregnant sow*
- ✓ *Separate house for gilt and dry sows*
- ✓ *Provision for farrowing pan*
- ✓ *Heating and cooling arrangement*
- ✓ *Suitable size of drinkers*
- ✓ *Suitable size of feed trough*
- ✓ *Suitable floor space*
- ✓ *Sufficient space for exercise*

How to keep a healthy pig

- ✓ Appropriate House
- ✓ Clean and sufficient drinking water
- ✓ Proper feeding
- ✓ Introduction of healthy, improved breeding male
- ✓ Regular vaccination, drenching/dry out and veterinary services
- ✓ Provision of farrowing pan

Effect of bad housing

- Abortion
- Slow/retarded growth and poor health
- Dysentery/Diarrhea
- Piglets dead after birth
- Parasitic Infection
- Economic losses due to less meat production
- Effect in Human health

- Spread of Contagious diseases

Selection of housing locations for swine

- The site should be at an elevated place that cannot be flooded by rain water.
- The site should be protected from the sun (shade from trees) and have ample fresh air.
- Away from residences (around 8-10 meter away downwind).
- In case of a large scale pig farm, the site selected needs also to be: well
- connected to roads throughout the year,
- Suitable for manure disposal, connected to reliable water and electricity sources.

Construction plan for a good pig house/shed

The important points about the pig house are as follows:

- The house must be strongly built.
- A pigsty can be constructed cheaply by using locally available materials. It needs to be constructed according to climatic conditions and according to the pig production system.
- The pigsty should be comfortable for the pigs: good ventilation and ample shade, no overheating, no smells, no draft and no dampness.
- The building should be constructed with its length axis in an East-West direction (protected from sun and rain).
- The floor of the house must be raised about 60 cm above the ground.
- The roof must be rain, proof.
- The high side of the roof should face in a direction where some sun can shine a little way into the house on this side: but there must always be shade in some part of the house.
- The pig building needs to be divided into different pens for each phase of the production cycle.
- The number and the size of the pens depend on the expected numbers of pigs to be housed in each production phase.
- The costs of constructing the pigsty should fit the pig production systems. An

efficient pig production is required to cover high construction costs.

Chicken house types

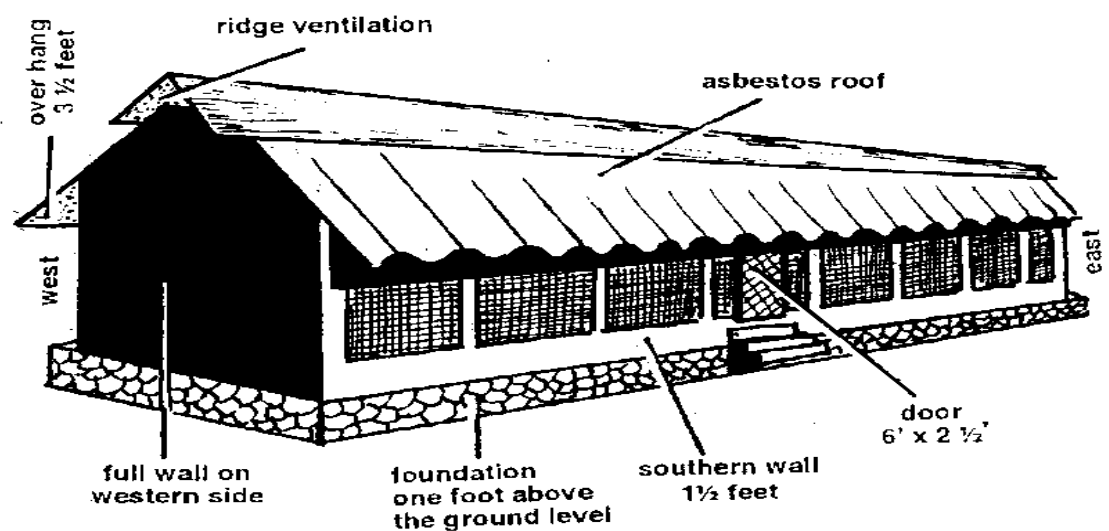
1. Depending on
2. availability of materials,
3. Availability of land
4. Cost of land
5. Type of farming activity
6. Climatic condition
7. Labor availability
8. weather and tradition, there are different types of chicken houses and shelters in tropical regions.

1. All side open chicken house

- All the open side is closed with sieve wire to protect the chicken from theft and different predators.
- It is mainly common in hot areas and should be constructed far (at least 50m) from other chicken houses.

2. One side open chicken house

- ✓ Unlike all side open house, there is only one side open.
 - It is preferred in areas where the daily temperature is 15-30c.
 - The height of the house should not be greater than 9 m. (figure below shows example of one side open chicken house)



A model poultry house

3. *All side closed chicken house*

This type of chicken house construction is important to control the effect of extreme hot and cold weather conditions on the chicken. It is suitable for areas which are very cold and very hot weather conditions. The majority of the different activities, such as control of internal temperature, in this type of chicken house are accomplished by mechanical way.

4. *House with deep pit*

- ✓ Have a deep pit so that the manure can be stored for >1year (up to 5 yrs).
- ✓ The waste material from the layer/chicken is collected in the deep pit for several years (5-10 years).

5. **High rise houses:**

- Built above ground level or above a fish pond, as a system of integrating.
- Always have the cage system or full slatted floors.
- Suitable for tropical climates



Figure 2. High raised and all side open houses

Internal chicken house arrangement

Even though there are different chicken house arrangement types around the world, the main are:

- i. **Deep litter system:** litter is the material used as bedding in poultry houses to absorb faecal waste from birds and to make the floor of the house easy to manage. It involves rearing of chickens on a floor littered by 5-10 cm thickness litter. The litter can be made from locally available material such as dry hay, teff straw, coffee pulp and saw dust. In principle **everything that can absorb water** is suitable as litter material.
- ii. **Half litter and half slated floor:** Has an advantage where wet litter is often a problem. Because the major part of the manure is stored under the slats, Litter remains in a better condition.
- iii. **Full slated floor:** Slats- wooden/plastic pieces of 2.5-5 cm wide placed through the length of house. Slats should be placed 3 ft above the ground floor to allow accumulation of dropping
- iv. **Cage system:** rearing of chicken in one house on the prepared cages or nests and it is more appropriate for layers. Cages are recommended for layers, but not generally used for meat birds.

Deep Litter System

In this system the birds are kept inside the house all the time. Arrangement for feed, water and nest are made inside the house. The birds are kept on suitable litter material of about 3" to 5" depth. The word litter is used for fresh litter material spread on the floor. Usually paddy husk, saw dust, ground nut hulls, chopped paddy straw or wood shavings are used as litter materials. This arrangement saves labour involved in frequent cleaning of faecal matter (droppings), however it needs periodical stirring. The litter is spread on the floor in layers of 2" height every fortnightly till the required is achieved.



Advantages

- Vit B2 and Vit B12 are made available to birds from the litter material by the bacterial action.
- The welfare of birds is maintained to some extent
- The deep litter manure is a useful fertilizer.
- Lesser nuisance from flies when compared to cage system.

Disadvantages

- Because of the direct contact between bird and litter, bacterial and parasitic disease may be a problem.
- Respiratory problems may emerge due to dust from the litter.
- The cost of litter is an additional expenditure on production cost.
- Faults in ventilation can have more serious consequences than in the cage system

Slatted (Slotted) Floor System

In a slatted floor, iron rods or wood reapers are used as floor, usually 2-3 feet above the ground level to facilitate fall of droppings through slats. Wooden reapers or iron rods of 2" diameter can be used on lengthwise of the house with interspaces of 1" between rods.

Advantages

- Less floor space per bird is needed when compared to solid floor system.

- Bedding is eliminated
- Manure handling is avoided
- Increased sanitation
- Saving in labour
- Soil borne infection is controlled

Disadvantages

- Higher initial cost than conventional solid floors
- Less flexibility in the use of the building
- Any spilled feed is lost through the slots
- More fly problem.

Slat (Slot) Cum Litter System (combination of slats and litter)

This system is commonly practiced for rearing birds for hatching eggs production, particularly meat-type breeders. Here, a part of the floor area is covered with slats. Usually, 60% of the floor area is covered with slats and rest with litter. Feeders and waterers are arranged in both slat and litter area. In case of breeder flock, nest boxes are usually kept on litter area.

Advantages

- More eggs can be produced per unit of floor space than all solid floors.
- Fertility is better with the slat cum litter house than with the all-slat house.

Disadvantages

- Housing investment is higher with the slat cum litter house than with the all-litter house.
- The separation of birds from the manure beneath the slats commonly results in fly problems.

Cage System

This system involves rearing of poultry on raised wire netting floor in smaller compartments, called cages, either fitted with stands on floor of house or hanged from the roof. It has been proved very efficient for laying operations, right from day-old to till disposal. At present, 75% of commercial layers in the world are kept in cages. Feeders and waterers are attached to cages from outside except nipple waterers, for which pipeline is installed through or above cages. Auto-operated feeding trolleys and egg collection belts can also be used in this rearing system. The droppings are either

collected in trays underneath cages or on belts or on the floor or deep pit under cages, depending on type of cages.

Advantages

- Minimum floor space is needed
- More number of eggs per hen can be received
- Less feed wastage
- Better feed efficiency
- Protection from internal parasites and soil borne illnesses
- Sick and unproductive birds can be easily identified and eliminated.
- Clean eggs production
- Vices like egg eating, pecking is minimal.
- Broodiness is minimal
- No need of litter material
- Artificial Insemination (AI) can be adopted.

Disadvantages

- High initial investment cost.
- Handling of manure may be problem. Generally, flies become a greater nuisance.
- The incidence of blood spots in egg is more
- Problem of cage layer fatigue. (It is a condition, in which laying birds in cages develop lameness. It may be due to Ca and P deficiency but the exact reason is not known)
- In case of broilers, incidence of breast blisters is more, especially when the broilers weight is more than 1.5 kg.

Types of cages

Based on the number of birds in a cage, it is classified as

- Single or individual bird cage (Only one bird in a cage)
- Multiple bird cage (From 2 to 10 birds, usually 3 or 4 birds per cage)
- Colony cages (Holding birds more than 11 per cage)

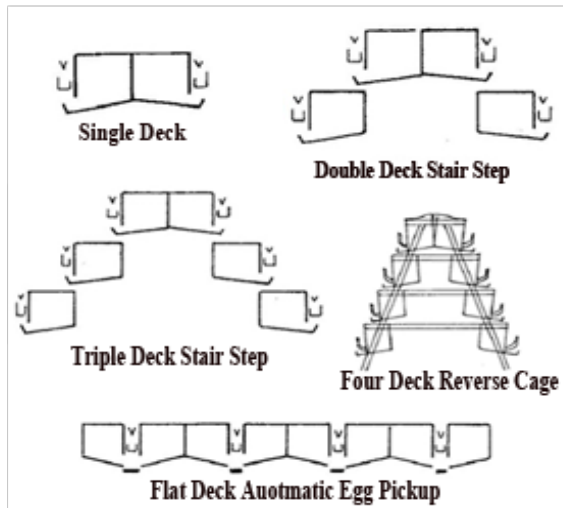
Based on the number of rows

- Single-deck
- Double-deck
- Triple-deck
- Four-deck
- Flat-deck

Based on arrangement of cages

1) Stair-step cages

- a) M-type cages
- b) L-type cages
- 2) Battery cages (Vertical cages)



Based on the type of bird reared

1. Brooder / chick cages
2. Grower cages
3. Layer cages
4. Breeder cages

Broiler cages

Elevated cage layer house

The height of the shed is raised by 6-7 feet using concrete pillars. The distance between two pillars is 10 feet. Two feet wide concrete platforms are made over the pillars. When 3 'M' type cages are arranged 4 platforms are needed. In case of 2 'M' and 2 'L' type cages are arranged 3 platforms are needed. When constructing platforms projecting angles or iron rods to be provided to fix the cages. The inter-platform distance is 6-7 feet depending upon the type of the cages used. The total height of the house is 20-25 feet and the width is 30-33 feet. This type of houses provides sufficient ventilation in tropical countries.



Poultry House Construction

Need for poultry house

- To protect birds from adverse climatic conditions
- To ensure easy and economic operation
- To ensure scientific feeding in a controlled manner
- To facilitate proper micro-climatic conditions in a near vicinity of bird
- For effective disease control measures
- To ensure proper supervision

Selection of location

- Poultry house should be located away from residential and industrial area.
- It should have proper road facilities.
- It should have the basic amenities like water and electricity.
- Availability of farm labourers at relatively cheaper wages.
- Poultry house should be located in an elevated area and there should not be any water-logging.
- It should have proper ventilation.

Layout of poultry farm

A small size poultry farm doesn't require any special layout as it involves construction of only one house. The medium and large size farms require special considerations for placement of building in the farm premises. The basic principles to be observed for layout are

- Layout should not allow visitors or outside vehicles near the birds.

- The sheds should be so located that the fresh air first passes through the brooder shed, followed by grower and layer sheds. This prevents the spread of diseases from layer houses to brooder house.
- There should be a minimum distance of 50-100 feet between chick and grower shed and the distance between grower and layer sheds should be of minimum 100 meter.
- The egg store room, office room and the feed store room should be located near entrance to minimize the movement of people around the poultry sheds.
- The disposal pit and sick room should be constructed only at the extreme end of the site.

Different types of poultry houses based on production

stages

- **Brooder / chick house**-It is used to brood and rear egg-type chicks from 0 to 8 weeks of age.
- **Grower house**-It is used to grow egg-type birds from 9 to 18 weeks of age.
- **Brooders cum grower house**-**Here, the birds are** reared from 0 to 18 weeks of age (entire brooding and growing period of egg-type chicken).
- **Layer house**-In which birds over 18 weeks of age are reared, usually up to 72 weeks of age.
- **Broiler house**-In which broilers are reared up to 6 weeks of age.
- **Breeder house**-In which both male and female breeders are maintained at appropriate sex ratio.
- **Environmentally controlled (EC) house**-In which, entire environment is manipulated in such a way that is optimum for the birds growth.

Poultry Housing based production system

Broadly, poultry housing systems are classified into three systems:

1. Free range or extensive system
2. Semi-intensive system
3. Intensive system
 1. Deep-litter system
 2. Slatted floor system
 3. Slat cum litter system
 4. Cage system

1) Free range system

This system is adopted only when adequate land is available to ensure desired stocking density by avoiding overcrowding. We can rear about 250 adult birds per hectare. A range provides shelter, greens, feed, water and shade. Foraging is the

major source of feeding for birds. Shelter is usually provided by temporary roofing supported by ordinary poles. The fields are generally used on rotational basis after harvesting of crops by moving of birds from one field to another depending on cropping programme. All categories of birds can be reared in this system. This system is most preferred for organic egg production.

Advantages

- Less capital investment
- Cost of housing is least.
- Feed requirements are less since birds can consume fairly good amount of feed from grass land.
- Fertility of soil can be maintained.

Disadvantages

- The scientific management practices can not be adopted.
- Eggs are lost when laid inside the dense grasses unless special nests are provided.
- Losses due to predatory animals are more.
- Wild birds may bring diseases unless proper care is taken.

2) Semi-intensive system

As the name indicates birds are half-way reared in houses and half-way on ground or range, i.e. birds are confined to houses in night or as per need and they are also given access to runs. The houses are with solid floors while runs are fields only. The success of rearing depends on maintenance of condition of runs to reduce the contamination. Runs can also be used on turn basis. The stocking density rate on an average for adult birds is 750 per hectare. This system is usually adopted for duck rearing. The feeding and watering facilities are provided in the pen.

Advantages

- More economical use of land compared to free range system
- Protection of birds from extreme climatic conditions
- Control over scientific operation is some extent possible

Disadvantages

- High cost for fencing.
- Need for routine cleaning and removal of litter material from the pen.

3) Intensive system

Birds are totally confined to houses either on ground / floor or on wire-netting floor in cages or on slats. It is the most efficient, convenient and economical system

for modern poultry production with huge numbers.

Advantages

- Minimum land is required for farming.
- Farms can be located near market area.
- Day-to-day management is easier.
- The production performance is higher as more energy is saved due to restricted movements.
- Scientific management practices like breeding, feeding, medication, culling etc. can be applied easily and accurately.
- The sick birds can be detected, isolated and treated easily.

Disadvantages

- Birds' welfare is affected. They cannot perform the natural behaviour like roosting, spreading wings, scratching the floor with legs etc.
- Since they are not exposed to outside sunlight and feed sources, all the nutrients should be provided in balanced manner to avoid nutritionally deficient diseases.
- Chances for spreading of diseases are more.

3. Routine activities in poultry farm

3.1 cleaning and sanitary environment

- **Rodent control:**
 - Avoid breeding, feeding & hiding places of rodents
 - Remove piles of trash and unused equipment
 - Feed spills or left in troughs stacked carelessly should be disposed.
- **Insect control**
 - ✓ Insects are agents in disease transmission:
 - ✓ May parasites & disease agents:
 - ✓ Measures against insects are part of the sanitary environment and sanitary clean up.

Sanitary environment

- **Carcass disposal methods**
 - Carcasses remain source of infection for pen mates and other poultry on the same or other farms.

- All carcasses should be disposed off by one of the following methods:
 - Pit or tank disposal
 - Burning (incinerators)
 - burying

Cleaning the building

- Good poultry house sanitation begins with a clean, disinfected house, prepared well in advance of the birds' arrival.
- Each house should remain empty for at least 2 weeks after it is disinfected and fumigated.
- The cleaning helps to control diseases because it:
 - Reduces the total number of pathogenic organisms
 - Remove materials that give shelter to pathogens
 - Exposes surfaces to disinfectants and fumigants.

3.2. Feeding of poultry

Type of feed and feed structure of poultry

Structure of poultry feed

Mash: Product after mixing several raw materials

Pellets: Pressed mash/feed ball

Crumbs: broken-up pellets

Positive effects of pellets & crumbs

- Increased intake
- Higher density of nutrients
- Less wastage, selection & de-mixing of feed
- Destroys toxic organisms (mycotoxins)
- Feeds are more homogeneous

- Facilitates handling

Type of poultry feed

Chick starter feed: fed until the age of 6-7 weeks.

Grower feed: Gradually substituted for the chick starter feed (no sudden changes).

Fed from 7wks up to the point of lay (i.e. when 5-10% production is reached, ≈18-20 weeks of age)

Layer feed: fed from the point of lay until the end of the production period. Higher Ca levels might be preferred in layer feed for eggshells strengths

Broiler feed: Generally, three types of feed are offered to broilers from day-old to marketing.

0-2 Weeks – **Broiler Pre-starter mash / crumble**

3-4 Weeks – **Broiler Starter mash**

5-6 Weeks – **Broiler Finisher mash**

Pre-breeder rations: To support Ca metabolism into peak production on medium Ca-level may be fed until 40% of production (between 18 and 22 weeks)

Broiler breeder rations: Fed to broiler parent hens

Cocks: Special broiler breeder males require less feed and less Ca.

Feeding systems

1. **Free choice (ad libitum) feeding:** i.e., a situation where feed is always available.

- Easy to manage.
 - Feed can be supplied for several days at a time and no monitoring or supervision is required.
 - Mechanical delivery systems relatively easy to devise.
- Circumstances in which birds over-consume
 - Over expenditure/cost on feed.
 - Fat deposition →↓ egg production, ↓ fertility, ↑ mortality.

2. **Restricted feeding**

- Recommended mainly for broiler breeders.

Methods of Restriction

1. Percentage Restriction

- Daily intake limited to a certain proportion of the known intake of similar birds fed ad libitum.

E.g. in case of broiler breeders, intake may be restricted to 70% of normal intake.

2 Limited accesses (skip-a-day' feeding)

- Birds supplied with their normal feed, ad libitum, 6 days a week.
- On 7th day birds given 800 g of grain per 100 birds only.
- This is the simplest method of restricted feeding.

3.3. Debeaking/ Beak trimming. Chickens are usually beak trimmed to control cannibalism.

- **Precise method of beak trimming** can be done at **7 to 10** days of age, because it is less stressful than at an older age (6 to 9 weeks). If re-trimming is necessary it should be done at no longer than 12 weeks of age.

Method of beak trimming

a. conventional cut.

- A hot blade trimmer is used to prevent beak re-growth
- Trimming can be at 6 to 12 weeks with each beak is cut and cauterized separately

b. Guide plate with an 11/16 inch hole is used. Both beaks are inserted through the hole and cut at the same time. Detailed instructions should be obtained before attempting this method.

With conventional trimming

- The upper beak should be cut 3/16 inches in front of the nostril while the lower

beak is left slightly longer

- After trimming in either case feeders should be kept at least half full until the beaks are healed.
-

Weighing and Culling:

Underdeveloped, chicks with stunted growth, diseased, any abnormal physical condition, untrue to the type or any other type of undesired pullets should be identified and culled out regularly starting as early as possible during growing period to save labor, feed cost, space and avoid contamination of certain diseases associated with undesirable pullets.

In culling of meat type breeding pullets, however, *body weight* is the major consideration, breeding males and females are selected on weight basis depending on prefixed amount of 'selection pressure'.

3.4 Hatchery management

Five major functions are involved in the incubation and hatching of poultry eggs. They are:

- **Temperature:**
- **Humidity:**
- **Ventilation** (Oxygen and Carbon dioxide level and air velocity)
- **Position of eggs:**
- **Turning of eggs:**

1. Temperature

Temperature is the most critical environmental concern during incubation. Embryo starts developing when the temperature exceeds the ***Physiological Zero***. *Physiological zero* is the temperature below which embryonic growth is arrested and above which it is reinitiated. The physiological zero for chicken eggs is about 75°F (24°C). The optimum temperature for chicken egg in the *setter* (for first 18 days) ranges from 99.50 to 99.75 ° F and in the *hatchery* (last 3 days) is 98.5 o F.

2. Humidity

Incubation humidity determines the rate of moisture loss from eggs during incubation. Recommended incubation relative humidity for the first 18 days ranging between 55 and 60% (in setter) and for the last 3 days ranging between 65 and 75%.

3. Ventilation

Ventilation is important in incubators and hatchers because fresh oxygenated air is needed for the respiration (oxygen intake and carbon dioxide given off) of developing embryos from egg setting until chick removal from the incubator. Generally the oxygen

content of the air in the setter remains at about 21%.

4. Position of eggs

Artificially incubating eggs should be held with their large ends up. It is natural for the head of the chick to develop in the large end of the egg near the air cell, and for the developing embryo to orient itself so that the head is uppermost.

5. Turning of eggs

Birds, including chickens and quail, turn their eggs during nest incubation. Nature provides nesting birds with the instinct of turning eggs during incubation. Similarly eggs to be turned at least 8 times a day. Turning of eggs during incubation prevents the developing embryo adhering to the extra-embryonic membranes and reduces the possibility of embryo mortality. In large commercial incubators the eggs are turned automatically each hour i.e. 24 times a day. Most eggs are turned to a position of 45° from vertical, and then reversed in the opposite direction to 45° from vertical.

HANDLING OF HATCHING EGGS AND STORAGE

The quality of hatching egg cannot be improved after lay but one can reduce the loss in hatching egg quality by adopting some standard procedures.

Maintaining egg quality in the breeder house

Use of enough clean, dry and mold-free nesting material can avoid cracked and dirty eggs. The frequency of hatching egg collection is very important to maintain quality. Hatching eggs should be collected at least 4 times a day.

Selection of hatching eggs

Eggs that are cracked, dirty or misshapen are usually not used for hatching. Very small or very large eggs do not hatch as well as eggs in the middle size range. Eggs with thin or very porous shells are not likely to hatch well because of excessive losses of water during incubation.

Reducing contamination of hatching eggs

Fumigation with formaldehyde gas is an effective method of sanitizing hatching eggs. DO NOT wash eggs unless necessary. If it is necessary to wash eggs always use a damp cloth with water warmer than the egg.

Storage of hatching eggs : Hatching eggs should be kept in an egg holding room with the temperature of 65°F and the relative humidity of 75%.