

<b>COURSE CODE:</b>	APH302
<b>COURSE TITLE:</b>	Non-Ruminant Animal Production and Husbandry
<b>NUMBER OF UNITS:</b>	3 Units
<b>COURSE DURATION:</b>	Three hours per week

---

---

### COURSE DETAILS:

<b>Course Coordinator:</b>	<b>Dr. S. O. Akinola</b>
<b>Email:</b>	<a href="mailto:bayomiola@yahoo.com">bayomiola@yahoo.com</a>
<b>Office Location:</b>	COLANIM Building
<b>Other Lecturers:</b>	<b>Dr. O. A. Adeyemi, Dr. O. M. Sogunle, Dr. L. T. Egbeyale</b>

### COURSE CONTENT:

Poultry production- problems and prospects. Management systems: management of broilers, layers and cockerels. Management of ducks and turkeys. Diseases and control. Hatchery enterprises. Factors affecting hatchery enterprises. Marketing and record keeping.

Pig production- problems and prospects. Management systems: management of pregnant sows, piglets, growers, gilts, breeding sows and boars. Diseases and control. Planning production targets: record targets and record keeping. Pig production enterprise.

Rabbit production- problems and prospects. Management systems: management of pregnant does, litters, growers, breeding does and bucks. Diseases and control. Planning production targets: record targets and record keeping. Rabbit production enterprise.

### COURSE REQUIREMENTS:

This is a compulsory course for all 300 level students in Colleges of Animal Science and Livestock Production, Plant Science and Crop Production' and Veterinary Medicine as well as those in the Departments of Agricultural Economics and Farm Management and Agricultural Extension and Rural Development. Students are expected to participate in all the course activities and have minimum of 70% attendance to be able to write the semester examination.

## READING LIST:

Poultry Production in warm wet climate by Oluyemi and Roberts, 1995.

Manual on Avian Production and Management by Ghosh and Samanta, 2008.

Goose Production, FAO Animal Production and Health Paper 154 edited by Roger Buckland, 2002.

A Manual for Primary Animal Health Worker, FAO Repository, 1994

Raising Turkeys (Breeds, Care, Health) [www.biblioteca.mvz](http://www.biblioteca.mvz)

## LECTURE NOTES

### BRIEF OVERVIEW OF LIVESTOCK INDUSTRY

- Livestock are farm animals or domestic animals. We live with animals, worship them, consume them, admire them, fear them, love them, care for them and depend on them. They are part of our sociology and our day to day lives. They are so important to us that we also study them and apply what we learn to improve their lives and their roles in our lives.
- Much of our use for livestock revolves around their use as food.
- Livestock can be classified on the basis of:
- Specie- Mammals(Cattle, sheep, goat, rabbit and pigs)
- Aves (Poultry)
- Nature of feed
  - Herbivore
  - Carnivore
  - Omnivore
- Type of Digestive System
  - Ruminant -Cattle, Sheep and Goats
  - Non Ruminants (Monogastric) - Poultry, Pigs, Rabbits

Table 1 Numbers of small ruminants and poultry in Africa, between 1961 and 2003

Animal species	Sheep	Goats	Chickens	Ducks	Geese	Turkeys
1961 – 2003 (overall growth rate, %)						
■ Africa						
Numbers, millions	in 135.1-254.7	94.3-229.2	274.2-1355.3	6.2-16.4	3.9-12.3	1.2-9.2
	(+88.5)	(+143.1)	(+394.3)	(+164.5)	(+215.4)	(+666.7)

Animals/Humans ratio	0.476-0.229 (-51.9)	0.332-0.269 (-19.0)	0.965-1.593 (+65.1)	0.022-0.019 (-13.6)	0.014-0.014 (0.0)	0.004-0.011 (0.0)
----------------------	------------------------	------------------------	------------------------	------------------------	----------------------	----------------------

■ **Sub-Saharan**

**Africa**

Numbers, in millions	71.2-174.0 (+144.4)	77.6-208.1 (+168.2)	207.0-767.3 (+270.7)	3.5-6.8 (+94.3)	1.5-3.0 (+100.0)	0.4-2.4 (+500.0)
----------------------	------------------------	------------------------	-------------------------	--------------------	---------------------	---------------------

Animals/Humans ratio	0.341-0.265 (-22.3)	0.371-0.317 (-14.6)	0.990-1.170 (+18.2)	0.017-0.010 (-41.2)	0.007-0.005 (-28.6)	0.002-0.004 (+100.0)
----------------------	------------------------	------------------------	------------------------	------------------------	------------------------	-------------------------

Source: FAO, 2004.

**The Development of Poultry Industry in the World**

The origin of the modern chicken is probably from the jungle fowl – *Gallus gallus* (*Benkiba*).

Early rearing of poultry was for:

- ✓ Religious.
- ✓ Superstitious.
- ✓ Beauty/aesthetics
- ✓ Fights.



**History**

1570 – England forbidden of cock fighting.

1840 – Commercial use of poultry products (eggs, meat, feathers).

1879 – USA- definition of breed and line.

**Poultry Industry Characteristics**

1. Spread all over the world.
2. No effect for Geographical location or different climates.
3. Distance does not affect growth efficiency.
4. Short production period.
5. Early large investments follow by small ones.
6. Feed – Major routine cost.
7. Tough competition.
8. Changeable production conditions. (Animals, Equipments, Marketing).

9. Fast accepting of new technology.
10. Shifting to integrative production.
11. Increase demand for poultry products.

### **Problems facing the poultry industry**

- ✓ Scarcity and high cost of day-old chicks, poults, etc.
- ✓ Poor quality of birds available for meat and egg production.
- ✓ Availability and high cost of poor quality feeds.
- ✓ Poor poultry health care services.
- ✓ Unsuitable poultry houses and poor maintenance of houses.
- ✓ Inadequacy of credits to poultry farmers.
- ✓ Inadequate managerial and technical know-how.
- ✓ Poor marketing, distribution and pricing of poultry products.

### **Prospects of the poultry industry**

- ✓ Poultry Meat Production: Broiler production for meat mart and fast food joints
- ✓ Poultry egg production: Layers production for retail egg sellers, etc.
- ✓ Breeding & hatching of chicks, poults, keets, etc.
- ✓ Poultry equipment manufacturing e.g. FACCO®
- ✓ Processing and marketing of poultry products.
- ✓ Feed production.
- ✓ Production of drugs and vaccines.

Poultry production is of importance in Food production, research, industry, income generation and as a hobby. It should be noted that poultry production accounts for 18% out of all agricultural business and 40% out of animal production.

### **Future threats to poultry business**

#### In the Environment

- ✓ Soil contamination
- ✓ Water contamination
- ✓ Air pollution
- ✓ Noise

#### With respect to Animal Welfare

- ✓ Layers: cages, beak trimming, molting, killing
- ✓ Broilers: crowdedness, marketing
- ✓ Geese: force feeding.

## **ESTABLISHING POULTRY, PIG and RABBIT ENTERPRISES**

### **Planning Principles**

Planning principles and objectives for any livestock development include:

- Minimal environmental (visual, odour, noise, wastes) impact and minimal impact on adjoining uses, with allowance for future expansion of operations.
- Must be consistent with relevant planning principles and objectives articulated in Local Council Development Plans.
- Maximise livestock welfare.
- Minimise disease risk.
  
- **General Considerations**
- Livestock farms should not create any significant adverse impact, including denudation, erosion and pollution of the environment, nuisance, human health risk, livestock welfare problems or loss of visual amenity.
- Livestock farms should be sited, designed and managed to ensure that odour emissions and noise are minimized.
- All buildings and other ancillary structures should be sited as unobtrusively as possible. Suitable trees and shrubs should be planted and maintained around the sheds and other ancillary structures intended for animal husbandry, to visually screen these activities from adjoining roads and properties.
  
- **Wastes Disposal**
- All effluent and other wastes must be properly managed and disposed of without adverse effects on public health and the environment, including water resources.
- Solid or liquid wastes should not be spread on the property within the prescribed distance of dwellings, watercourses or roads.

### **Livestock Management Systems**

Simply put, it is a measure of the exposure of livestock to sunshine and pasture. It can also mean the degree of restriction applied to livestock movement or freedom. The standard management systems are Extensive, Semi-Intensive and Intensive Management Systems. In recent years however there have been modifications to this classification, nonetheless it will suffice for this class. The following is a summary of the characteristics of the three management systems

Table 2. Livestock Management System Classification

Characteristic	Intensive	Semi-intensive	Extensive
Breed and flock size	Specialized breeds: large number of animals per unit area	Specialized and dual-purpose breeds	Local indigenous type: Few animals
Housing	Modern housing, generally with concrete walls and regulated internal environment	Varies from modern houses to simple housing made from locally available materials	Specific houses are rare
Feed resource	Commercially compounded feeds	Commercially compounded, homemade mixtures and scavenging	Scavenging and occasional feeding with home grains and household refuse
Health programme	Standard and regular animal health programme	Disease control and health programme at varying levels	No regular health programme of disease control measures in place
Markets	Cold chain system for input-output distribution	Input and output distribution is based on existing trading centres	No formal marketing channels
Infrastructure	Water, electricity and communication available	Modest infrastructure depending on proximity to urban centres	Underdeveloped infrastructure
Product storage and processing	Products refrigerated; dressed animals and table eggs refrigerated	Minimum refrigeration, occasional dressing of slaughtered livestock	No refrigeration, sales of live animals and eggs
Technology/information	Formal training, extension services available - information disseminated through producer and consumer associations	Moderate formal training and extension services	Local knowledge, with moderate or no extension services

## POULTRY MANAGEMENT AND PRODUCTION

Poultry is a common term and it indicates all the domesticated birds which are reared for production of eggs and/or meat for the economic benefits of human beings. The most important poultry species are chicken or fowl, duck, quail, turkey, guinea fowl, peafowl, etc. But the term 'poultry' most often used as synonymous to chicken as it accounts for more than 90% of the total poultry population in Nigeria and our poultry industry is mainly chicken oriented. Poultry production is an important and diverse component of Nigerian agriculture. Poultry products mainly eggs and meat are a healthy part of the diets of most Nigerians. Chicken meat is very popular throughout the world. It is seen as a healthy meat low in fat and rich in protein (lean meat). Chickens are the most numerous birds in the world. The chicken is believed to have been domesticated nearly 5000 years ago from wild birds in Southeast Asia.

Modern poultry production occurs primarily in enclosed buildings to protect the birds from weather, predators, and the spread of diseases from wild birds. This has allowed farmers to greatly increase production efficiency while significantly reducing the amount of labour required.

- **Species:** It is a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding, and considered as the basic unit of taxonomy. The important poultry species in Nigerian poultry industry scenario are
  - (i) Chicken/fowl - *Gallus domesticus* (reared for egg and meat).
  - (ii) Duck - *Anas platyrhynchos* (mainly reared for egg and to some extent meat).
  - (ii) Guinea Fowl- *Numidia* (mainly reared for meat and also egg).
  - (iv) Turkey - *Meleagris gallopavo* (mainly reared for meat).
- **Class:** It indicates group of breeds developed in a particular geographical area. The breeds of chicken are classified into four classes, viz., American class, English class, Mediterranean class and Asiatic class.
- **Breed:** A group of birds which are similar in shape, size and body conformation, and descendants of common ancestry is known as breed. All the birds of a breed have more or less same genetic makeup with common morphological and physiological **sehlp**. The examples of some breeds of chicken are White Leghorn, Rhode Island Red, New Hampshire, Australorp, Sussex, Aseel, etc.
- **Variety:** It is the sub-division of a breed distinguished mainly by colour of plumage, type of comb, etc. For example, Leghorn breed of chicken has 12 varieties, like white, brown and buff coloured plumage, and single and rose type comb, etc.
- **Strain:** It indicates a group of birds with some special characters within a breed or variety. It is developed by a breeder by introducing some economic characters like egg size, growth rate, feed efficiency, laying ability, mortality, etc. Nowadays strain is more popular than breed concept. For example, Anak-2000, Hubbard, Caribro-91, Vencob, Starbro are some broiler strains of chicken.

- **Hybrid Chicken**

Nowadays pure breeds of chicken are not generally used for commercial production of egg or meat. First, the pure breeds are replaced by breed crosses, and now breed crosses are replaced by strain crosses. Some important breed crosses and strain crosses of chicken are given below.

- Breed crosses:

1. Austra - white: The Australorp male is crossed with White Leghorn female to produce this breed cross.
2. Rhodo - white: The Rhode Island Red male is crossed with White Leghorn female to produce this breed cross. White plumage is dominant with occasional blackish feathers.
3. Sussex - hampshire : The Sussex male is crossed 'with Hampshire female to produce this breed cross.
4. Red- rock: The Rhode Island Red male is crossed with Barred Plymouth Rock to produce this breed cross. The male progenies are barred and females are black.

- **Strain /crosses:**

1. Broiler strains  
Cobb, Ross, Hubbard, Vencob, Anak - 2000, Chabro, *etc.*
2. Layer strains  
Starcross - 288(white/brown egg), Olympia, Hissex

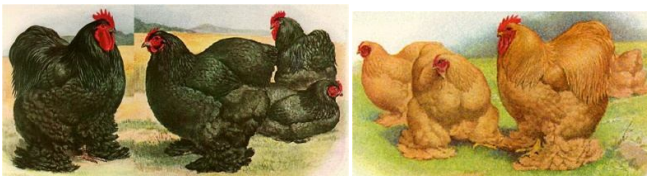
### Some Breeds of domestic chickens

**The Asiatic Family:** They are characterized by:

1. Heavy (male 6.5kg, female 4.5 kg)
2. Colorful
3. Shank feathers
4. Low in reproduction
5. Non-aggressive
6. Yellow skin
7. Late maturation

**Examples:**

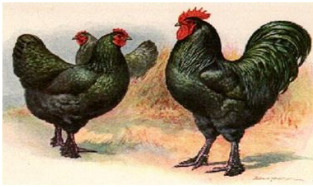
#### **Cochin**



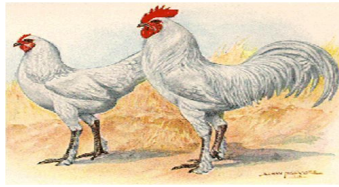
Dark

Buff





Black Lungsham



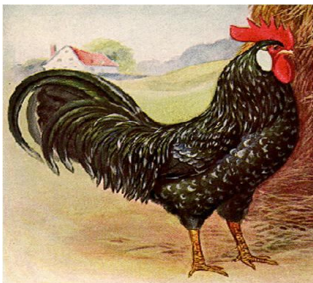
White Lungsham

**Mediterranean family:** They are characterized by:

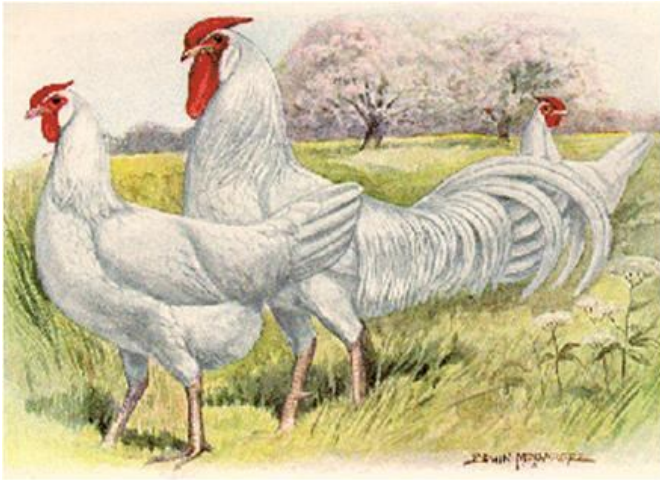
1. Light weight (male 2.5 Kg female 2.0 Kg)
2. High metabolic rate
3. Early maturation
4. High reproduction
5. Cock fight
6. Nervousness

Examples:

**Anacona** – originally from Italy ; black with white dots, yellow skin



**Minorca:** originally from Spain. Tall with white skin.



Single Rose Comb: White Minorca

**White face black Spanish:**

black shank, beak, white face single comb



Leghorn: High productivity (egg production) nervousness , many colors



Brown Leghorn



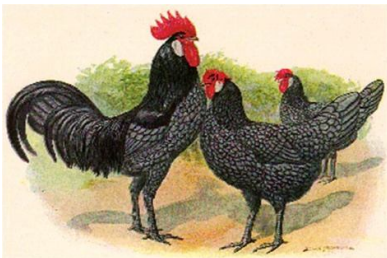
White



Buff

**Blue Andalusian:**

Bluish color white skin , single comb

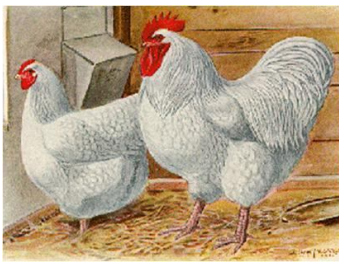
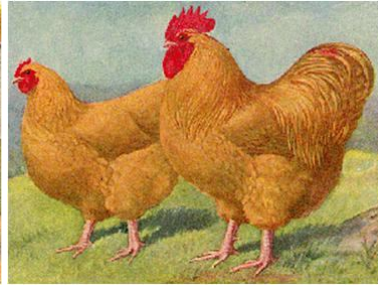
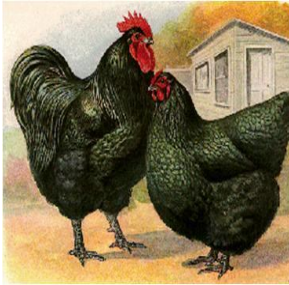


**English family:** They are dual purpose breed that lay brown eggs, has white skin with moderate body weight and egg production

**Sussex:** large breast, male 4 Kg, female 3kg 240 eggs/year



**Orpington**



**Australop:** Australian development from the Orpington as an egg type bird.

High productivity, excellent egg shell quality



**Cornish – Indian game bird**

Developed for hunting, low reproduction, high breast muscle yield, being used as the male in broiler breeder.



**Droking: 5 fingers**



**American family:** Modern and developed for meat and egg production.

**Plymouth Rock:** Heavy, 150-180 egg/year – female in broiler breeder flocks



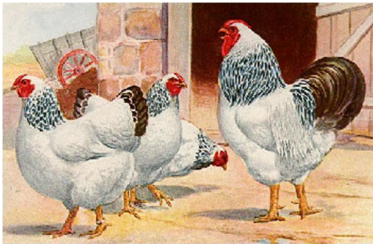
**Rhode Island Red:** developed as a dual purpose bird, brown shell egg used as genetic source for brown shell egg layers.



**New Hampshire**



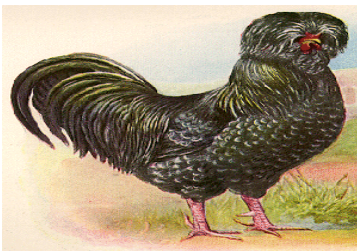
### Wyandotte



**European family:** These are local European birds used traditionally in Europe because of meat quality and taste

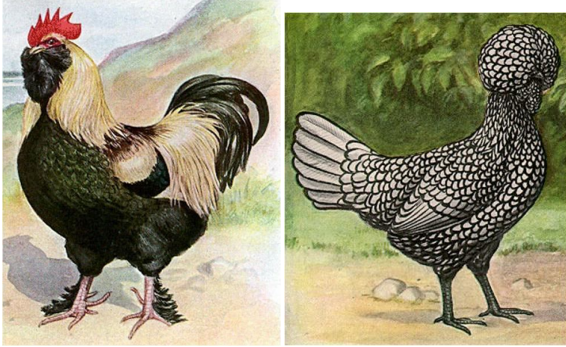
Examples:

**Houdan:** from France



**Faverolles**

**Polish**



## FACTORS TO CONSIDER IN ESTABLISHING POULTRY FARMS

Sometimes there is no choice, but if there is a choice, features for a good location are:

- well-drained land; this is especially important where litter systems are used
- within sight of owner/supervising personnel
- away from other chicken houses, to reduce the spread of diseases; in general, the more distance, the better
- in hot climates, having tall trees which cast shade on the roof, is an advantage; however, the natural air flow (wind) should not be hindered
- no direct sunshine entering the house; placing the house in an east-west direction is best
- Location should be such that it allow easy transportation of birds, feed and eggs to and from the farm.

### Housing

- A properly constructed chicken house, regardless of its size and the materials used, has certain essential features:
- a watertight roof
- proper ventilation
- inner surfaces which are easy to clean
- rat and wild bird proof floor, walls and roof
- correct location

### The ideal poultry building

1. The *materials* which are used should be:
  - Long lasting (durable)
  - Easy to handle and easy to repair if damaged
  - Readily available and as cheap as possible
  - Building and repairs should preferably be carried out by the poultry farm itself in order to reduce costs.
2. The *width* of the house should generally not exceed 9 metres. The length depends on the number of chickens that is going to be kept and the available building space.

3. The *height* of the poultry house should not be less than 2 metres anywhere in order to make the house easily accessible everywhere (without stooping). Moreover it provides more volume to the House resulting in a better air quality.
4. The *floor* should be made of concrete (this is the ideal floor for a chicken house because it is easy to clean).
5. In hot climates at least 3 sides *should be open* (wire netting!) in order to have enough fresh air (ventilation) for the chickens. By means of boards or mats the sides may be temporarily and partially closed when there are young chickens inside.
6. The *roof* should protect the chickens against direct sunlight and rain and for that reason it should extend the walls for about 50 cm beyond the wall. The roof may be ridged or slope to one side. If the roof is ridged, this ridge should be *open* to permit heat to escape.
7. The chickens should be protected against too much heat during the day.

### **Life Cycle of A Chicken**

Conveniently divided into 4 viz:

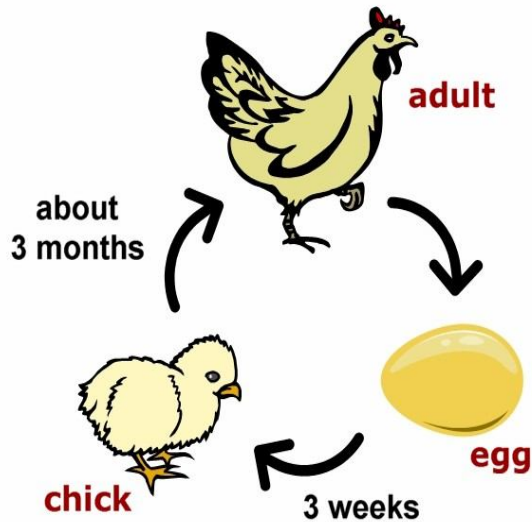
Embryonic Stage (Incubation) -First 21days

Postnatal/chick (Brooding) - Day 1-8th week

Grower Stage (Rearing) - 8 to 20/24th week

Adult Stage (Management of Layers/ Breeders) - Above 20/24th week





#### **EMBRONIC STAGE (INCUBATION)**

- The management of the embryo. It is the provision of conditions for successful development of a fertile egg into a fully developed chick.
- Incubation could be natural or artificial. *Artificial incubation* is required as soon as larger numbers of chicks (or ducklings, etc.) are needed. In that case it is not practical to make use of a broody hen (or duck, etc.).

#### **Selection of hatching eggs**

Only first class eggs should be used; all eggs with obvious abnormalities should be rejected

- malformed eggs do not hatch well
- broken or cracked eggs are useless because they dry out inside the incubator
- small eggs usually give weak chicks
- long eggs are mostly 'double yolks' which will never hatch
- abnormally coloured eggs are usually the result of a genetic defect

There are specific egg-weights for each type of chicken according to their production season, but in general a hatching egg should weigh between 52 and 70g. Handle hatching eggs carefully because they are costly!

#### **Conditions for Hatching of Eggs**

- The development of a fertile hen egg into a young chick requires:
  - a temperature of 37.5 - 39 °C (100 - 103 °F), for three weeks
  - a supply of fresh air permitting the (growing) embryo to breathe
  - enough humidity to prevent the egg content from drying out in the (warm) incubator
  - some movement of the egg to prevent the embryo from sticking to one side of the egg

- An incubator must therefore have a:
  - source of heat
  - thermometer held at egg level
  - thermostat to maintain the temperature at 37.5 - 39 °C
  - tray which holds the egg steady but allows the movement of air around the eggs
  - supply of water to humidify (to moisten) the air in the incubator
  - ventilator to provide fresh air and to remove stale air

### **Temperature**

Temperature is the most critical factor in incubation. The normal temperature of a hen varies between 41.4 and 41.9 °C. The optimal temperature for hatching determined in the centre of the egg is 37.5 to 37.7 °C. Deviations from the optimal hatching temperature cause mortality and affect the time of hatching. The lower the temperature, the later the hatching because of a slower growth rate of the embryo. Also the frequency of so called malposition of the chicks is increasing with temperature deviations. Generally the eggs are more sensitive to overheating than undercooling. High temperatures cause higher embryonic mortality, a shorter duration of incubation and leg and navel abnormalities, especially after ten days of incubation. The coinciding low RH causes sticky chickens losing moisture, so that they are more sensitive to lack of water during their first days of life. Low temperatures will delay hatching time. Navels may be open and infected. Also here characteristics of high RH can be observed: sticky and relatively small chicks.

### **Relative humidity**

The relative humidity RH is the amount of water vapour in the air expressed as a percentage; 100% means that the air is saturated with water vapour. The warmer the air, the more water vapour it can contain. *Not enough* moisture in the air can cause the developing embryo to dry out and die. *Too much* moisture can cause the embryo to 'drown'.

### **Turning eggs during incubation**

- *Turning or altering the position of the egg* during incubation has a definite influence on the embryo mortality rate. It is necessary for the embryo to be gently but frequently moved within the egg; this prevents the embryo from settling and adhering to certain structures, as it would do if left for 21 days in one position.
- In the flat-type incubator turning also ensures more even warming of the egg content. The turning may be *manual* or *automatic* by means of a mechanical device that can be set to turn the whole of the contents of the incubator at regular intervals. There is much to be said in favour of automatic turning; it is regular, smooth and it can be carried out both during the day and the night without the need of night rounds.
- Slow and regular turning is most advantageous in the early stages of incubation. The intervals between turnings can be as short as a quarter of an hour, provided that the eggs are turned in opposite directions each time. If the turning is always done in the same direction it seems to interfere with the centering action of the chalazae and embryonic death may be high.

- It has been found that *hourly* turning, throughout the 24 hours of the day, gives the best results. If the turning is done by hand, the number of turnings may be reduced to 5 or 7 times per day. It is important to turn an odd number of times under such circumstances to ensure that the embryo does not spend the long unturned period of the night always on the same side. The need for frequent turning is greatest during the first 18 days of incubation. It is recommended *not* to turn the eggs during the last 3 days.

#### **Positioning of Eggs**

- The positioning of eggs in the incubator is one of the factors affecting hatchability. The eggs are positioned in the incubator such that the broad ends are up. Eggs with narrow ends up show unduly high proportion of dead in shell through the failure of the embryo's head to establish access air space, thus hatchability will reduce by 30–40%.

#### **Ventilation**

- *Adequate ventilation* is of great importance during incubation. It is not only the supply of oxygen to the developing embryo that matters, but also the removal of waste products such as carbon dioxide.
- The air flow should never pass back from 'dirty' areas such as hatcher, to 'clean' areas such as setters and egg holding rooms.
- Ventilation is usually assured through holes near the bottom of the incubator which serve as *inlets* and adjustable *outlets* near the top of the incubator. Bigger incubators usually have a fan or paddle as well (forced-air ventilation).

#### **Hatching and delivery of day-old chicks**

- After 18 days of incubation (thus on the *19th day*), the eggs are transferred to a hatching tray (but in big incubators the eggs go to a special hatching compartment). They may be *candled* during this transfer, to detect any dead embryos.
- It is often recommended to increase the *humidity* during the hatching. Ample *ventilation* should be given, since the newly hatched chicks do not only generate a lot of heat but also require plenty of fresh air for breathing.

#### **During hatching**

- When the chick hatches it is rather wet. Chicks must be allowed to dry in the hatcher and to fluff out their down feathers. This is a slow process when the relative humidity is 75% or higher. To speed up this process, the humidity should be lowered again when about 2/3 rd of the chicks have come out of their shells. Allow approximately 4-5 hours for the drying process, after which the chicks are removed from the hatcher.
- Chicks should not be left in the hatcher for too long; this would tend to dry them out too much, the dehydration would lower their vigour and vitality. Chicks from smaller eggs dehydrate more rapidly than chicks from bigger eggs.

### Chick handling

- Freshly hatched chicks often suffer because they are handled several times; this means *stress*.
- Make sure that everything is ready and 'in line' to receive the chicks and to dispatch them, so that any handling has not to be done twice, and the chicks are not kept in a certain handling place too long.

### Incubation Period

Different species of birds and even the strains of birds lay eggs that have different incubation periods. Although some species have the same period of incubation, most do not have the same. So whether it is natural or artificial incubation that is used, the eggs must stay in the incubator for the required period of time before they are finally hatched into chicks or poults.

These incubation periods can only be kept strictly when conditions within and outside the incubators are favourable for the eggs. Under certain situations even after the period is elapsed the chicks or poults are not hatched and when they eventually hatch, hatchability is very low.

Table 3. Incubation Period for different poultry species

Poultry Eggs	DAYS
Chicken	21
Duck	28
Muscovy Duck	33-35
Guinea	28
Bobwhite Quail	22-24
Coturnix Quail	16-18
Pheasant	21-24
Pigeon	17-19
Ostrich	40-42

Swans	42
Geese	33-34

### Management of Eggs in the Incubator

- Fumigate the incubator and the hatching eggs using Formaldehyde and  $\text{KMnO}_4$  (2:1).
- Allow the Incubator to run for about 24 hours to permit the detection and possible rectification of any defect before eggs are set.
- Eggs are set horizontally in egg trays table-type incubator and vertically in cabinet incubator (broad end should be up).
- Trays should not be concentrated to one section of the incubator.
- Colour labels should be used on the trays to identify time of setting.
- Turning begins 24hrs after setting in opposite direction and at odd number of times in a day.
- Candling is done twice e.g. For chicken - 5<sup>th</sup> day to determine fertility and 18<sup>th</sup> day to detect dead or living embryos.
- After the candling at the 18<sup>th</sup> day (for chicken), hatching eggs with living embryos are transferred to the hatching compartment.
- Though chicks hatch on the 21<sup>st</sup> day in the case of domestic fowl, they are given extra for the down feather to dry off.
- Chicks that are fully developed and emerged from their shells (pipped) are removed from the incubator.
- Those that died and could not emerge are referred to as 'dead in shell'-DIS
- Meanwhile, those that are not fully developed and died before the candling at the 18<sup>th</sup> day are referred to as 'dead in germ' - DIG
- Candling is done by exposing the eggs to a beam of light in a darkened area

### Causes of Embryonic Death (DIG & DIS)

Certain features are usually associated with the different causes of embryonic mortality or poor management operations:

- Failure to hatch following pipping may be due to insufficient moisture.
- Hatching too soon and malformed chicks may arise from excessively high temperature.
- Weak chicks may result from overheating of the incubator.
- "Mushy" chicks may be caused by too low an average temperature and poor ventilation of incubator; the chicks get weak, drowsy and puffed up and death occurs shortly.
- Blood rings in broken-out shells suggest early embryonic death and may be due to either high or too low an incubator temperature, incorrect fumigation or wrong storage of eggs.

### There are 3 peaks of embryonic death

1. Between the 4<sup>th</sup> and 5<sup>th</sup> days due to transition from carbohydrate to protein as source of energy for the growing embryos. This is accompanied by accumulation of  $\text{CO}_2$ ,  $\text{NH}_3$  and  $\text{C}_3\text{H}_6\text{O}_3$  (lactic acid) if ventilation is very poor.

2. Between the 14<sup>th</sup> and 15<sup>th</sup> days of incubation - associated with riboflavin (Vitamin B<sub>2</sub> – C<sub>17</sub>H<sub>20</sub>N<sub>4</sub>O<sub>6</sub>) deficiency in diet.
3. Between the last 3 days of incubation – due mainly to mismanagement of the hatching eggs.

### Calculations made in the Hatchery

- Percentage Hatchability = (No of Chicks hatched/ No of fertile eggs) x 100
- Percentage fertility = (No of fertile eggs/ No of eggs set) x 100
- Percentage hatch = (No of day old hatched/ No of eggs set) x 100
- Percentage settable eggs = (No of eggs set/ No of eggs collected) x 100

### CHICK STAGE (BROODING)

Brooding is the process of caring for young chicks from day-old to eight weeks of age. It entails essentially, the provision of factors like heat, light, humidity, ventilation, feed, water and disease control measures for the survival and rapid growth of chicks. It is the efficient combination of these factors that determines the level of physical and physiological development and the mortality of the chicks. A brooder or a brooding unit is designed to house chicks from day-old until they no longer need supplementary heat between 0-8 weeks.

During the period from 1 day to 8 weeks (brooder period) young chickens need special care. It is the most critical time in the post-hatch life of the chicken and is highly prone to mortality

#### Temperature

- Young chicks cannot yet regulate their body temperature themselves. So, normally *artificial heating* is provided during the brooding period.
- Brooder operations in temperate climates require heating of a whole house. In the (sub)tropics heat may be provided to a particular area in the house, a corner or one room only, at least during the night.

#### Artificial heat sources are:

- electric brooder (infra red heat bulbs)
- gas brooder (gas heaters)
- kerosene brooders (kerosene lamp/kerosene heater)
- other fuel sources (e.g. charcoal)

#### Preparation for brooding:

##### Before Arrival:

- Ideally, all sites should be single age (i.e. all in-all out).
- Houses, the surrounding areas and all equipment should be thoroughly cleaned and disinfected.
- Expected delivery time of chicks should be confirmed so that there is no possibility of delay in unloading boxes. The longer the chicks remain in transport boxes, the greater the degree of dehydration. This may result in early mortality and reduced growth potential.

- All equipment must be checked to see that it is in good working order.
- Litter material should be spread evenly to a depth of 3-10cm and then leveled and compacted in the brooding area.
- The rodenticide program should be in operation prior to chick arrival.
- Equipment must be assembled in the appropriate configuration:
  - Configuration will depend on the brooding system and on other equipment being used.
  - Feeders, drinkers and brooders should be arranged to allow chicks to maintain body temperature without dehydration and to find feed and water easily.
  - Supplementary feeders and drinkers should be placed in close proximity to the main systems.
- Houses should be pre-heated to achieve target house and litter temperatures, 24 hours prior to arrival of chicks. Temperature should be monitored regularly to ensure that a uniform environment exists throughout the whole brooding area.
- Supplemental feeders should be filled and placed in the brooding area in a proper ratio.
- Supplementary drinkers, should also be available. They should be placed evenly throughout the house so that no chick will be more than 2m from water.

**After Arrival:**

- Chick boxes should be carefully unloaded and distributed evenly throughout the house.
- Chicks must be tipped quickly, gently and evenly over the brooding area. The empty boxes should be removed from the house as soon as possible.
- All chicks must be able to eat and drink immediately on placement in the house.
- Chicks should be left to settle for 1-2 hours to become accustomed to their new environment.
- After 1-2 hours, a check should be made to see that all chicks have easy access to feed and water and that they are active and spreading uniformly throughout the house.
- Checks should be made every 4-6 hours, throughout the first 24 hours, paying particular attention to ventilation, temperature, feeding and drinking equipment. Chick behaviour is an indicator of whether or not problems exist.
- From 2-3 days of age, permanent feeders and drinkers should be repositioned and adjusted.
- On day 7, one third to one half of the supplemental drinkers should be removed and the balance should be removed at 10 days of age.
- On each of days 8, 9 and 10, one third of the supplemental feeders should be removed. Chicks should be gradually trained to the main feeding system within the first 10 days of placement.

## Adequacy of Heat during brooding (Chicks as indicators)

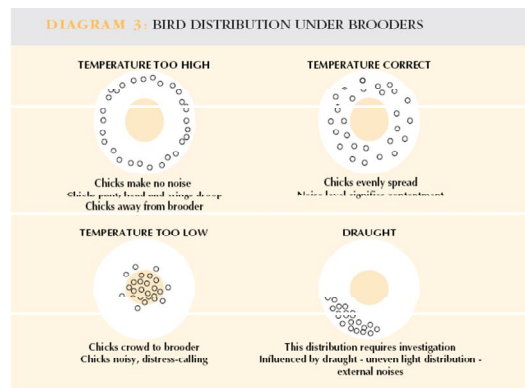
When the temperature is *too high* we see that:

- the chicks sit with spread-out wings and open beaks (rapid breathing).
- the chicks sit as far as possible away from the heat source.
- there is less feed intake: the chicks drink more and this often causes wet litter.
- there is more (risk of) feather pecking.

When the temperature is *too low* we see that the chicks:

- come close together
- are less active
- will raise their feather cover
- will stay close to the heat source

## Chicks as indicators



- **Evaluation of growth during brooding**  
Genetic gains in growth rate mean that broilers are achieving market weights at an earlier age and as a result, the brooding period occupies a greater proportion of the life of the flock.
- **Brooder management**  
Chick behaviour is an obvious and immediate indicator of correct brooder temperature.

There are 2 systems of brooding broiler chickens:

- Spot Brooding
- Whole House Brooding

Spot Brooding is where heat is provided by conventional canopy brooders with heat lamps. For maximum effectiveness, brooder surrounds should be used to confine birds to the desired area of heat, feed and water. Correct temperature is indicated by chicks being evenly spread throughout the brooding area.



### **Whole House Brooding**

In whole house brooding there is no temperature gradient within the house. Brooders or other sources of radiant heat may be used to supplement this system.

### **Litter Management**

Litter material, when laid in sufficient depth, provides a layer of insulation between the chicks and the cold concrete of the house floor. Litter is important for the well-being of young chicks because it creates a comfortable environment at chick level.

- Litter absorbs moisture from the droppings and from spillage around drinking systems. If this is excessive, however, wet litter can result. This increases downgrading at processing through breast blisters, hock burns and ammonia burns on the skin.
- Increased concentrations of ammonia in the house caused by wet litter can impair the immune system of the birds.
- Litter Height: The amount of litter required to provide adequate height depends upon the water absorption capacity of the material being used. A general guideline is that the litter height should be in the range of 5-10cm.

### **Stocking density**

- Stocking density has a significant influence on poultry performance and final product in terms of uniformity and quality. Overstocking increases the environmental pressures on the broiler. Bird welfare is compromised and this will reduce ultimate profitability. Quality of housing and especially environmental control will influence the stocking density which is applied. If stocking density is increased, an appropriate increase in feeding space and drinker availability must be made. In such circumstances, care must be taken to maintain air quality by careful ventilation.

### **Housing and environment**

- One of the most important considerations in the choice of housing design is local climate. Environmental conditions affect the well-being and performance of the broiler chickens. Housing and ventilation equipment should allow control of the environment so that the commercial and welfare objectives can be fulfilled.

## Feeding and Drinking

- There are several different systems available for delivery and distribution of feed to broilers. Since feed constitutes the major share of total production cost, wastage should be an important consideration in the choice of system.
- There are three major systems available:
  - Automatic pan feeders: 1 pan per 65 birds; 33cm pan diameter.
  - Chain feeders: 2.5cm per bird; 80 birds per metre of track.
  - Round, hanging tube feeders: 65 birds per tube; 38cm diameter base.
- Distance between the feeder lines should be not more than 2.5metres. This ensures that all birds have adequate access to feed.
- Level of feed within the feeder should be adjusted to a height that minimizes wastage. If possible, the feed supply system should be allowed to empty at least once a day. This eliminates the presence of stale food and therefore reduces the risk of contamination and the growth of micro-organisms.
- It is essential that fresh water is available to the poultry flock at all times and that it is free of contamination. The drinking systems chosen must be capable of delivering the water efficiently to all birds with the minimum of spillage. To ensure that the flock is receiving sufficient water, each day, the ratio of water to feed consumed should be monitored.
- Birds will drink more water at high ambient temperatures. Water requirement increases by approximately 6.5% per degree as temperature exceeds 21°C. Water consumption will vary with feed consumption.
- Drinkers should be distributed evenly throughout the house so that no broiler is more than 2m from water.
- As a guide to level, water should be 0.6cm below the top of the drinker until 7-10 days and there should be 0.6cm of water in the base of the drinker from 10 days onwards.

The height at which the bell drinkers are suspended should be checked and adjusted daily, so that the lip of the bell is level with the broilers' backs from 7 days onwards.

## Additional management tips during brooding

- Clean and refill waterers daily.
- Add a vitamin/mineral supplement to the water of young fowl for the 1<sup>st</sup> week to help them get off to a better start.
- Consider the possibility of predators attacking your flock and provide adequate protection
- Observation of the flock is important particularly for signs of unusual behaviour
- Debeaking: removal of part of the lower or upper tips of the beak to prevent cannibalism (flesh eating)
- Dubbing: removal of part of the comb desprurring: removal of spur (horny projections above the claws on the legs of male birds)
- Toe clipping: removal of part of the toe to avoid tearing of the flesh during mating
- Wing tagging: done for identification
- Immunization: Day-old (Newcastle vaccine (I/O), Mareks (for pullet chicks), IBDV (Infectious Bursal Disease Vaccine) i.e. Gumboro at 2 weeks and Lasota at the 3<sup>rd</sup> week or vice versa.

## Management Systems

- **Commercial Production System**

- **Intensive mgt. E.g. Battery cage and deep litter**
- **Semi-intensive**

- ✓ It produces meat-type and egg-type chickens
- ✓ Feed Conversion Ratio (FCR) is 3.75: 1 calculated as :  
FCR or Feed: gain = Feed intake/weight gain  
or Feed efficiency = Weight gain/feed gain
- ✓ Live weight at 8-10wks = 1.2 to 2kg
- ✓ The egg strain produces 150-200 eggs in a cycle
- ✓ Male chicken (for meat or breeding purposes) attains market weight of 1.5 – 2.5kg at 20-25wks.

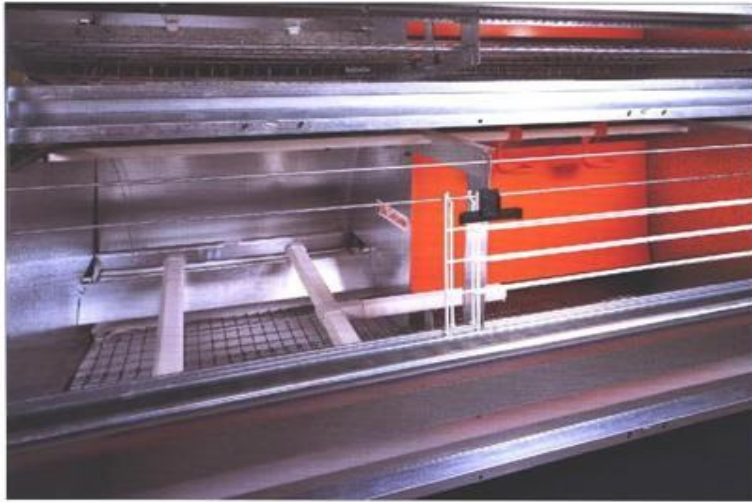
- **Traditional System**

- **Free-range**

- ✓ Entails rearing of indigenous chickens mainly on free-range.
- ✓ Requires minimal investment.
- ✓ Produces both meat and egg (30% egg and 70% meat).
- ✓ Egg production is on the average 50 eggs in a cycle.

## Improved/enriched cages





**Range System**





### Trends in modern poultry business

#### Broilers

- ✓ Increase production and consumption since 1997
- ✓ Massive poultry houses construction
- ✓ Reduction in number of growers – increase unit size
- ✓ Increase professional efficiency
- ✓ Integrative growth method
- ✓ Increase in physiological diseases



#### Layers



- ✓ Closely related to population size
- ✓ Price not stable due to constant increase in costs
- ✓ Under constant attacks of animal welfare organizations
- ✓ The creation of new layer – 16 months of production

#### Management of Layers (Laying birds)

### **Stages of Life:**

1. Pullet chicks: day-old to 8weeks (fed on chick mash)
2. Growing stage: 8 - 20weeks (Point of cage – 12 to 14 weeks and Point of Lay – 14-16weeks. (fed on grower's mash)
3. Laying stage: 20 to 72weeks (fed on layer's mash)
  - Birds should be transferred to the laying quarters (deep litter or battery cages) at 15 to 17 weeks old. The pen must have been cleaned, disinfected and made to rest for about 2 days.
  - Birds are transferred in well-aerated crates in the morning or evening.
  - The birds should be without feed for 4 to 6 hours before been transferred.

### **Management of layers (Provision of Nest Box)**

- Nest boxes are provided for layers that will be maintained on deep litter.
- Nests are preferably lined up near side of the pen away from the sun ray.
- Wood shavings should be placed on the floor of the nest box to protect the eggs against breakage and to produce clean eggs.

### **Signs of Onset of Laying**

1. Birds will start to cackle (make noise with their throat)
2. The combs and wattles will be bright red and when touched, the bird will tend to stoop.

### **Routine Management Operations on Layers**

- Dead birds are removed to prevent contamination of other birds that may peck on them.
- Fresh feed is added to the stale feed in the trough.
- Water troughs are moved out and thoroughly cleaned and replenished with clean and cool water.
- Eggs should be collected at least 3 times a day; once at 8-9am, 12-1pm and 4-5pm. Frequent collection of eggs prevents egg breakages and help keeps eggs clean.

#### **Note:**

1. Eggs collected should be kept in egg trays or cartoons and should be packed with the small end down.
2. Cracked eggs, leakers and thin-shelled eggs should be kept separate after gathering.
3. Eggs should not be stored for longer than 2 weeks at room temperature to avoid spoilage.

### **Occasional Management Operation**

- Culling: This refers to the removal of sick, injured, unproductive and poor producing birds from the flock. The advantages derivable from culling of birds are:
  1. Prevention of spread of diseases.
  2. Increase in the quality of the stock.
  3. More space is allowed for the remaining birds.
  4. Increase in profits principally by reducing feed required to produce a dozen eggs.

**Table 4: Culling Chart**

Part	Laying	Not laying
<b>Pubic Bone</b>	<b>Thin, spread apart (takes 3 to 4 fingers)</b>	<b>Blunt, rigid &amp; close together (takes 2 or less fingers)</b>
<b>Vent</b>	<b>Large, smooth, moist</b>	<b>Small, shrunken &amp; dry</b>
<b>Abdomen</b>	<b>Full, soft, pliable</b>	<b>Contracted, hard, fleshy</b>
<b>Comb</b>	<b>Large, smooth, bright red, glossy &amp; soft</b>	<b>Shrivelled, dry, dull and scaly</b>
<b>Ear lobes and wattles</b>	<b>Smooth, soft</b>	<b>Rough, dry</b>

**Note:** Inactive birds are not laying. Birds that have small and dry vent are either not laying or poor producing



**Advantages**

- More pullets may be kept/unit area in battery cages that are 3 or more tiers high.
- Broodiness is eliminated
- Culling (removal of unproductive birds) is made easier.
- Less feed may be required per dozen egg.
- Eggs can be collected less frequently

**Disadvantages**

- The initial capital outlay is higher because of the cost of the cages and house construction.

- Higher percentage of blood spots in eggs
- Internal egg quality drops off more quickly
- Fly problems are higher with the cage system

### Management of Breeders

- Chickens are also kept as breeders for production of day-old chicks
- Breeding stock should be reared far apart from other poultry stock. Breeder may either be for the production of broiler chicks for meat production or for the production of pullets for egg.

**NB. Most of the management principles discussed for chickens also apply.**

### Additional Management and Feeding Principles

- ✓ Breeding chickens are mainly reared on floors. From the rearing to adult stage, they are given more floor space, more feeds and water.
- ✓ To prevent indiscriminate mating, males and females are managed separately till maturity.
- ✓ The recommended ratios between males and females in the flock are:
  - 1 male to 12 females – for light birds
  - 1 male to 10 females – for medium-sized birds
  - 1 male to 8 females – for meat-type birds
- ✓ Breeders may be revaccinated for IBDV at 14-16 weeks of age.
- ✓ If movement to a separate layer house is necessary, they are moved at 10 to 12 weeks. Movement at a young age prevents stress and ensure possible breaks in *Mycoplasma gallisepticum* and *Mycoplasma synoviae* clean status.
- ✓ The enclosure where the birds (males & females) are kept (though separately) should be made of wire netting so that the birds can see and get used to themselves.
- ✓ The males should be introduced into the female pens about one hour before dark in order to allow little time for fighting that may ensue.
- ✓ Note that cockerels (male birds) attain peak fertility at 24 to 26 weeks of age. **Only intact males are used for breeding.**
- ✓ The first eggs for incubation should be collected at least 2 weeks after the onset of egg production. Hatching eggs weighing between 50 to 54g should be collected and fumigated immediately.
- ✓ The diets of the males and females are changed to breeders diets (15% CP & 2850kcal/kg ME) at maturity (24<sup>th</sup> week for male and Point of Lay for female)

### Management of Broiler Chicken

- Management similar to that of pullet chicks during brooding but it requires a higher ventilation because they are stocked at a higher density (0.06sq m) from day-old to market weight.
- **High stocking density informed by the need to ensure profit from floor space and restrict extensive movement which is accompanied by the wasteful dissipation of energy.**



- The birds are fed broiler starter (0-4weeks) with 23-24% CP and 3200Kcal/kg ME and finisher (5-8weeks) with 20-22% CP and 3200Kcal/kg ME.
- A broiler chicken consumes about 2.5 to 4kg or more feeds from day-old to market weight. The FCR is from 2:1 to 5:1.
- Under good management, mortality should not exceed 5%.

## **SPECIAL CARE OF BROILERS AND LAYERS DURING HOT AND COLD TEMPERATURE PERIODS**

### **Care during Hot Temperature Period**

High temperature and humidity produce stress to the birds leading to

- ✓ Reduction in feed intake
- ✓ Loss of production (including loss of egg production, increased number of thin shelled and small sized eggs, respiratory distress, loss of immunity and heat stroke.
- ✓ In extreme weather conditions, mortality may result.

**The most favourable temperature zone in case of chicken is 18-21°C.**

To combat the ill-effects of summer stress the following measures are to be taken seriously. Housing Mgt., Water Mgt., Feed Mgt. and Medication.

### **Housing Management**

- ✓ Height of the poultry pen should be 8 to 10ft for proper ventilation in the poultry.
- ✓ Distance between two poultry pens in the farm complex should be at least 60ft for proper air circulation.
- ✓ East-west direction of poultry pen is beneficial to reduce the direct sun light entering inside the pen.
- ✓ Roof is to be white washed (with lime) to reduce heat in the pen.
- ✓ In extreme cases, pedestal or ceiling fans may be used to give comfort to the birds.
- ✓ Water sprinkling over the birds may also save the birds from heat stroke.
- ✓ About 10% birds of the recommended stocking density should be reduced.

### **Water Management**

- ✓ Cool the water using ice cubes in water trough
- ✓ More water troughs are to be provided during the heat of the day or in hot period.
- ✓ Dosage of medicines administered through drinking water should be adjusted accordingly.

### **Feeding Management**

- ✓ Feeds should be give during the cooler part of the day, i.e., at early morning and at late evening.
- ✓ At noon hours wet mash may be given to the birds to increase the feed intake (overnight soaking of feed is not desirable due to fungal infestation (aflatoxicosis). In other words, the feed is to be mixed with water just before offering it to the birds.
- ✓ More numbers of feeding troughs are to be provided than normal.

- ✓ The energy content of the compounded feed is to be reduced if possible. Protein, vitamin and mineral contents of the feed are to be increased.

#### Medication

- ✓ Vitamin C may be added to the drinking water (at 10mg per bird for 2-3days)
- ✓ During the noon hours glucose and electrolytes may be given in the drinking water at 8g glucose + 2g electrobion powder per 100ml drinking water.
- ✓ Anti stress medicine may be added in the drinking water @ 1ml per 20birds for 7 consecutive days.

#### Care during Cold Temperature Period (Ambient Temperature <10<sup>0</sup>c)

- ✓ To counteract the ill-effects of winter stress, the following measures are to be taken methodically:
- ✓ Extra heat is to be provided in the house with the help of electric heater or bulb (just like brooding management).
- ✓ Energy content of the feed is to be increased by about 100-150Kcal/kg of feed.
- ✓ Depth of deep litter is to be increased (in case of deep litter system of management)
- ✓ About 10% of the recommended strength of birds is to be increased in the pen.
- ✓

#### MANAGEMENT OF TURKEY

- Reared primarily for meat or as breeders to produce hatching eggs.
- They are rarely kept for the production of table eggs though the eggs are edible.
- The facilities required for a certain number of chickens should be doubled for the same number of turkeys. The stocking density is 0.12m<sup>2</sup>.
- ***Desnooding i.e removal of the snood (a tubular fleshy appendage on the head near the front) is done to prevent head injury due to pecking and also reduce the spread of a disease known as erysipelas.***
- The vaccination schedule for chickens is also suitable except that turkeys are not vaccinated against IBDV. However, they are vaccinated against **blackhead (histomoniasis)** disease.
- The feeding regime for turkeys reared intensively is as shown below:
  - ✓ Turkey starter diet : 0 -8weeks
  - ✓ Turkey grower diet : 8 – 16 weeks
  - ✓ Turkey finisher diet : 16 – 20 weeks
  - ✓ Turkey roaster diet : > 20 weeks of age.

***Turkeys are marketed as meat birds any time from 16 weeks of age. The CP of starter is 28% while finisher has CP of 18 – 20%. The feed intake up to 24 weeks of age is about 25kg/bird.***

- ✓ Extensive mgt of turkey requires the establishment of well-managed fenced pasture having ranged shelter.

- ✓ Wing clippings are practised when the birds are placed on range usually at 15 weeks of age in order to prevent flight.
- ✓ Toe clipping is also done with the aid of a surgical shears in order to prevent back scratching and tearing of flesh during mating.
- **Note: Breeding males should not be wing-clipped after 16 weeks as this may toss them off balance.**

#### **Management of Breeding Turkey**

- Turkey starts to produce eggs at about 32 weeks of age.
- Potential female breeders and males should be reared separately to allow for the following advantages:
  1. To reduce injury to female due to bruising in the latter stage of growth.
  2. To reduce fighting among the males because they fight less in the absence of females.
  3. To increase the efficiency of feeding the sexes separately

**The same diets fed meat turkeys are suitable for breeding turkeys up to the 28<sup>th</sup> week.**

#### **Selection of Breeders**

Breeders are selected for vigour at 12-16 weeks, 22-24 weeks and 7 months. The criteria for selection are:

- Straight and strong legs (not crooked, no swollen hock, etc)
- Potentiality for early market finish: plump well, meaty drumsticks, good breast muscle, rapid feathering, bright round head, good health and livability, good egg production and fertility.

**Table 5: Recommended male to female ratio are as follows:**

<b>Turkey size</b>	<b>*Single mating</b>	<b>**Flock mating</b>
Small-sized turkey	1male: 20 females	1male: 15females
Medium-sized turkey	1male: 18females	1male: 12females
Large-sized turkey	1male: 16females	1male: 10females

\*Refers to where a pen of hens is mated with only one male

\*\*Refers to where several males are allowed to run with the entire females.

Note: Keep extra males for future use

- Laying turkeys are best reared on deep litters and exclusively in confinement.
- Nest (60x60x60cm) are provided 3 to 4 weeks before eggs are expected
- Turkey breeder produces about 100eggs in each breeding season (4-5months)
- Small-sized turkeys are more prolific than the large-sized turkeys.
- Artificial Insemination is used with or without natural mating for the heavily fleshed toms (males).

## DUCKS AND GEESE PRODUCTION

- These are known as '**water fowls**' because of their love for swimming water, though they can be raised without access to swimming water.
- They can be raised for meat, table eggs and as breeders to produce hatching eggs for ducklings and goslings.
- Ducks are mainly kept as free-ranging birds in Nigeria.
- Ducks and geese reared for meat may be finished on pastures. They may be allowed outdoors at 4 to 6 weeks of age or at 2 weeks in warm weather.
- Ducks are not good foragers as geese. It is economical to rear ducks without access to pasture though they can be let out into a yard. **Floor space of 0.12sq meter is adequate for fast-growing ducks, 0.45sqmeter for breeders and 100ducklings per hectare on range. Swimming water is essential from 6weeks of age.**
- Geese are best finished on pastures since they are excellent foragers and weeders. **They are stocked at 40-50 birds/hectare. Floor space required is 0.1sq meter.**

### Management of Broiler Ducks and Geese



Ducks



Geese

These are managed essentially in the same way as chickens. However, the points outlined below are specific for broiler ducks and geese:

1. They do well in simpler houses since they are fairly hardy and can protect themselves better against marauders.
2. Less brooder heat (30<sup>0</sup>C) is required during brooding.
3. Dim all night lights.

4. Drinking water must be changed frequently (at least 4 times a day) than in the case with chickens.
5. Water troughs are more suitable. They should be emptied at night and refilled in the morning.
6. Since duck droppings are extremely wet, more care should be taken to remove wet litter promptly. **Mouldy litter should be avoided in order to reduce mortality.**
7. Vaccination (except IBDV) schedule for chickens is adequate..
8. Ducks and geese should be caught by picking them up by the neck rather than the legs since the legs are easily sprained by handling.

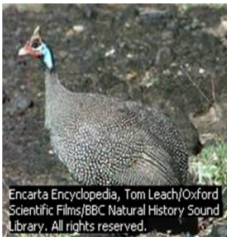
### Feeding of Laying Ducks and Geese

- Ducks and Geese can be fed the same diets.
- Four types of diets may be used viz.,
  - a. Starter diets
  - b. Grower diets
  - c. Breeder developer: fed at 200 to 250g/bird/day to about 3 to 4weeks before eggs are expected.
  - d. Breeder diet fed during the laying period

**Note:** At 8-10weeks of age, a duck attains 3kg weight with feed efficiency of 0.26 to 0.33.

Mortality can be less than 5%.

### MANAGEMENT OF GUINEA FOWLS



**Helmeted Guinea Fowl**

- Can be raised intensively though mainly raised extensively or semi-intensively.
- The meat has a 'gamey taste'.
- They are not as fast growing as chickens.
- They are ready for the table at 12 to 16 weeks of age.
- In Nigeria, guinea fowl meat and eggs are from five main colour types or varieties of the helmeted guinea fowl, viz.,
  1. **Pearl or grey (Sake)**, 2. **Lavender (Hurudu)**, 3. **Black (Agulu)**, 4. **White (Parareu Zabi)** and 5. **Grey breasted (Hankaaka)**
- ✓ Guinea fowls are mostly reared on deep litter although they can also be reared in cages.

- ✓ They retain their **'feral'** (flighty and wild) behaviour. It is necessary to cut off the last portion of one wing (**pinioning**) before 2 weeks of age and to clip the flight feathers once every 3 to 5 weeks starting from the 4<sup>th</sup> week of age.
- ✓ Live weight is about 0.5kg at 6 weeks, 0.9kg at 8 weeks and 1.3 to 1.5kg at 10 to 12 weeks. Subsequent weight gain to maturity is very small.
- ✓ Floor space is about 0.1sq meter from day-old to market age of 12 weeks.

Note: the same health management procedure recommended for chickens should be strictly adhered to for guinea fowl. Mortality is very high in keets.

### Feeding of Guinea Fowls

- Feeders used for chickens are suitable for guinea fowls.
- The following feeding regime is required:
  1. Guinea fowl starter diet : day-old to 8 weeks
  2. Guinea fowl finisher diet: 8 weeks to 12-16 weeks of age
  3. Guinea grower diet fed to pullets: 8 weeks to Point of Lay
  4. Laying diet fed to laying guinea fowls

\* In the absence of guinea fowl diets, the respective diets meant for chickens can be used.

### Management of Laying Guinea Fowls

- ✓ They are kept in battery cage or on deep litter.
- ✓ Egg production begins from 26 to 32 weeks of age. ***This is seasonal in the indigenous guinea fowls. It begins in March or April and stops in October of the same year thereby laying about 80 to 120 eggs each year.***
- ✓ If they are reared in range, it is important to leave at least one egg in the nest during collection to prevent the birds from making a new nest.
- ✓ The mating ratio for breeding guinea fowl is 1 male to 3 or 4 females. Though they prefer to mate in pairs.
- ✓ On range, they tend to be monogamous.

### Light Management

- ✓ The effect of light on growth and production is a very important factor. Chicks should be placed on 24 hours of light for the first week. Broilers and capons can then be allowed to follow the natural day length as long as there is at least 14 hours of light provided.
- ✓ Day length control is very critical for attaining maximum egg production. A basic rule is: Never decrease day length for laying hens.

### General guidelines for total of natural and artificial light could be as follows:

- First week after chicks are housed – 24 hours of light
- Two to 6 weeks – 16 hours of light
- Six to 12 weeks – 13 hours of light
- Twelve to 18 weeks – 10 hours of light



- At 18 weeks, increase day length one half hour per week until 15 hours of day length is reached. Laying hens much have a minimum of 8 continuous hours of rest (blackout) per 24 hour period.

Use one 60 watt bulb for laying hens or very young birds. One 25 watt bulb (per 200 square feet of floor space) is adequate for growing pullets, broilers and capons.

### The Role of Light in Poultry Management

**What is light?** The visible light is a tiny portion of the electromagnetic radiation between 380-780 nm.

**Table 6: Electromagnetic radiation**

	IR	Red	Orange	Green	Blue	UV
Wave-length (nm)	800	700	600	500	400	300
Frequency (sec <sup>-1</sup> x10 <sup>-15</sup> )	0.37	0.43	0.5	0.6	0.75	1
Energy (Kcal/mole)	36	41	47	57	71	95

### Light systems in poultry farms

#### 1) Incandescent lamp

- ✓ Low cost installation
- ✓ Low efficiency
- ✓ Short life (750-1000 hr).



#### 2) Fluorescent lamp

- ✓ High efficiency (x4)
- ✓ High intensity
- ✓ Higher life time (4000 hr).
- ✓ Performance reduction in cold temperature and length of time.

#### 3) Mercury

#### 4) High pressure Sodium

#### 5) Compact Fluorescent Lamps (CFL)

#### 6) Light Emitting Diode (LED)



### Light penetration - Light Absorption

**Short waves** radiation can be characterized by:

- 1) Almost no tissue penetration.
- 2) High energy collision in surface molecules, i.e. skin, hair, and feathers.

**Long waves** radiation can be characterized by:

- 1) Deep tissue penetration.
- 2) Low energy absorption in deep tissue molecules.

### Effects of Light Stimulation on Reproduction

- **Photoperiod:**  
In birds from subtropical and temperate latitudes, photostimulation increases reproductive activities.
- **Intensity:**  
Light intensity plays an important role in rearing birds, mainly because birds need a certain light intensity to be photostimulated.
- **Light Spectrum:**  
In general, red light stimulates egg production efficiently, whereas green or blue light has little or no effect.



### Effect of Light Stimulation on Growth and Development of Meat-type Birds



#### a. Photoperiod:

- ✓ Several studies reported that long darkness periods enhance growth more than continuous illumination.
- ✓ Several other studies indicated that maximum yield is obtained by using continuous or near continuous lighting regimen.
- ✓ Other studies suggest that intermittent light improves growth rate, feed efficiency, and reduces leg abnormalities, and mortality.

#### b. Intensity

- ✓ Light intensity is a major behavioral tool in meat type birds.

#### c. Light Spectra

- ✓ Light spectra affect growth in broilers. Broilers raised under blue or green fluorescent lamps gained significantly more weight than birds reared under red or white light, whereas feed conversion and mortality were not affected.

### In Conclusion

1. **Green light** stimulates growth at early age.
2. **Blue light** stimulates growth at late ages.



### Vaccination

- Disease prevention may be practiced by isolation of different age groups and species of birds.
- Thorough clean up between flocks.
- Also purchase healthy birds, vaccinate properly, dispose of dead birds, maintain comfortable environment and control traffic between flocks of birds. These steps will generally control most poultry diseases.
- There will be times when a vaccination program becomes necessary because of past history of the farm or geographic area. A suggested vaccination schedule:
  - ✓ Marek's Disease: One day of age at hatchery
  - ✓ Newcastle-Bronchitis: First vaccination at 2 weeks, second at 6 weeks, third at 16 weeks
  - ✓ Fowl Pox: 12 weeks
  - ✓ Epidemic Tremor: 14 weeks

### Do's and don'ts in vaccination

- Vaccine itself induces stress to the birds. So use of all available vaccines for a particular bird is not generally recommended, and it very much depends on the incidence of a particular disease in the farm and its surrounding areas.
- Vaccines should be procured only from reliable sources.
- The vaccines are to be stored under refrigeration until use at the temperature of 2° to 8°C, if otherwise not instructed by the manufacturer.
- Proper vaccination schedule including accurate dose of vaccines and proper age of birds are to be followed preferably as recommended by the manufacturer.
- Expired vaccines and left-over vaccines should never be used.
- It is desirable to vaccinate the birds during the cooler part of the day, *i.e.*, either in the early morning or in the late evening especially in summer months.
- Vaccination should not be done to the sick birds. Only healthy birds are to be vaccinated at their recommended ages.
- It is desirable to provide some vitamins and anthelmintics at least a week before the vaccination to overcome vaccine induced stress.
- For vaccination through drinking water, birds are to be kept thirsty for a few hours before giving vaccine containing water. Clean and cold drinking water should be used for this purpose and it should be free from chlorine or any drug.

**Table: Preventive medication schedule for broiler chicken (0-42 days)**

Age	Medicines/Vaccines
<b>1st week</b>	
Day 1	Glucose and electrolyte water (as antistress and energizer) Marek's Disease vaccine by intramuscular injection at thigh muscle at the recommended dose. (This vaccine is generally given at the hatchery level).
Day 2-4	Vitamins in morning water and antibiotic in afternoon water.

Day 5-7 5th or 6th or 7th day	Vitamin A and B-Complex in drinking water. RDF I vaccine through ocular or nasal drop.
<hr/>	
<b>2nd week</b>	
Day 8-11	No medicine/vaccine.
Day 12-14	Vitamins in drinking water.
11th or 12th or 13th day	Gumboro/IBD vaccine through ocular drop or in drinking water
	at the recommended dose.
<hr/>	
<b>3rd week</b>	
Day 15-21	Liver tonic in drinking water or feed.
21st or 22 <sup>nd</sup> or 23rd day	RDFI vaccine (booster dose) - ocular drop or in drinking water.
<hr/>	
<b>4th week</b>	
Day 22-28	Anticoccidial drugs
<hr/>	
<b>5th week</b>	
Day 29-32	Vitamins in drinking water and liver tonic in feed or water.
Day 33-35	Liver tonic in drinking water or in feed.
<hr/>	
<b>6th week</b>	
Day 36-37	Liver tonic in drinking water or in feed.
Day 38-42	No medicine/vaccine.

Note: ® Broilers are marketed at the age of 42 days. The above medication schedule may be changed, if necessary, as per suggestion of a Poultry Specialist or a Veterinarian.

### Record Keeping

- Keep daily, weekly, monthly or yearly records for all types of birds to provide information for:
  1. Acquisition of loan
  2. Allocation of resources in the case of budgeting
  3. Statistical purpose
  4. Future reference or for making projections.

Example: Egg Production Record:

It will include: Number of birds stocked, Mortality or culls, total eggs collected (crates and pieces), eggs sold and amount.

The record may also include:

Items purchased, cost of items, drugs and vaccines used, treatment and date, and balance of returns over expenditure.

### Terminologies

Chick: A young chicken less than 6 weeks of age.

Day-old chick: A chick that is 24 hours or less old.

Pullet: refers to a female bird up to the end of her first laying year.

Hen: refers to mature female poultry after the first adult shedding of feathers (female birds in her second or subsequent years of laying)

Cockerel: refers to a male chicken less than a year old

Cock: a male chicken over a year old

A rooster: a fully grown cock with prominent comb and spur

A capon: a castrated male chicken

Table eggs: eggs produced for consumption

A broiler: chicken bred specifically for meat production

A roaster: a young male meat-type chicken grown to heavier weight and it is usually between 12 and 16 weeks of age.

Poussin: refers to poultry bred to be killed at tender age for the table.

Tom: a male turkey (female is hen)

Spent hen/Old layer: refers to female chickens that are disposed off after laying eggs for at least a cycle.

## RABBIT PRODUCTION



Rabbit are very interesting and rewarding animals that can provide a great deal of pleasure and interest, whether kept in ones, and twos, or in hundreds. There are two main reasons why people keep rabbits in the tropics: as a source of food and/or as a source of income.

### **BENEFITS OF RABBIT PRODUCTION**

1. Capital requirement is minimal. With some scrap wood or bamboo, a hutch can be constructed.
2. Spacing is minimal. It can be set up at backyard.
3. A rabbit is a convenient 'one meal size', thus avoiding the need for storage.

4. Rabbit keeping is not restricted by any taboos or particular beliefs that prevent the eating of rabbit meat or its promotion as food.
5. Feeding rabbits is very cheap. Even though supplementation with concentrate or grain is sometimes necessary and definitely will increase growth rate, roadside grass, kitchen offal, garden leaves, etc (feed of no direct value to humans). can provide the main feed at almost no cost.
6. Rabbits can be tended by women, children or men unlike bigger animals for it needs no force to be restrained.
7. Because they produce offspring regularly (gestation period of 28 – 32 days), they form a regular source of income instead of a large amount at once.
8. It matures for table between 5 -6 months, breeding (5 – 7 months)
9. Rabbit is a prolific animal.
10. Meat from rabbit is an all white meat product that is high in protein and low in fat, sodium and cholesterol as compared to other common meats, such as beef, lamb, pork and poultry. Rabbit meat has been recommended for years by some physicians to their patients with coronary heart conditions.
11. It is not a smelly or noisy animal and can easily be kept near to school buildings or people's houses.
12. It produces rich manure for gardening or flower beds.

#### **BREEDS OF RABBIT**

**Dutch:** The dutch is a small breed with a mature live weight of 2.5-3.5kg. It has a wide white band of fur around its body at the shoulders as well as a white stripe down the middle of its face.



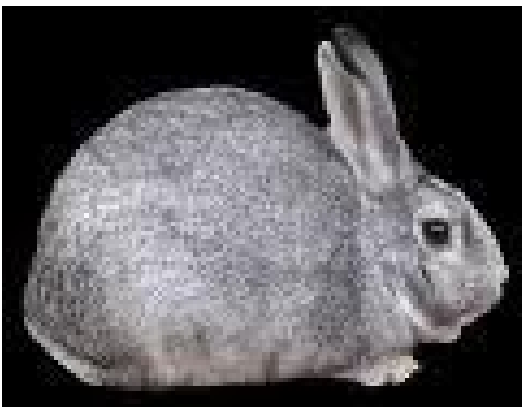
**New Zealand White:** This breed is used most widely throughout the world for meat production. It is all white in colour and usually weighs 3-5kg when mature.



**New Zealand Red:** This is essentially red but has not been intensively selected for growth rate. Mature live weight is 3-4.5kg.



**Chinchilla:** This breed is blue-grey in colour with a white belly. There is a thick fold of skin around the front of the chest which is very obvious when the rabbit is in good condition and sitting in a resting position. The weight range for the mature Chinchilla is 3-4.5kg



**Californian:** This is the second most popular breed for meat production. The colour is all white but with black tipping on the nose, ears, feet and tail. The weight range for the mature Californian is 3-4.5kg.



These breeds can be divided into two for practical purpose without trying to make scientifically correct distinctions:

**1. Fancy and Fur breeds**

These are not necessarily good meat producers, they do not have large litters nor are they resistant to diseases. They have nice skins, nice colours, funny ears etc. example is angora

**2. Meat breeds**

These are also called utility breeds, either by a fast growth rate or large and frequent litters. It is necessary to make a further distinction based on weight.

Light breeds (up to 2-3kg adult weight)

Medium breeds (3-5kg)

Heavy breeds (>5kg)

**HOUSING AND EQUIPMENT**

Rabbit housing and equipment differ from country to country. Factors that affect their design include;

1. Climate
2. Raw materials (Availability and cost)
3. Scale (large or medium) and system of production (Intensive, Extensive or semi-intensive)
4. Expertise of the rabbit production

**Housing requirement**

Housing should be able to provide:

**Adequate space:** Since rabbit spends its entire life in its hutch, it therefore needs sufficient space to avoid the stress caused by restriction of movement. Space should be able to provide good ventilation to prevent the animal from being choked up by ammonia (NH<sub>3</sub>) from their urine.

**Protection:** Housing should be able to prevent against injury within the hutch, rain, direct sunlight, direct and indirect wind and predators such as dogs, cats, rats, ants, man, etc.

## **TYPES OF CAGES/ HUTCHES**

**Indoor hutches:** These are kept inside a house (stable). The stable is a place in which or under which the hutches are placed.

### **Advantages:**

- I. It provides good conditions for the rabbit and the rabbit keeper
- II. Easy access to animal (even when there is rain or high sunlight)
- III. For animal adequate protection
- IV. The individual hutch can be easily cleaned and disinfected
- V. It allows ease increase in production

### **Disadvantage:**

It is very expensive

### **Out door:**

The requirements of space, protection and ease of management can be achieved through appropriate design, construction and siting.

**Design:** A typical rabbit hutch dimensions are follows;

1m above the ground

Height of hutch: 60cm at the front, 50cm at the back for easy drainage

Width: 50-60cm

Length: 90-120cm

**Construction:** The materials used in construction would usually be locally available materials such as interwoven branches, split bamboo, mud, tin, plastic. If possible, a fence should be built around outdoor hutches and fitted with a padlock gate.

**Siting:** Common aspects of the siting include the following;

- a. It should be placed near a house wall / fence to provide shade and protection (from sunlight, rain and wind). Note that while too much sunlight may be stressful, too little is also undesirable because the hutch may become damp, there will also be reduced disinfection by the sun's ultraviolet rays, and Vitamin D synthesis by the rabbit may be impaired if it does not experience some direct sunlight.
- b. It is important to site hutches under trees in a very hot environment

- c. The site must ensure security against predation. This is achieved when hutches are kept near keeper's house.

**Advantages:**

- it requires low capital
- Materials are always available
- Appropriate when starting production

**Disadvantages:**

- No perfect protection against predator
- Difficult to clean
- Not easy to increase the number of hutches quickly (it limits production)

**Floor Method:** This involves keeping the rabbits on the ground in a fenced area provided with simple boxes for shelter.

**HOUSING EQUIPMENT**

These are

1. Water trough
2. Feeder
3. Kindling (nest) box
4. Forage / Roughage rack

**Water/Feeding Trough**

The materials for water/feeding trough should provide the following;

- a. it should be impossible to tip over
- b. Deep enough to discourage scratching out of contents
- c. It must not cause injury to the rabbit
- d. It should not be expensive to prevent increase in cost of production

**Roughage / Forage rack** (it can be fitted inside or outside of the hutch)

- a. It must not limit feed intake
- b. It must contain fresh succulent forage

**Nest boxes**

This can be open or closed. An open top 12" x 18" x 10" plywood box works well. This comes in when the animal is about to kindle.

- a. It should not be placed until the animal is about to kindle
- b. It should be draught free/ proof
- c. It should prevent the young rabbits leaving until they are at least 2-3 weeks old.

**MAINTENANCE OF EQUIPMENT**

1. Water and feeding trough must be washed regularly (daily)
2. Use clean rag (cloth to dry the feeder)



3. Disinfection of the water and feeding trough at least once in a week with EDTA or Izal to remove feed adhered to feeder and prevent disease outbreak.
4. Roughage rack and cage must be cleaned once in a week and disinfect when young ones are not there.
5. Checking for the development of sharp edges in hutches and on equipment which may cause injury.
6. Nest box must be removed after weaning (5-6 weeks), wash and disinfect in preparation for next breeding season.

## **NUTRITION**

Proper feeding will influence the rabbit's growth, fertility and health. Some feedstuffs contain a lot of protein; some are sources of energy (rice bran, tubers, etc). Protein and energy as well as minerals are of importance. It should be noted that the amount of feed to give a rabbit depends very much on the state of production.

### **Protein level**

The protein level of the feed is very important. For efficient rabbit feeding, you need four diets. Since most rabbit producers cannot (or do not want to) handle more than one feed, a 16-17% protein feed may be substituted.

### **Protein Requirements of Rabbits**

Newly weaned rabbits	>18% CP
12-24 weeks old	16-18% CP
Breeder	15-17% CP
Other stocks (Normal growth)	12-14% CP

### **Carbohydrates and Fats**

Carbohydrate and fats provide energy. Rabbit needs energy for contraction of muscles which enable the rabbit to move. It is also used to join substance together to build up the rabbit's body and to make products such as hair and milk. Rabbit adjusts their food intake to satisfy their energy requirements. A general recommendation of energy requirement for breeding rabbits is 2600-2700 Kcal DE/kgDM or 2.0-3.0 MJME/kgDM.

### **Minerals**

Most of the minerals in the rabbit's body are in the bones and teeth which contain large amounts of the two minerals; Calcium (Ca) and Phosphorus (P). These minerals help to give the bones their hardness. They are also involved in maintaining the acid-alkaline balance in the blood. Phosphorus also involves in energy transfer within the body cells. Ca, P and Vitamin D are often considered together because they interact with each other. Other minerals are Mg, Na, K and Cl (major minerals). Examples of trace minerals are Fe, Cu, S, Co, Zn, etc.

## **Vitamins**

Vitamins are chemical that are require in very small amount to speed up chemical reactions within the rabbit body. The most important vitamins are vitamins A and D and the B vitamins, choline and Thiamin.

## **COPROPHAGY / CAECOTROPHY**

This is the eating of faecal-like pellets produced in the caecum. These caecal pellets are sometimes called soft faeces. To do this, the rabbit sucks in the soft faeces as they emerge from the anus, then swallow without chewing. Consumption of the soft faeces starts when the rabbit is about 4 weeks old. Note that rabbit can survive without practicing caecotrophy for many days but death is usual if they are prevented from eating their soft faeces for several months. Soft faeces are higher in crude protein and lower in crude fibre than hard faeces. Their higher protein level is due to their content of bacteria.

Caecotrophy is a very important part of the rabbit's digestive processes. It recycles some unabsorbed nutrients as well as returning protein and vitamin B rich bacteria for enzyme digestion in the small intestine.

The quantities of feed for total daily consumption for all animals are as follows;

- \*Young fattening rabbits (4-11 weeks); 110-130g
- \* Lactating does with litters (weaning at 4 weeks): 350-380g
- \* Adult (maintenance) rabbits: 120g
- \* For the rabbitry as a whole: from 1 to 1.4kg of feed per mother cage per day

## **FEEDING SYSTEM**

These are:

**Extensive system:** total dependence on forages and kitchen wastes.

Advantages

- Cheap
- Easy to provide the quantity of food required

Disadvantages

- Forage availability varies with season
- The quality of the forage reduces during dry season
- It is labour intensive
- It can introduce diseases and health problems

**Intensive system;** Total dependence on prepared concentrate foods from the feedmill.

Advantages

- High levels of production
- Little risk of disease introduction

Disadvantages

- Very costly
- Depends on the feed miller (in terms of availability and quality)

**Semi-intensive system:** The use of forages supplemented with prepared concentrate foods. It falls between the extensive and intensive system in terms of advantage and disadvantages. It is also the system that is most suitable for the small-scale producer.

### **Types of feed**

Aside balanced pelleted feed which contains 3-35g DM per kg of live weight per day given to the rabbit, the following wild and cultivated plants are suitable for rabbit feed:

- ✓ *Amaranthus spp.*
- ✓ *Mimosa pigra*
- ✓ *Arachis hypogea*
- ✓ *Panicum maximum*
- ✓ *Cocos nucifera*
- ✓ *Daucus carota*
- ✓ *Ipomea batatas*
- ✓ *Leucaena leucocephala*
- ✓ *Tridax procumbens*
- ✓ *Sorghum vulgare*
- ✓ *Vigna sinensis*
- ✓ *Zea mays*
- ✓ *Solanum tuberosum*

### **SEXING OF RABBIT**

Determining the sex of rabbits is not difficult with a little practice. It can be carried out shortly after weaning at six to eight weeks. This is the time when the males and females should be separated, the rabbit should be held on its back, put one finger on the tail side of the genital opening and on the abdominal side. Press down gently and stretch the organ with the finger and thumb. If it is a doe, a long slit will appear, if it is a buck, a small rounded tube-like structure will show.

## REPRODUCTION

### The male

The proper age for the first mating depends on the breed and individual development. For small breeds it is 4-5 months, for large breeds 9-12 months. One male can easily handle up to 8 - 10 does. It is good practice to keep the male hutch at some distance from the females so they will not get accustomed to each other's smell.

### The female

The does require more care and attention. Like the males, the proper age of first mating depends on the breed and individual development. Mate does when they reach maturity (4-5 months for the lighter breed, 7-9 months for the heavy breeds).

### Buying Breeder Stock

Once buildings are built or renovated and equipment purchased, you should purchase a good breeding stock. Remember -- Poor breeding stock will produce poor offspring. It is important that you begin with good stock.

The price a breeder asks for stock does not reflect the quality of the rabbits. Only time, records, and results can prove the worth of breeding stock and the reputation of the breeder.

Look at the records of the breeder's rabbitry to see the quality of the stock. Here are a few things you should look for:

1. Good health
2. Average litter size (8 or more)
3. Death rate (not over 5%)
4. Percent conception (90% or better)
5. Dressing percentage (55-60% including heart, liver and kidneys)
6. Select rabbit based on the feeding style/system.

All of this information may not be available, but most of it should be. It pays to deal with a breeder who keeps good, accurate, reliable records. A look around the breeder's rabbitry can tell you much about the type of operation he has, but his records tell the real story.

## MATING

Experience suggests that early morning or evening mating is best. It is certainly advisable to avoid the hottest periods of the day for this important operation. For mating, always take the doe to the buck's cage. If they fail to mate a few minutes, take her to a different buck. If this fails, try again the next day but **do not** leave the doe with the buck all day or even an hour in an attempt to solve a mating problem. If the doe is ready to be mated she will stand still within a few seconds, stretch out and slightly raise her hindquarter so as to allow the buck to mount and mate. Successful mating is signalled by the buck thrusting forward and literally falling off the doe. Often the buck makes a characteristic cry of pain or joy. If the buck slides backwards off the doe and does not fall the mating has not taken place. If mating was successful put the doe back in her hutch.

## **PREGNANCY TEST**

### **Palpating**

Palpating is a method used for determining doe pregnancy at 14 days after mating. Non-pregnant does are re-bred immediately. The objective is to feel the developing embryos in the horns of the doe's uterus. Position the doe lying relaxed, feet down, facing you. Grasp the ears and a fold of skin from the shoulders (scruff) with one hand. Place your other hand the body between the hind legs and just in front of the pelvis. Place your thumb on one side and forefinger on the other side of the uterine horns. Be careful not to apply a lot of pressure; just slide your fingers along and the embryos should slide gently between the thumb and forefinger. Does that have been handled often are much easier to palpate. Do not attempt palpation unless the doe is calm or you may damage the embryos.

### **Late pregnancy test**

Inexperience keepers should practice detecting pregnancy on does that are 20 days pregnant at which stage the foetuses are easy to identify. By around 28 days the mammary gland will have developed significantly and this can be regarded as final confirmation of pregnancy. At around 29 days, the doe will begin to remove fur from her abdomen to make a nest.

### **Pseudo-Pregnancy Test**

False pregnancy occurs as a result of sterile mating or more commonly from stimulation of one doe riding another. It happens more frequently with does that have not kindled their first litter. Always separate does at least a month prior to breeding. Does must be separated at least 18-20 days before mating. The doe may pull fur and attempt to make a nest but she will not keep it clean.

## **KINDLING AND MOTHER CARE**

When the doe is almost ready for kindling (about 4 weeks after mating) you can put a nest box in the cage (hutch). Kindling can take place in this nest box at any time of the day but morning early seems to be the most popular time. All she needs now is rest and feed.

### **Cannibalism or Abortion**

Cannibalism and abortion are common problems. The causes are many and mostly undependable. These are some of the causes:

1. First-litter does are extremely nervous. Give them one more chance and then cull if cannibalism recurs.
2. Unbalanced diet
3. Lack of water
4. Predators can cause the doe to stamp her feet and mash the young
5. Unusual noise can cause the doe to injure the young and can result in cannibalism.
6. Moving nest box after young are kindled.
7. Shallow nest box makes the does feel insecure and she is easily disturbed.

### **Fostering**

Fostering means getting a doe to accept rabbit(s) from another litter. Guidelines for carrying out fostering are as follows:

- \* Mate does on the same day
- \* The litters involved should be born within 3-4 days of each other.
- \* Only foster rabbits that are less than five days old.
- \* Remove both the foster doe and the donor doe from their hutches.
- \* Carefully remove the rabbits to be fostered from their nest with the minimum of disturbance and without touching any of the rabbits that are not being fostered; return the donor doe.
- \* Introduce the rabbits to be fostered, disturbing the foster nest as little as possible.
- \* Leave the newly mixed rabbits for a few hours so that they all take on the same smell
- \* Return the recipient doe to the hutch while at the same time giving her some food which you know she likes.

### **Weaning**

Weaning is the separation of the doe and the young. This usually takes place between 5-6 weeks. After weaning, the doe should be allowed to recover her body condition before re-mating. Much will depend on the level of feeding but the doe should normally have rest of at least four weeks.

### **Handling of Rabbits**

- Rabbits should be handled gently. They must never be lifted by their ears.
- A rabbit can always be picked up by the skin of the shoulders.
- For rabbits weighing less than 1kg, one method is to pick them up and carry them by the saddle just above the hindquarters, using thumb and index finger
- If the rabbit is heavier, it is best to take it by the skin fold around the shoulders, but if it has to be transported or shifted for more than 5 or 10minutes, it either be supported with the other hand or be carried on the forearm with the head in the bend of the elbow
- If it struggles and cannot be controlled, it is best to just drop it so it will fall on all fours and then pick it up again within 2-3seconds.

### **RABBIT DISEASES**

**Ear Canker and Skin Mange:** External parasites such as mites can cause a variety of skin and ear conditions. With ear canker the entire ear may become filled with crusty scabs. Without attention the mange may spread onto and over the face. All rabbits and particularly their ears should be regularly inspected for mange and skin sores. Rabbit with ear canker may shake their heads a great deal.

Mange caused by mites can be easily controlled by **acaricide drops or solution** (dipping)

**Coccidiosis:** This is the most common diseases in rabbits. It may be classified as a parasitic disease since the causative organism is a microscopic animal (protozoa). Symptoms in moderate or severe cases include a loss of appetite, "pot belly", diarrhoea and an inability to gain weight.

Coccidiostats may be bought and added to their drinking water to prevent Coccidiosis or to cure it as required.

**Mastitis:** This is a bacterial disease is not common but is occasionally seen in rabbit. It occurs when there is an infection and inflammation of the teats, which become hard and sore.

Antibiotic (75,000-100,000 units of penicillin) will clear up the condition but as it has a tendency to recur; it may be unwise to continue breeding from that doe.

**Snuffles (Chronic Rhinitis):** It is a bacterial infection of the respiratory system similar to cold in humans. The symptoms are sneezing, noisy breathing, a runny nose and wet and matted fur on the face and inside of the front legs as a result of the rabbit using its front legs to wipe its nose and face.

Antibiotics may appear to be effective but mortality is usually high and those rabbits that recover are often affected again if exposed to some new stress.

**RECORD KEEPING**

The only way you can know how well you are doing in the rabbit business is to keep good records. If you keep good records then you can make sound management and business decisions. Good records let you know if you are making a profit, and they are necessary for income tax purposes.

Keep only necessary records. You can easily overburden yourself with record keeping. Decide what records you need and then keep them daily. Listed below are some basic records you need to keep:

1. Breeding records - date bred and buck used
2. Kindling dates and number born, dead and alive
3. Number and weight of weaned rabbits
4. Average weight at market time and age of fryers at that weight
5. Expenditures (including utilities)
6. Sales

You should design your own record cards to meet your needs.

**Sample Records**

**An example of a doe record card**

Doe Name----- Date of birth-----

Date mated	Buck used	Date kindled	Number born alive/dead	Date weaned	Number weaned	Notes

**An example of a buck record card**

Doe Number----- Date of birth-----

Date used	Doe mated	Date doe kindled	Number born alive/dead	Number weaned	Notes

## PIG PRODUCTION

### INTRODUCTION

In spite of certain negative, cultural and religious sentiments, pig continues to improve its position as a source of animal protein in the human diet. Pigs are kept for meat production, which can be in form of pork or bacon. The fat obtained from it can be used for preparation of lard. Pigs have a higher survival rate under scarcity of inputs as presently observed in Nigeria. Pigs are efficient utilizers of concentrates and converters of feed into edible human food. Pigs produce more live-weight gain, from a given weight of feed than other animals except the carefully managed broilers. Pigs lead other animals in the production of vitamin B<sub>1</sub> and stand second in the productivity of the vitamin niacin per kilogram given. They have the ability to utilize a host of agro-industrial by-products and crop residues with little or no processing and at minimal cost.

Pigs have a tremendous ability to store fats but it should be remembered that except where feed is plentiful and cheap, it might not be economically meaningful to attempt to build up fats in pigs. This is because it takes much more feed to produce a kilogram of fat as it is to produce a kilogram of lean meat. It is therefore the job of the pig producer to make sure that the pigs are slaughtered at the time when the fat-lean ratio is acceptable to the consumers.

Pigs are also reputed for growing maturing rapidly and having a remarkable fecundity or prolificacy. This is judged by the number of piglets produced per litter, which can go up to fifteen in some cases, and they can be managed to raise 2-2.5 litters per year. In addition, pigs need only a small space in which to grow unlike beef and dairy cattle, which usually require at least 1ha of natural pasture per head. Pigs can be raised on a small area either in a close confinement within a building or on a small area of pasture.

### PROBLEMS AND PROSPECTS OF PIG PRODUCTION IN NIGERIA

- Production or management problems: low average productivity  
The problems of management are linked with those of production and these include nutrition, labour, capital, disease control, breeding and marketing. Others are low literacy level, rejection of technical assistance, housing condition (moist, no waste disposal, inadequate ventilation and drainage, under-utilization of space, overcrowding, foreign designs) and no attention to breeding programme
- Record keeping- scanty records, very few farms have record on input, such as feed, drugs and accurate record of stock that is slaughtered or sold. No critical analysis of the economic performance of the operation
- Problems of feeding :
  - most problematic
  - Genetic potential must be expressed through adequate nutrition
  - Inadequacy in quality and quantity of feed
  - <5% of feed in Nigeria is for Pig production, adaptation of poultry feed for pigs
  - Inadequate provision of water. Volume given determines feed efficiency.
  - There is very low effort in the use of agro-industrial by-products
  - Low production of key ingredients needed for pig feed- <=10% maize in production, <10% GNC and Fishmeal.



- Requiring urgent need for alternative feedstuff for feed: e.g. Cassava, sweet potato, molasses, blood meal, offal meal; and also cocoa husk, pineapple waste, plantain peels, rice husk, yam peel etc.
- Processing with or without chemical can improve by-product and crop residues
- Creed feeding and flushing of gilt and sow are not practiced
- Health Problems:
  - Good knowledge of routine health and prevention procedures
  - Difficulties of employing the assistance of veterinary doctors
- Housing problems-
  - Inadequate knowledge of the floor space requirement of pigs
  - Under-utilization of space and overcrowding
  - 2.23m<sup>2</sup> is required by the following:
    - 3 dry or 2 pregnant sows
    - 1 boar or 1 sow and her litter
    - 2 Bacon pigs up to 90kg body weight
    - 10-12 weaners/growers
- Marketing Problems:
  - Pork is acceptable by some people and religion
  - Fresh pork, Sausage, Bacon and Ham- products
  - Dispose off pig at 70-90kg body weight if not use for breeding

### **STRATEGY FOR THE DEVELOPMENT OF PIG INDUSTRY IN NIGERIA**

The strategy requires a development policy which focuses on highly complex and capital intensive operation. It should be in two forms:

- Large scale feed depot – use of agro-industrial by-products and crop residues
- Pig breeding and multiplication centres-
  - Production and multiplication of foundation stocks.
  - Availability of genetic materials
  - Development of strains of pigs adapted to the condition in the country.
- Mobilization of pig producer in pig development efforts:
  - Small scale pig producers in the village
  - Establishment of Co-operative piggery unit –attract bank financing
  - Community farms- self effort based, with government supplying feed, drugs, weaners; processing and marketing
- Establishment of compensatory policy
  - Subsidies feed, foundation stock, equipments
  - With others requiring heavy initial investment e.g. building
- Establishment of facilitating programmes:
  - Credit provision
  - Risk reduction by providing supportive services as veterinary and extension services
  - animal health and disease prevention

### **PIG MANAGEMENT SYSTEM**

#### **Extensive system –**

Traditional system in the tropics and it is the cheapest. Animals are usually few with 1-3 breeding female/herd. It is usually with or without supplementary feeding of low quality, which is erratic. It is predominantly indigenous pigs, which are scavenger. They are characterized by low growth,

productivity and high mortality. They are characterized with high load of intestinal parasites. Pigs are kept to meet family needs.

### **Semi-intensive system**

Pigs are confined and fed in backyard and fed with kitchen waste, vegetables and by-products. With minimal management adopted. It is characterized by low productivity and high mortality. They consist of indigenous and crossbreed of exotics. Productivity is high compared with the scavenging pigs.

### **Intensive system**

It is a commercial production with pigs numbering 50 and above. Purchase of feed, more sophisticated housing, with adequate space. Pigs are managed to optimize output. Consist of higher performing exotic and indigenous breeds. Marketing of finished pigs are done through local butchers.

### **BREEDS**

Many breeds of pigs can be kept in Nigeria. These include:

**Large white (Yorkshire)** – They originated from Britain. They are white with erect ear, and appreciable body length. The large white thrives well under confinement conditions. It is best known for its large litter size and mothering ability. The large white pig is a docile tractable breed. Being one of the largest breeds, the gains are somewhat slower compared with other breeds. However, the carcass is of excellent quantities.

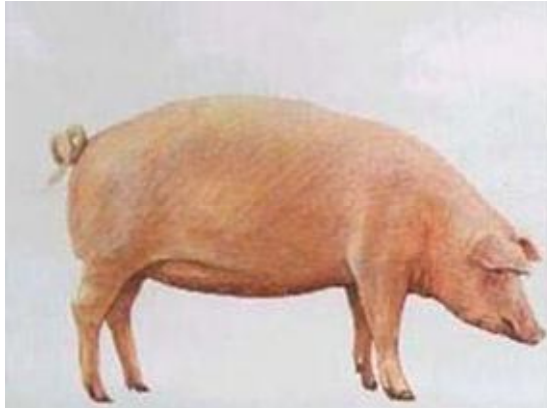


Large white Boar

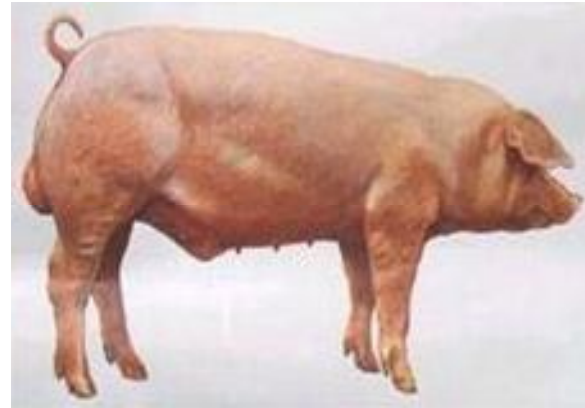


Large white Sow

**Landrace** – they are white and possess large floppy ears and longest body compared with any other breed. They have large litter size and very good mothering ability. The flesh is excellent for making bacon. The breed performs well under good management. They are white in colour. They have the longest body size. Sows produce and rear large litters of piglets with very good daily gain( ADG) and high lean meat content ideal for either pork or bacon production



**Land Race Sow**



**Land Race Boar**

**Duroc** – they are sound and vigorous, very fast growing and profitable in production under varying production practices. The pigs are red to golden brown in colour. Thick auburn coat and hard skin and have short drooping ears and arched back; they are considered to be very good meat hogs.



**Duroc Sow**



**Duroc Boar**

**Tamworth** – they are long-bodied, long-necked and long-legged with straight head. Colour varies from golden red to dark red. It is used for the production of bacon and meat. The sows are good mothers, and piglets have high birth weight. They came from Britain.



**Large Black** – The large black breed is a big British pig, long well proportioned with a good reputation for ham and bacon production. It is a long, black pig with lop ears and good ham and is considered a good grazer and mother.

**Pietran Breed** - Belgium breed of medium size. The colour is white with black spots. Around the black spots there are characteristic rings of light pigmentation that carries white hair. Ears are erect. It is famous for its very high lean meat yield. But associated with presence of the halothane gene responsible for Porcine stress syndrome. It's therefore not desirable as a pure bred but used in cross bred synthetic terminal sire line



**Poland China** – Originated from U.S.A. They are sound on their feet and legs, and perform well in confinement. They are black with white on the snout, the feet and the tail tip, with drooping ears. They are a meat type hog, producing a high-yielding carcass with high lean to fat ratio.

**Hampshire**- They are a black colour type of pig easily recognized by a white belt around the shoulder including the fore-legs. They have a good feedlot performance, yield of good lean and red meat. They also have high prolificacy and high survival rate of the piglets.



Hampshire Sow



Hampshire Boar

**Indigenous breed** – Small in size with a long snout, back swept ears and a straight tail. The commonest colours are brown with black patches, brown, black, and black with gray or white patches. It is characterized by stunted growth, poor reproductive performance of average of about 3 piglets. They are very hardy and have sharp feet.

## **HOUSING**

A well-drained land is needed both for housing and paddocking. This will minimize disease outbreak and parasitism. Pig building apart from providing protection against inclement weather should also provide proper hygienic conditions required to maintain the healthy growth of pigs at lowest possible capital expenditure. The house design should ensure reduced labour input but increased efficiency in management and operation.

Permanent pig houses should be cool, durable and easy to clean. Floor should be made of concrete while roofing could be made of corrugated iron sheets covered with bamboo leaves/grass or adex sheets. The free-range system may be used for the fattening but the range will need partitioning with fencing materials into paddocks of suitable sizes. Farrowing pen is designed to contain the sow and the piglets with little restriction and presence of guardrails. The boar pen is of similar design to accommodate a boar and a sow at mating. A pen measuring 2.23m<sup>3</sup> is alright for 10 weaners/growers or 3 dry sows or 2 pregnant sows or 1 boar or 1 sow and her litter or 2 finisher. Adequate provision must be made of feed and water trough.

## **MANAGEMENT PROCEDURE**

### **Daily routine:**

The everyday management of recurrent jobs must be strictly adhered to. They are:

- Water – should be provided the first thing in the morning. Remove the leftover water in the trough, clean the trough thoroughly and refill with clean fresh water. If a wallow facility is provided, replenish with fresh water.
- Feeding – This follows next. Dry feed should be available at all times. Restrict (wet) feed is supplied twice a day. Provide not more than what pigs will eat within 20-30minutes. Remove leftover, because it gets sour and is a breeding ground for maggots etc. If possible, provide daily greeneries (leaves, grass, etc.). If breeding stocking can go on pleasure it must be done early in the morning as long as it is cool.
- Cleaning – Should be done after watering, feeding and allowing pigs to eliminate. The pens will stay cleaner. Remove manure and moist bedding. Cleanliness is all-important and cannot be over emphasized. If a pen is vacated it should be washed and disinfected before other animals are brought in.
- Observation – Observe every animal each day for its state of health, injuries, general comfort, signs of heat, etc.

## **BREEDING**

### **Source and choice of breeds**

The introduction of diseased stock poses the biggest threat to the herd's current health status.

- Pigs should only be brought in from known healthy herds, and where possible some guarantee obtained as to their freedom from certain diseases, or parasites.
- A period of quarantine (4–6 weeks) and acclimatisation provides insurance against new diseases being introduced and allows new pigs to be exposed and gain immunity to diseases on your unit.
- Large white is robust, adaptable and of higher performance than others breeds.
- Duroc - Jersey also has good attributes for both rearing and growth in the tropics.
- Landrace pigs have been widely used for crossbreeding purposes in the tropics. They do well under close confinement feeding but must be well managed and fed.

### **Selection of Breeding Gilts**

- One of the greatest effects on profitability is the number of piglets reared per sow per year. As well as possessing the genetic potential to improve the production characteristics of her progeny, the sow must have the ability to rear large, healthy litters.
- Gilts selected to have at least 6 evenly spaced teats on both sides so as to accommodate a large litter. Avoid selecting gilts with blind teats. Short, thick teats are less desirable than longer thinner teats.
- It should be large, without sign of infantilism, and free of the 'fish hook' appearance found in hermaphrodites
- Gilts should be selected from sows, which wean 9 -10 or more piglets per litter and are known to be good mothers.
- Select breeding gilts at weaning period, further selection should be done 5-6 months of age.
- Select fast growing weaners. These will likely consume less feed per unit live weight gain, thus less costly to keep.
- Select gilts which have developed hams and comparatively light heads.
- The selected gilts should have good body confirmation i.e. strong legs, sound feet etc. Gilts should be wide through the hindquarters with depth and squareness in the body cavity. If the physical soundness of the gilt is in doubt she should not be kept as a breeder
- Gilts should be quiet but alert and active. If there is any tendency to be flighty or overly aggressive, they should be disregarded as future breeders.

### **Selection of Breeding Boars**

- It is extremely important to select a good boar since it contributes half the quality of the herd. Areas to consider:
- Boar should have sound feet with good, full hams, uniform curve at the back and of good length.
- Boar should have at least 12 nicely placed rudimentary teats so as to pass on this characteristic.
- Selection should be done before castration i.e. at 4 weeks.
- Make sure that his toes and pasterns are not long, weak or misshapen. When he walks, he should move freely, without any sign of stiffness or lameness.
- The testes should be normal in shape and size, even, and free from defects

## Types of Breeding

### Pure-breeding:

- Mating purebred individuals of the same breed.
- The progeny has the same genetic makeup.
- Objectives of pure-breeding are to identify and propagate superior genes for use in commercial production and to propagate and identify superior females for maintaining valuable genetic material.

### Cross breeding:

- Mating two individuals from different breeds.
- Take advantage of the observed improvement in performance of the progeny above that of either parent - heterosis.

### Out breeding:

- Mating individuals of the same breed but who are less closely related than the average of the breed.
- There should not be a common ancestor for at least four generation back in the pedigree of the boar and the females with which he is mated.
- It is a useful mating system in purebred individuals.

### In breeding:

- Mating individuals of the same breed but which are more closely related than the average of the breed. This could be between as close individuals as full sibs or sire or daughter.
- Pure breeding is a special kind of in-breeding.
- High frequency of homozygous gene pairs applies to both desirable and undesirable traits. In breeding causes decrease in litter size and increases mortality. Inbred sows are inferior in milking and mothering ability. It delays sexual maturity in gilts and boars. Inbred boars have less sexual libido. Inbred gilts have fewer eggs during oestrus and farrow smaller litters than those out bred.

## Breeding Strategy

Breeding is a complex science that requires skill and knowledge. It also requires thorough record keeping. To achieve genetic improvement the following methods can be used:

- **Selection:** select the best individuals in the herd for breeding, looking at their performance in various characteristics e.g. litter size, growth rate, feed conversion ratio, disease resistance etc.
- **Culling:** remove the individuals that do not perform well.

## MANAGEMENT OF BREEDING STOCK

Pigs selected to the breeding herd usually include the young male and female pigs.

### Boars:

- Start serving after 8 months of age.
- First two months of service, serve only twice per week.
- After can service six times per week.
- Should be kept in its own pen to avoid fighting.

- When mating transfer the sow to the boar
- One boar can serve up to 15 sows
- Considerable exercise is necessary to prevent the development of leg weaknesses.
- The boar's feet should be trimmed regularly as deemed necessary.
- Boar should be washed with soap and water every 4 months and sprayed for the lice and mange.
- The pen walls should be white washed with a wash containing a powerful disinfectant at the same time.

#### **Gilts/sows:**

- Provide enough exercise as some sows will tend to fatten if not exercised.
- A fat sow takes longer to come on heat.
- It is also more likely to crush her young piglets.
- First service for gilts should not be until the age of 7 - 8 months.
- Sexual maturity occurs as early as 4 - 5 months.
- Reproductive life of a sow is 4 - 5 years.
- Keep about 3-4 gilts/sows per pen of 9-10 m<sup>2</sup>
- Pen should be kept clean (change bedding regularly).
- Sows/gilts pens should be next to the boars to stimulate them to come on heat.
- But not too close so that they would not get use to him.

#### **Flushing:**

It is important that the gilt has at least two true heat periods before mating, to gain the increase in ovulation rate. For gilts, the ovulation rate can be further increased by a high energy intake for 10–14 days prior to service but should be reduced for the first 3 days after mating. Increased feeding levels afterward to ensure adequate energy intakes, but prevent high energy intakes between days 70 and 105 of gestation.

#### **Breeding Cycle**

The normal heat period lasts for 3 - 5 days

##### **Heat signs:**

- ✓ 1st stage: Early heat signs
  - General restlessness
  - Vulva turns red and is swollen
  - White mucus discharge
  - Grunting noise
- ✓ 2nd stage: Service period signs
  - Real Oestrus lasts for 40 - 60 hours
  - Vulva becomes less red and swollen
  - Slimy mucus discharge
  - Tendency to mount and be mounted by others.
  - The sow or gilt will stand still when pressure is applied to her back. (Thus the right stage to send her to the boar or inseminate).
- ✓ 3rd stage: *Post oestrus*-period signs
  - The sow/gilt will not stand still when pressure is applied to her back.
  - The swelling of the vulva disappears.



**Note:**

- The usual length of oestrus cycle is 3 weeks (21 days)
- shorter or longer periods may be seen in the range of 18-24 days.
- Mate gilts when standing heat is first detected, and again 24 hours later

**Recommended practices**

- Put the sow with the boar for a short period every day when the heat is expected.
- Always take the sow to the boar. This is less upsetting for him.
- Put the sow and boar together just before feeding.
- Allow the boar to serve twice, with an interval of about 12 hours between services. If the sow doesn't conceive, she will return on heat in about 3-week's time.
- 10 days before service, give the sow/gilt 1 - 2 kg of feed extra per day. Continue this for one week after service.
- give 0.5 kg extra feed per day at last month of pregnancy, but decrease gradually one week before farrowing. Provide plenty of water to help prevent congested gut during farrowing.
- Each boar should be kept in its own pen to avoid fighting. For mating, the sow is taken to the boar.

**SYSTEMS OF MATING**

**Pasture mating** – this involves grouping of sows and gilts with one or more boars. This has the advantage of reducing the requirement for labour as the boar is more skilled in detecting heat than the most skilled herdsman. The system also provides them with adequate exercise. On the other hand however, it is not easy to know the sire of the piglet, records of conception and farrowing date cannot be kept, and there is no regulation of the sexing activities of boar which lead to sex abuse. Also where females are many and only few boars are present, it is possible to neglect some of the female.

**Hand mating** – this is the control and organised pairing of specific animal for the purpose of reproduction. In this system of mating which is characteristic of intensive system, female animals on heat are usually identified and brought in to predetermined male for mating. On certain cases where male and female are inexperienced, assistance may be necessary. In this system, there is better control of boar power, the conception and farrowing date can be better planned and the respective sires can be known. The disadvantage of this method include low fertility, which may result from inaccurate heat detection and it involves a lot of labour especially in terms of heat detection.

**Artificial insemination** – The semen from the prime boar can be used on many farms and even across continent. A single ejaculate can be used for 15-20 pigs. It has the volume of 150-500ml. The sperm is collected over a dummy sow by means of rubber tube the sperm is collected in to flask and subsequently process into vials which can be processed and transported to various farms where they can be reconstituted and used for the herd. It has the advantage that animal separated by distance can produce offspring through mating without actual contact. Through A.I., one boar can be used for well over 2,000 females per annum with a resultant progeny of at least 20,000 piglets, it prolong the usefulness or effectiveness of desirable animal which cannot perform natural service either as result of accident or old age or injuries. The transportation of animal is expensive. In addition animal being move from one farm to another may have to undergo quarantine procedures to reduce the risk of disease transmission. All these problems are eliminated or reduced through A.I. On the other hand,

the system is very expensive in terms of labour and equipment and poor detection of heat may result in low conception rate

## **FARROWING AND BIRTH MANAGEMENT**

### **a. Expected date of birth**

On average pregnancy lasts 115 days after conception (3 months, 3 weeks and 3 days).

### **b. Farrowing Preparation measures and birth of piglets**

About a week before the expected delivery date, the sow should be:

- Washed with soap and water and then rinsed with a mild disinfectant. The pen should be disinfected before the pregnant sow is put in. Immediately after washing she should be put in a pen of her own.
- Dewormed and treated for lice and mange. Any good acaricide (cattle dip) can be sprayed on the sow or gilt to kill the lice and ticks.
- Putting in the farrowing pen a week before the birth will also help her get used to the new surroundings. This increases chance of a quiet and smooth farrowing. It makes individual feeding of the sow possible.
- 2 days before farrowing, the sow and the pen should be washed and disinfected again.
- high pressure sprayer in shower area for pigs should be provided, in case of large farms

## **Signs of Farrowing**

- Udder enlargement during the last 2 days
- The udder will start to look much redder.
- A white or clear fluid can now be extracted from some of the teats.
- The sow will be livelier, alert, and restless and may start to bite.
- She scrapes the floor with her forefeet and sweeps the straw bedding into a corner with her snout to make a nest.
- In group housing the sow may fight other sows
- Just before delivery, the udder will swell and the sow will calm down.
- Before the first piglet is born a bloodstained fluid comes out of the vagina. In gilts the fluid may be released earlier
- The sow will usually farrow during the night or evening

## **Problems related to the birth**

- Difficulties during birth
- Crushing of piglets
- Slow Delivery
- Weak piglets
- Piglets born prematurely
- Accidental killing of the piglets by the sow
- The sow becomes ill after farrowing

## **Piglet Management and Care of the newborn piglets**

- A few minutes after the birth the umbilical cord may be pulled gently away or cut if necessary (to about 5 cm length).

- After birth, the navel of each piglet should be soaked in a cup of iodine solution to prevent inflammation and tetanus.
- Each piglet should be rubbed carefully, dry with a cloth.
- Make sure the piglets are able to suck from the udder as soon as possible after birth.
- Weak piglets may need to be assisted .
- The piglets can be given additional feed of goat or cow's milk, or a mashed bean porridge to which a little sugar has been added.
- If the milk produced by the sow is too little to meet the needs of the piglets or the sow completely neglects the piglets, they should be put on another sow or reared on cow or goat's milk.

#### **Feeding piglets whose mother produce less milk**

- If the sow does not produce enough milk the piglets should be given to another sow which farrowed or gave birth up to three days before.
- This sow should have fewer piglets than the number of teats on her udder.
  - Transfer extra piglets to the sow with less piglets after disguising them with a spray which has a strong smell e.g. engine oil/kerol diluted with water to last at least 1 or 2 days.
- All piglets should be sprayed as soon as introduction is done so that the foster mother doesn't recognize the foreigners.
- If there is no sow to take over feeding the piglets, they will have to be given extra food by hand.
- Goat or cow's milk can be given to the motherless or orphaned piglets.

#### **Teeth Trimming**

- The piglets are born with needle sharp teeth
- It is usually necessary to trim the piglets' teeth to prevent them biting the udder.
- Only the points of the teeth should be removed.
- If any more is removed there is a risk of damaging the mouth.
- When trimming the teeth the tongue of the piglets should be rolled back to avoid injuring it.

#### **Anaemia or Iron deficiency**

- Anaemia is caused by iron deficiency.
- This iron is needed for the formation of haemoglobin.
- This is an important problem, especially for young piglets kept indoors.
- They receive additional 1-2 mg/day from milk while they need 7mg during the first week.
- The piglets become very pale a few weeks after birth and their growth slows down.
- This can be prevented by:
  - Giving the piglet (0-3 days after birth) iron injection preferably at neck muscles
  - Oral iron- paste containing iron is put in the mouth within 24 hours of birth
  - Feeding compost- must be of good quality and supplied daily. Compost of poor quality may contain bacteria.
  - Wood ash can also be put into the pen. This will not provide iron, but it does contain other important minerals.

### **Tail Cutting**

- Cut the tip of the tail within 4-7 days.
- This prevents tail chewing, which can lead to infections.
- A piece of chain can be hung down from the ceiling for the piglets to chew.

### **Heating for Piglets**

- In cold weather, a small area can be heated with an infrared lamp.
- This keeps the young pigs warm.
- It helps prevent pneumonia and crushing as the piglets tend to stay under the lamp when not feeding.

### **Creep feeding**

- Young piglets from 7 days onwards should have high protein feed available to them.
- This has to be fed in a small area where the mother cannot eat the feed.
- The feed conversion rate of young piglets is very high and thus creep feeding is particularly economic.
- Creep feeding helps the piglets to get used to feeding at an early age.

### **Weaning piglets**

- The piglets should already have started getting used to eating from a trough alongside their mother.
- They will need protein-rich feed as they will be growing fast.
- There should also be plenty of clean water for the piglets to drink.
- It is important for the piglets to learn to drink water early in preparation for weaning

### **Types of weaning**

- Weaning is usually undertaken in one of the three following categories:
- Conventional weaning: 3–5 weeks of age.
- Early weaning: 10 days of age to 3 weeks.
- Specialised weaning: segregated early weaning (SEW) and medicated early weaning (MEW).

- **Steps taken at weaning Sow**

Determine whether the sow is to be culled or served again.

- On the day of weaning don't feed the sow, in the days following farrowing flush the sow until serving ( flush for max of 10 days)
- Move the sow to another pen ( near a boar)

Sometimes vitamin/mineral is given just after weaning

### **Steps taking at weaning Piglets**

- Give piglets identification (tagging, notching, tattooing)
- Weigh the piglets to judge their average weight gain and uniformity
- Feed piglets with care to prevent digestive problems after weaning. The type of feed should not be changed during and just after weaning
- Weaning (3-5 wks) do not feed more than 100-200g/piglet/day during 1st 4 days

- Weaning (6-7 wks) start by feeding about 50% of the ration piglets receiving during the last few days of suckling, then increase gradually
- Check health of the piglets carefully (especially first 4-12 days after weaning)
- Prevent stress, pay attention to hygiene and climate of the pen

## **OCCASIONAL MANAGEMENT OPERATIONS**

**Castration** – This is done for male pigs that are not required for breeding. Castration is carried out because it is believed that pigs castrated grow faster and they not the “boar taints” which is the “boar odour”. The boar odour is produced as result of deposition of polyphenols as one of the secondary characteristics of pig. The castrate tends to be fatter than the intact male and female at a given age. It is therefore, necessary to restrict feed intake if carcass leanness is the consumer preference index. Castration is carried out usually by two herdsmen, one carrying the pig by the hind leg with the belly facing upward. It is done between 2-3 weeks of age. The pig is carried tightly. The other herdsmen clean the scrotum with disinfectant. He then hold the testis with his hand through the skin and by means of sharp object cut through the testicle to the skin. The testicle is then pull out and the two inner cord can be broken while the thick outer cord is swirled round or looped about 10 times to prevent excessive bleeding. It is then tied and subsequently cut. The second testicle can be removed through the same opening or similar one on the other side. Pig is then released and provided with dry bedding in a well disinfected pen until proper healing takes place.

**Measurement of back fat thickness in pigs** – The consumer demand usually favour lean pork. Moreover, fatty male and female usually encounter reproductive difficulties. The back fat thickness is measured at 3 point using the back fat probe. This is incited on the animal back fat right through the shoulder, behind the last rib, and midway between the last rib and the base of the tail. The averages of the 3 measurements give back fat thickness and this is directly related to fatness in pigs. An ultrasonic equipment can also the used and this depends on the conductivity of electricity which passes through the back fat and the muscular part of the pig. This is graduated to detect the fatness of pig. Another way of measuring fatness of pig is by using lead acetate paper which is transparent. This is used to measure the surface area of the transverse section across the *logissimus dorsi* (muscle which lies across the back of the pig and mainly located through the loin area). Lead acetate paper is placed on the transverse section of the *logissimus dorsi* and traced with pencil on the paper, and by means of plan meter, the area is measured and this is referred to as loin eye area. The loin is directly proportional to the muscularity or the leanness of pigs. Fatness and leanness in pig has an inverse relationship, the loin eye area is indirectly proportional to the back fat thickness.

**Ear notching** – this is for the identification of animals for record purpose and it should be carried out at an early age usually not more than one day after birth. The system is easy and permanent compared wit other methods of marking; such as the use of a tattoo mark or ear tags. The right ear is used for the litter number and left for the individual number.

## **FEEDING**

The high productivity of pig in terms of growth and reproduction necessitate the provision of highly digestible well-balanced rations. Pigs, being an omnivorous monogastric animal can digest only smaller quantity of crude fibre. Therefore, their capacity to utilize roughage is limited. However, this does not mean that they do not need any roughage. Providing good pasture of good quality hay is a nutritional necessity as well as it reduces feeding cost considerably. As different from ruminants, the

amino acid content and the concentration of B vitamins in the feed are important for pigs. The type of feed and the methods of feeding greatly influence the feed efficiency, growth breeding efficiency, carcass quality and health in general.

Grains form the basis for feeding, to which protein rich concentrate and pasture are supplemented. Because of grain shortage in most developing countries, pig producer should look into the use of by-products for economical production.

By-products of oil extraction industry (oil cakes), milling industry (wheat bran, rice bran, maize bran etc.), dairy industry (whey, skimmed milk), slaughter house (meat meal, blood meal, bone meal), fishing industry (fish meal), brewery industry (spent grain, brewers yeast) or the use of hatchery wastes form good sources for swine feeds. Many human foods which have been damaged or contaminated can sometimes be used as swine feeds. Surplus potatoes, yams, molasses can partially replace grains in swine rations. It should however, be noted that the nutritional requirements of swine varies with the sex, age and the physiological status of the animal. Feed requirements per day for the different classes of pigs are as follows:

Piglets	0.25kg
Weaners	1.0kg
Growers	2.0kg
Fatteners	2.5kg

The water requirements per day are as follows:

Class	Litter/day
Piglets	1
Weaners	3
Growers	5
Finishers	8
Gilts/sows/boars	8
Lactating sows	20

- a. **Sucking pigs-** Milk is the most important feed for baby pigs. This is supplied by the sow. However, even when fed liberally, some sows are not able to supply enough milk for maximum growth. Under such conditions, it is possible to increase weaning weights considerably by supplying high quality creep ration during the suckling period. Such creep feed should contain 24-26% CP and 3400-3800 kcal digestible energy.
  
- b. **Growing-Finishing pigs:** The period from weaning to market is one of the rapid growth and changing nutrient requirements. The age and size at weaning will influence the type of ration that should be provided for the first part of the post-weaning period. Under most conditions, it is desirable to leave the pigs with sow until they are five to six weeks old. Nutrient requirements for gaining pigs (6-12 weeks) are much more exacting than those of older pigs. The crude protein and digestible energy of weaner diet is 20% and 3250-3400kcal/kg while for grower is 16-18% and 3000 kcal/kg and fattener diet is 15-16% CP and 2800 kcal/kg respectively.

- c. **Feeding of sow:** Gilts and sows are not likely to produce a normal number of ova during the oestrus period if they have been improperly or under-nourished. They should be in thrifty, vigorous and gaining condition at breeding time. They should be prevented from becoming too fat during pregnancy. Sows that are allowed to become fat tend to farrow small weak piglets. Gestation rations must support the growth of the developing foetus in addition to maintain the sow. Therefore, the level and quality of protein, minerals and vitamins in the ration is important. The amount of feed required per day during lactation is 3-4 times that required during gestation. To prevent udder problem at the onset of milk production, it is a good practice to supply fresh water to the sow and to withhold all feed for a period of 12-24 hours after farrowing. Crude protein content for breeding sow is 15-18% and 2900-3200kcal/kg digestible energy.
- d. **Feeding the boar** – the nutrient requirements of the boar are not so well defined as those of the sow, but in general, rations used for sows are satisfactory for boars. Excess fatness is to be avoided since it may adversely affect the boar's activity and aggressiveness. However, feed intake should be not be restricted to the extent that the boar developing and unthrifty appearance.
- e. **Feeding methods-** Restricted feeding and *ad libitum* feeding.

## DISEASES

Keeping animals healthy by confusing purchases to healthy herd, by proper isolation of new animals, by employing sound principle of sanitation, management and feeding, and by the judicious use of appropriate and dependable drugs and other medicaments, are the practical and economical ways of avoiding losses from diseases. Sows should be dewormed 2 to 3 days before farrowing. Weaned pigs should be dewormed between 6-8weeks of age. Always consult the veterinarian for assistance on the health of the pigs.

## RECORD KEEPING

The importance of simple management records in pig rearing cannot be over-emphasized. For a producer to be able to ascertain which sow or boar is doing well and desirable, it is necessary to keep records about their performances. A fair record should contain the following

- a. When the sow was bred last i.e. the breeding date,
- b. The boar used for breeding,
- c. Expected date of farrowing,
- d. Actual date of farrowing,
- e. No in the litter,
- f. No of mortality (death) per litter and weaning date,

The following records should be kept:

1. Boar breeding record – This record contains the breed, the boar number, the date of birth and the parents.
2. Sow record – Like the boar, it contains almost the same information but the result of breeding which include the expected date and actual time of farrowing.

3. Litter production record – this record is very important for the breeder to know the total number of litters his or her pigs have produced in a particular period or year and number of pigs weaned, it determines the performance of the sow.
4. Performance traits – Most reliable, indicator of the pig's performance are highly heritable traits such as growth rate and efficiency gain. Growth rate is measured by gain in weight from weaning to a final weight and usually expressed as daily gain while efficiency of gain is a measure of how much feed was needed to put on weight.