**Poultry and Swine Production**

1. **Origin and Breeds of Chicken**

Poultry:- includes all edible domestic birds kept for the purpose of human food production such as Chicken, Turkey, Geese, Doves, Pigeon, Ducks, Ostrich, Guinea fowl etc

Chickens:- are numerous, widely distributed throughout the world and economically important to any country as compared to the others.

### In Ethiopia:- the word poultry is synonymous with chicken

**Chicken**

Zoologically :- Chicken belongs to the genus “Gallus” of the family

Phesianidae and simply known as Gallus domestics or domestic fowl

Origin :- Chicken is originated in Southeast Asia, where the following wild species are

still known

Gallus gallus :- Red Jungle fowl

Gallus lafayetti :- Ceylonese jungle fowl

Gallus sonnerati:- The gray jungle fowl

Gallus varius :- The black jungle fowl

**Classifications of chickens**

Chickens are classified according to Purpose of keeping & Geographical distribution

1. Purpose of keeping :- Exhibition type, Meat type, Egg type, Dual purpose
2. Geographical Distribution:- Asiatic breeds, American breeds, English breeds & Mediterranean breeds

**Characteristics of Asiatic Breeds**

Beautiful in color

Heavy in body weight

Exhibition / meat type

Red in earlobe color

Posses shank feather

Lay few brown eggs

* Example
* Brahma
* Cochin
* Langshan

**Characteristics of American and English Breeds**

Medium in Body size

Dual purpose in utility

Red in earlobe color

Have no shank feather

Lays brown eggs

Good foragers

Adaptable to the tropical environment

* Examples
* Plymouth Rock (American)
* Rhode Island Red (American)
* New Hampshire (American)
* Australorp (English)
* Sussex (English)

**Characteristics of Mediterranean Breeds**

Small in body size

Egg type in utility

White in earlobe color

Have no shank feather

Lay white eggs

* Examples
* White leghorn
* Brown leghorn
* Ancona

**Characteristics of Indigenous chickens**

None descriptive breeds closely related to the jungle fowl

Variable in feather and egg color and comb type

Small in body size and late in maturity (0.9-1.5kg)

Lay few (40-60)small eggs with strongly yellow yolk

Pronounced in broodiness and maternal instinct

Highly adaptable to scavenging and scratching

Resistance to disease under village conditions

1. **Biology of the chicken**

**Digestive and Reproductive System of the Fowl**

**Digestive System**

Major organs of digestion of domestic chicken include Mouth, Esophagus, Stomach, Small intestine & Large intestine

Mouth of poultry is characterized by

Absence of lips and teeth

Presence of barbed shaped tongue for forcing feed into esophagus

Presence of salivary gland secreting

(1) water and mucus for lubrication

(2) enzyme amylase for starch digestion

Esophagus of poultry consists of a pouch like structure known as crop “Crop” used for food storage and softening.

Stomach of poultry comprises of

(1) Glandular stomach (proventriculus) known as true stomach which secrete gastric juice containing

Water and mucus for lubrication

Hydrochloric acid for activation of pepsinogen

Enzyme pepsin for protein digestion

(2) Muscular Stomach (Gizzard) which is oval in shape consists of two pair of red, thick and powerful muscle internally covered with white thick and horney epithelial. Consists of grit or sand for grinding of food particle

Small Intestine is the major site of digestion and absorption of digested nutrients with the help of Pancreatic juice, Bile juice and Intestinal secretion

|  |  |
| --- | --- |
| **Secretion** | **composition** |
| Pancreatic juice | Water and mucus for lubrication  Inorganic salt for acid neutralization  Enzyme amylase for starch digestion  Enzyme lipase for fat digestion  Enzyme trypsin for protein digestion  Enzyme chmotrypsin for protein digestion  Enzyme carboxypeptidase for protein digestion |
| Bile juice | Water and mucus  Bile pigments  Bile acids for emulsification of fats |
| Intestinal juice | Water and mucus  Enzyme maltase  Enzyme dipeptidase  Enzyme amino peptidase |

Ceca :- are two blind pouches found at the juncture of small and large intestine. It is the site of fibrous feed digestion (fermentation)

Rectum :- is a short tube leading to cloaca

Cloaca :-is a common chamber for digestive, reproductive and urinary systems.

**Reproductive System**

Male Reproductive System

Male Reproductive System of poultry comprises of Pair of Testes, Pair of Ductus deferens (Conducting ducts), a single Cloaca

The testes are

Located high in abdominal cavity and never descended into scrotum. Ellipsoid in shape and light yellow in color and well supplied with blood vessel. Possess numerous ducts (somniferous tubules) for semen secretion and collection

Secrete Male sex hormone (androgen)

Hormone Secretion

Poultry is photoperiodic animal and increased day length causes the release of gonadotropic hormones from anterior pituitary. Gonad tropic hormones cause enlargement of testes and androgen secretion. Androgens influence the development of secondary sex characteristics (such as comb growth and condition, male behavior, mating Interest) and stimulate and increase semen production.

Ducts deference:-conduct semen out side the body and opens into papilla located in the cloacae.

Cloacae:- consisting of

Papilla:- intermittent organ

Rudimentary copulatory organ:- used for sexing day old chicks

Female Reproductive System of chicken consists of

Pair of ovaries:- Site of ova formation and hormone secretion

Pair of oviducts :- Site of secretion of all the other components of egg

Ovary is

The site of ova (yolk) formation

Posses large number of small immature ova

2-3 large mature ova (yolk)

Ovum enclosing membrane (follicular membrane)

Empty membrane

The site of hormone production (estrogen, progestrone and androgen)

Ovarian Hormones

Follicle Stimulating hormone (FSH) of the anterior pituitary cause development of ovary and secretion of ovarian androgen estrogen and progesterone.

Estrogen :- causes

The development of the oviduct

Increased blood level of calcium, protein, fats, vitamins and other substances necessary for egg formation Spread of pubic bones and enlargement of vent

Progesterone:- causes

The release of Latinizing hormones which in tern cause the release of mature ova from ovary (ovulation)

Androgen is responsible for the red waxy comb and wattle of laying hens and affects secretion of albumen

**Oviduct**

Oviduct is divided into six parts

Infundibulum :- site of reception of ova (ovulated yolk) and fertilization

Magnum:- Site of albumen secretion

Isthmus :- Site of shell membrane production

Uterus :- site of shell formation

Vagina:- site of pigment and eternal cuticle formation

Vent:- site or point of expulsion of fully formed eggs

Sexual Maturity known as porosity is measured by age at the first egg. It generally ranges from 19 - 24 weeks depending on genetic factors, environmental factors, feeding, health status

Light intensity

Other management practices

**Egg Formation**

Yolk formation

The yolk is enclosed and attached to the ovary by follicular membrane. When mature the membrane rapture and release the yolk the process known as “ovulation”.

The ovulated yolk is engulfed (received) by the infundibulum where fertilization is likely to occur if the hen is mated.

Ovary of laying hen

Posses large number of small immature ova (2000-12000)

2-3 large mature ova (yolk)

Yolk enclosing vetalline membrane

Ovum enclosing membrane attached to the ovary (follicular membrane)

Empty membrane

Ovulation is controlled and depends on Ovarian hormonal balance, Nervous and hormonal factors, Time of the first ovulation, Time of passage of the yolk through the oviduct

Albumen Formation

Albumen or the white egg is formed around the yolk in magnum and comprises of 4 distinct layers

Chalaziferous layer

The inner thin albumen layer

The thick albumen layer

The outer thin albumen layer

Composition of albumen:- Within the albumen

2.7% is chalazae and chalaziferous layer

17.35 is inner thin albumen

57% is thick albumen

23% outer thin albumen

Membrane Formation

The shell membranes are formed around the albumen in isthmus.

The two membrane adhere to each other except at the large end of the egg where they separate to form air cell.

The membranes mainly consists of a fibrous protein material and act as a barrier to the penetration into the egg by bacteria and fungi.

They also help reduce the rate of evaporation of water from the egg thus slowing the rate of deterioration of the egg.

The two membrane adhere to each other except at the large end of the egg where they separate to form air cell.

There is increase in the size of the air cell with increase in age of the egg

Egg shell formation

The egg shell is formed around the membrane in uterus or shell gland.

The formation of egg shell require

Adequate supply of calcium ions

Presence of adequate carbonate ions

Sufficient fluids

The quality of egg shell depends on Length of time in lay, Increased environmental temperature

Egg laying time, Stress Disease

Laying :- is expulsion of fully formed egg from the vent (oviposition).

Egg is layed with large end first

Egg shape:- mainly determined by magnum

Egg size: determined by size of the yolk

Egg color : is function of breed

Yolk color: is function of feed

**Composition of eggs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item (%) | Whole egg | Yolk | Albumen | Shell + Membrane |
| Water | 66 | 48 | 88 | 2 |
| Dry matter | 34 | 52 | 12 | 98 |
| Protein | 12 | 17 | 11 | 6 |
| Fat | 10 | 33 | - | - |
| Carbohydrates | 1 | 1 | 1 | - |
| Ash | 11 | 1 | 1 | 92 |

Composition of eggs

The major component of egg is water

Yolk is concentrated source of nutrients such as vitamins,minerals,fats,proteins, pigments and cholesterol etc. With the exception of protein and fats others could be altered by feed).

Albumen protein posses antibacterial property and is a line of defense against microbial penetration

Membrane and shell are the first line of defense against microbial penetration.

Parts of an Egg

(1) The germ disk or blastoderm

(2) The yolk

(3) Albumen

(4)Shell membrane

(5) Egg shell

1. **Incubation and Hatchery Management**

Embryonic development

Ovary :- is the site of yolk production and hormone secretion

Infundibulum :- is site of ova reception and fertilization

Isthmus:- is the site of membrane formation and cell division

Uterus :- is the site of shell formation and continued cell division (gastrula ion)

Laying :- embryonic development stops when the egg is laid and cooled below

physiological zero point

Embryonic Development resumes when the egg is placed under optimum

environmental condition

Incubation :- is the art of bringing eggs from laying to successful hatching

It is the process of placing eggs under optimum environmental

condition for hatching

Incubation Period :- is a time period between incubation and successful hatching

Incubation period of different poultry species

Birds Days Pigeon 17 Chicken 21 Guinea fowl 28 Duck 35 Turkey -- Ostrich 42

Fertility and hatchability

Fertility :- is defined as the number of eggs incubated that are fertile

Percent Fertility :- is the percentage of fertile eggs of all eggs produced.

% Fertility = number of fertile eggs x 100

number of total eggs produced or set

Hatchability :- is defined as the number of fertile eggs that hatch in to normal chick

Percent Hatchability :-is the percentage of fertile eggs which actually hatch out as live young.

% Hatchability = number of eggs which hatch out x 100

number of total eggs incubated

Assume that 5000 eggs were incubated out of which 600 were infertile.

Finally 3000 chicks were removed from the incubator

% fertility = (5000 – 600) x 1000

5000

= 88%

% Hatchability = (3000) x 100

5000

= 60%

Fertility factors

Light condition, Age of the male, Male to female ratio, Nutritional status, Health status can affect the fertility of the eggs.

Hatchability factors include Nutritional status, Genetic make up, Health status, Physical conditions of the eggs, Storage conditions of the eggs, Incubation condition of the eggs

**Types of incubation**

There are two types of incubation

1. Natural Incubation

Natural incubation :- is the process of hatching with the help of broody hen.

Procedures of natural incubation

Select thoroughly broody hen.

Dust the hen with powder of insecticide

Provide roomy, cool and dark incubation box of 40x40x40 cm

Use a base of sand or earth upon which dry organic materials( hay, straw, ,sawdust etc) could be placed

Place 10 to 16 eggs under the hen depending on her size.

Provide adequate feed , clean water and dust bath near the incubation box.

Disadvantages of natural incubation

Difficult to get hold of broody hen when required

Broody hen ceases laying during incubation and brooding periods

Few numbers of chicks could be hatched at a time.

1. Artificial incubation

Artificial incubation:- is the process of hatching with machine (incubator).

Procedures

(1) Collect and store eggs at a temperature of 50-55(10-13), relative humidity of 75-80%, in clean places, for about 10 days, with small end up position and occasional turning.

(2) Wash, clean, and disinfect the incubator and all its parts. Adjust the incubation temperature, humidity, ventilation and turning devices in advance of incubation.

(3) Select the eggs against large and small sizes, abnormal shapes and abnormal shell structure

(4) Place the selected eggs on a tray with large end up position, set the eggs in the incubator, close all the openings and fumigate with formaldehyde gas (17 grams of Kmno4 plus 100ml of 20% formalin).

(5) Run the incubator and test for embryonic development on 7th and 14th of incubation

Candling on the 7th day of incubation is done to remove infertile eggs and early dead embryo.

Infertile eggs:- is transparent and clean when light is passed through it.

Routine Hatchery practices

Chick Removal : Remove the chicks as soon as they dried up

Chick sexing:- done on the basis of cloacal examination

De-beaking:- is the practice of removing certain portion of the beak to avoid cannibalism

and feather picking.

Vaccination :- Vaccinate against Newcastle Disease, Infectious Bursa (Gumboro) Fowl

Thypoid,etc

Chick Delivery:- Baby chicks should be transported during the first 1-3 days after

hatching

Hatchery wastes:- could be processed into animal feed or incinerated

Empty Hatchery :- Should be cleaned, washed, disinfected and fumigated prior to the

next incubation.

1. **Brooding and Rearing**

Brooding:- Refers to raising of chicks during the 1st 8 weeks of their age(0-8weeks).

Rearing :- Refers to keeping of growers to an age of sexual maturity(9-20weeks)

Method of Brooding

Natural brooding

Artificial Brooding

Natural Brooding

Natural brooding:-is chick raising with the help of broody hen (mother), which

Provide the heat required

Communicate feed and water source

Alert danger conditions

Provide protection against predation

Disadvantages of Natural Brooding

Broody hen ceases laying during the incubation and brooding periods of about 81 days.

Few No of chicks are raised at a time and it does not fit to market oriented production system

Success depends on the maternal instinct of broody hen and prevalence of predators in the area.

Artificial Brooding

Artificial Brooding :- is chick brooding with artificial supplementary heat.

Requirements of successful A.B appears to be provisions of

Constant brooding temperature

Adequate space

Continuous Ventilation

Proper management

Brooding Temperature

Initial brooding Temperature:-for day old chick should be 35 at 5 cm from the floor and this temperature should be reduced by 2.8 each week until it equals ambient temperature.

Ideal brooding Temperature:- for baby chicks may exist when temperature range of 15- 38 is given since chicks find the temperature that is comfortable to them when given choice

Low Brooding Temperature:- results in bunching, crowding, smothering and high mortality.

High brooding temperature:- results in reduced feed intake high water consumption, prostration and high mortality.

Ventilation:- is required for the purpose of

Supplying oxygen as fresh air

Removal of metabolic end –products such as Co2, ammonia, moisture and heat.

Ventilation requirement depends on

Kind of brooder houses

Chick density

Environmental conditions

Space requirement :- brooding temperatures is one of the most critical factors for chick brooding. However, as chicks grow and mature the need for supplementary heat is less important, but provision of adequate space become critical

Space Requirement

Age in weeks Hover Space Cm2/chick Floor space m2/chick 1-4 47 0.045 5-8 67 0.072 9-12 93 0.09 >12   0.18

Proper Management

Provide adequate feed and clean water.

Practice close observations

Exercise strict sanitation and regular vaccination

**Preparation of brooder house**

The brooder house should be prepared two days before the chicks are due to arrive as follow.

Make the brooder house tight and free of draft

Clean and disinfect the brooder house and all the fixtures

Cover the floor with proper bedding or litter materials

Transfer the chicks to the brooder house as soon as they dried

During the transfer group them on the basis of degree of maturity

Feed them with starters ration and provide adequate clean water.

Methods of Rearing

Growers could be reared using

Free range system (Traditional system)

Deep litter system (Modern System)

Cage system (Recent System)

Free Range system:- involves growers (pullet) keeping on pasture or on free range with

night time enclosure in a house.

Deep litter System:- involves pullet rearing in total confinement on deep litter of several

cm deep

Cage System (Battery System):-Involves growers keeping in an individual or small group cages as means of increasing concentration of the birds and reducing labor cost. .

General Management of growers

Transfer :- Transfer growing stock to growers house at the end of 8 weeks of age.

During the transfer

Group them according to age, sex and body condition.

Remove or cull pullets that are not well developed.

Transfer them all on the same day.

Growers House preparation

Growers house should be well prepared in advance (cleaned disinfected and made tight) and should consist of

(1) Adequate space

Broilers=0.14m2/head

Light breed of layers=0.19m2/head

Heavy breeds of layers=0,23m2/head

(2)Roosting Material:- Roosting materials of 10-13cm/head

(3) Normal electric bulb of 40-60 watt to provide additional supplementary light for 2-3 hours at night.

(4) Floor litter of about 2-3 inch deep

(5) Adequate ventilation

(6) Adequate growers ration and clean water

1. **Management of Layers**

Keeping of Laying Flock

Growing flock should be transferred to layers house at an age of 20 weeks.

During the transfer

Group them according to age and body condition.

Transfer them all on the same day

Mix selected males at the ratio of 1:10

Preparation of layers house

Layers house should be well prepared in advance and should consists of

Adequate space of 0.20 – 0.25m2/head

Adequate Perch and perching space

Perching space= 20-25 cm/head

Distance between the perches= 38-45 cm

Perching materials=2x3 or 2x4 inch lumber

Laying Cage/ Nest

Dark, cool, and well ventilated Laying nest of 40x40x40 cm/5-6 hens.

The laying nest should be easy for cleaning and disinfecting.

Adequate feeders, waterers, feeding and watering spaces.

Feeder :-Provide double sided feeder of 30 cm long for 20 chicks 10 growers & 6 layers.

Waterer :- provide watering trough of 3 litter capacity for 25 birds to be filled twice a

day.

Appropriate litter materials of 2-3 inch deep

Adequate electric light and ventilation

Egg recording card showing Number of birds, Date of hatching, Breed or crosses, Daily egg production, Daily feed consumption, Vaccination and health data etc

1. **Poultry Production Systems**

In the different parts of the world, there are several production systems practiced by poultry farmers. In Ethiopia three poultry production systems can be seen. One production system may be important in one agro-ecology but may not be important in the other. These production systems are characterized mainly by the objectives of the producer, the input used and number and types of birds kept on the farm, these systems are (1) Traditional (backyard) production system (2) Semi-intensive production system and (3) Intensive production system. Each of these systems has its own merits and demerits.

Traditional (backyard) production system

In Ethiopia there are about 56 million chickens of which about 99% is indigenous chicken. The traditional production system is practiced almost by every family in the rural, urban and pre -urban dwellers. It is estimated that an average of six indigenous birds are kept by every family. This system involves the rearing of chickens in an open unrestricted environment with or without artificial shelter. Moreover, it is characterized by minimum input with birds scavenging for most of their food and no investment other than the cost of the birds and for simple night time shelter. Almost all birds kept under this system are non descript indigenous breeds of low performance. Broodiness is highly pronounced, egg production is estimated at 40-60 per bird per year. Egg weight is low ranging from 39 to 42 gm. The weight of male to an age of 12 months is about 1.52 kg and for female it is much less than this.

**Semi-intensive production systems**

This is a newly emerging system in urban and pre-urban areas particularly along the roads from Addis Ababa – Debrezeit – Nazareth and Addis Ababa Sebeta roads. This system involves the use of poultry run which is an area of land enclosed by fence of wire netting. It is characterized by small flock size (usually 50-500 birds). It is organized along commercial line. The system has the following advantages and disadvantages.

**Intensive production systems**

These systems are used by medium to large-scale commercial enterprises, and are also used at the household level. Birds are fully confined either in houses or cages. Capital outlay is higher and the birds are totally dependent on their owners for all their requirements; production however is higher. There are three types of intensive systems:

Deep litter system

In the deep litter system, the birds are confined to a large permanent house. The floor is kept covered with finely cut straw, rice hall or sawdust. Troughs to provide feed and water are always made available for the birds. The litter is normally renewed ones every year or when it becomes lumpy. In addition to feeding and water troughs, perches and nest boxes are provided for the layers.

**Slatted floor system**

In this system, wire or wooden slatted floors are used instead of deep litter. The system allows stocking rates to be increased to five birds/m2 of floor space. Birds have reduced contact with faeces and are allowed some freedom of movement.

**Battery cage system**

The birds are housed or kept in cages within the house. The cages varies in size, type and form but they are all designed with facilities to provide water and feed as well as egg and droppings collection. The system is very efficient for raising layers. The cages are either constructed entirely of wire or wire and wooden frames. Most cages are about 18 inches high and 8 inches deep. The width of individual cages varies depending on whether they are designed to hold one, two or more birds (14 inches for one layer or two light breeds). The floor is of wire mesh to allow droppings drop through. The floor slopes from behind into which eggs roll as they are laid. The cages are usually arranged in blocks of 3 or 4 tiers. Modern cages incorporate some forms of mechanical feeding.

1. **Poultry Housing System**

Types of Housing

Poultry housing systems vary from the small backyard flock only having simple night shelter (‘extensive’ poultry farming), to modern poultry houses with thousands of birds in controlled environment houses (‘intensive’ poultry farming). In more intensive systems in hot climate zones, there are two options: open houses in wet climates and closed (environmentally controlled) houses in dry regions. The main types of houses used by poultry farmers shall be discussed here.

Poultry run

The poultry run is a piece of land enclosed by a fence of wire netting or other barrier. The birds wander in the run during the day and are shut up at night in a house located within the enclosure.

The house must be equipped with perches and nest boxes for laying flocks. Feed and water trough are situated either in the run or in the house. If the house has solid floor and is littered 0.3m2 of floor space should be allowed for each bird. Other types of houses, such as wire floored or slated floor house may require less floor space.

The poultry run requires less land than the free range system. The poultry run does not involve expensive equipments. The birds and the eggs are also completely protected against thieves and predatory animals. On the other hand the poultry run requires a considerable amount of fencing and a more elaborate house than the free range system (high capital).

The fold unit

In this unit both the house and run are combined. The fold unit is systematically moved over an area of grassland. Since the birds are on fresh ground every day, the land remains reasonably free of parasites. Birds have also reasonable protection against predators and thieves. The fold unit does not require expensive fencing. This system can be used for different types of poultry, including growers, birds kept for meat and layers. The ideal land for fold unit is flat and well drained soil. A land that is liable to be flooded is not suitable.

The Full-Sided Wall House

This is common in the temperate regions where the temperatures are extremely low. In the tropics, this type of house is used for brooding day- old chicks. · The house is completely insulated by building-up the bricks/blocks to the height of the house. Small windows/air spaces are created to allow free flow of air (ventilation).

The Open-Sided House

This type of house is commonly found in the tropical world. It is recommended that in a hot environment where there is high humidity and temperature, the poultry house should be the open sided type to allow free flow of air. Floors should be made of concrete. Walls are raised to about 1m high and the remaining upper part of the wall is completed with 1.25cm hexagonal wire mesh. It is used for rearing adult birds. It can be used for younger birds provided the open-sides are covered with plastic or jute materials to conserve heat.

1. **Poultry Nutrition**

Feed stuffs used in the formulation of poultry diets can be categorized in to cereal grains and their by products, protein and amino acid sources, mineral and vitamin supplements.

Cereal Grains and Their By- Products

Cereal grains and their by-products should constitute the largest part of the ration. They are the chief sources of carbohydrate and services as the principal sources of energy for chicks. The cereal grains however, do not contain protein in amounts required for best results. Cereal grains are also deficient in certain minerals and vitamins. High- energy grains that are suitable for poultry includes corn and wheat. Corn is an excellent grain for poultry. It may constitute as much as 50 to 60 % of the entire ration.

Cereal grains are processed in various ways that results in the production of by products that are used as livestock feeds. In Ethiopia, such by- products come mainly from wheat. There are two major by-products, namely wheat bran (‘frushka’) and wheat shorts (‘frushkelo’). These types of feed should not make up more than 10 % of the total ration

Protein and Amino Acids Sources

Protein supplements are needed to increase the total quantity of protein as well as to satisfy essential amino acid requirements. They should make up 15-30% of the total ration in poultry. The following feedstuffs are categorized in this group.

Oil seed meals: these feedstuffs are by- products of vegetable oil production. The main poultry feed in this group includes soybean meal, cotton seed cake, peanut seed cake, sunflower seed cake, and noug seed cake.

Grain legumes. The major grain legumes for poultry feed include beans and peas. They are lower in protein content than oil seed cakes.

Protein supplements of animal origin: Animal protein sources that are commonly used include fishmeal, meat meal, and blood meal. Fish and meat meal high amount of vitamins and minerals.

Synthetic amino acids: sources of feed- grade lysine and methionine

Mineral Supplements

Minerals are needed by poultry in fairly small amount. They are needed primarily for bone and egg shell formation. Feedstuffs that can be used as a mineral supplement includes limestone, salt and steamed bone meal.

Lime stone: it supplies calcium for the building of bones and egg shells. The laying hen has a need for larger amount of lime stone than young growing chicks. Egg shell contains between 1.6 and 2.4 gram of calcium. Therefore, around 2.5-3.5% of the total laying ration should be made up of lime stone. One percent lime stone in the chicks or growers ration is recommended.

Salt should be also included in the diet of poultry but the requirement is very small (0.25-0.5%). Excess salt results in high level of water consumption and wet droppings.

Steamed bone meal is needed in poultry rations as a source of phosphorous.

Vitamin Supplement

They are necessary for health, growth and reproduction of all animals. Vitamin deficiency in the ration will cause stunted growth, low egg production. Natural sources of vitamins for poultry are most abundant in green growing plants, green cured alfalfa, distillers and brewers by products and brewer’s yeast. Vitamins are also manufactured synthetically.

Nutrient requirement of poultry include Energy, Protein, Vitamins, Minerals & water.

Energy Requirement of poultry could be obtained from Carbohydrates & Fats

**Commercial rations include the followings**

|  |  |  |  |
| --- | --- | --- | --- |
| Age (weeks) | Ration type | Energy  (Mecal/kg) | Protein (%) |
| 0-8 | Starters ration | 2.6-3.0 | 19-23 |
| 9-20 | Growers ration | 2.7-3.0 | 15-16 |
| > 20 | Layers ration | 2.7-3.0 | 16-18 |
| 0-12 | Broilers ration | 2.8-3.4 | 17-21 |

1. ***Characteristics of Swine and their Production***

***Piggery Development In Ethiopia***

In Ethiopia the primary objective of adoption swine were for:

* utilize the garbage foods
* research purpose
* recently as source of food

Swine production in Ethiopia is in its infant stage. For the last number of years adequate emphasis was not given for the sector. Unlike other livestock distribution, swine farms are restricted to central part of the country near, Addis Ababa. According to Ethiopian livestock development master plan (MoARD, 2007) all the pig population in the country has been under private ownership and in strictly religious terms members of the Ethiopian Orthodox church as well as people of the Islamic faith are not in favor of consuming pork which effectively means that there is only very limited pork market within Ethiopia and in those solidly Islamic surrounding countries. Hence, no public intervention has been promoted on pig production in Ethiopia.

The pig population in Ethiopia was estimated to be 29,000 heads representing 0.1% of African pig population. In many rural parts of Ethiopia, pig production was characterized by extensive production system whereby pigs are allowed to scavenge at backyard and municipal garbage dumping sites. On the other hand, extensive husbandry system coupled with poor environmental hygiene and voracious feeding behavior of pigs has been indicated as a major risk factor for infection of pigs with helminths and gastrointestinal parasites where pigs may act as potential reservoir hosts of human gastrointestinal parasites such as ascariasis.

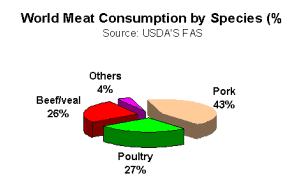
Small scale pig production is a very recently introduced economic activity in Ethiopia. The domestic pig is an animal which has been very much neglected by the scientific community in Ethiopia; hence very few publications are available focusing mainly on pig production.

***Role of pig production in rural development***

A pig enterprise contributes in many ways to improve the livelihood of poor and vulnerable small-scale farmers.

***As source of food***

Swine are valuable for their flesh, prepared as ham, bacon, and pork, and for their fat (lard); they also provide many other products, e.g., leather for gloves, footballs, and other articles, and bristles for brushes. At household level pig production provides access to animal protein for farm families, contributing to an improved diet for family members. Pork with its beneficial components like essential amino acids, vitamins and iron, facilitates a balanced important for young children in food insecure regions. On-farm processing of pork can produce products with improved storage characteristics, enabling meat consumption throughout the year regardless of when slaughter occurs. Pork is the world most consumed meat type.



***Source of income***

Additional income is earned from the sale of the animals (swine) and importantly from their products. This additional income can be used to invest in farm assets, pay for school fees and medical treatments. Pigs provide income for women, strengthening their role in families as well as in local communities. Commonly when pigs are sold, men get involved, often curtailing women’s access to income. The development of a smallholder pig sector thus needs to consider gender issues and this can be supported by extension services and appropriate training. Pigs can contribute positively to the empowerment of women and enhance their equal participation in local markets. It can give women a better say in family matters, allow for their own income to be earned and in case of widowhood or abandonment can provide a safety net. It can also give women a greater role in their local communities. There are also indications that pig production is gaining a foothold as a source of income generation in communities that do not have a tradition for rearing pigs.

***Store of wealth and a safety net in times of crisis***

In poor rural but also peri-urban areas, pig production often functions as a banking system where the animal is a source of wealth that can be accessed when additional income is needed. This might be the case when school fees need to be paid, household members seek medical assistance or cash is needed for further investments. In this regard, pigs represent an attractive intermediate between poultry production which can be initiated with very little money and the more long term oriented cattle production option requiring far higher cash outlays.

***Source of manure***

The high quality manure has always been valuable in the farming industry, especially when the pig unit is integrated with arable systems. Their manure is a valuable fertilizer that can contribute to increased agricultural productivity. Pig manure can be an excellent source of plant nutrients including Nitrogen (N), Phosphorus (P) and Potassium (K). It can be used to replace much of the chemical fertilizer required to fertilize grassland and crops and produce very substantial reductions in fertilizer costs. The use of organic manures such as pig manure not alone makes good economic sense for the farmer but also is environmentally sensible in that the demand for the manufacture of chemical fertilizer will be reduced accordingly. Chemical fertilizer manufacture and transport creates significant demands on the increasingly scarce global energy supplies.

Pig manure can also be used as a source of fuel when processed in a bio-digester. Methane production from pig manure collected in small-scale pig holdings can be sufficient to cover the demand for household cooking stoves and therefore reduce the dependency on external energy sources like wood or fossil fuels . Incorporated in aquaculture systems, their manure can fertilize ponds which in turn feed fish – a common practice in Southeast Asia that can be adopted in other regions of the world.

1. ***Breeding of Pigs***

***Breeds of swine***

There are over 90 recognized breeds and an estimated 230 varieties of pigs in the world. They can be broadly classified into indigenous or unimproved types or the more modern exotic types which have been selected and developed for specific commercial purposes.

***Indigenous breeds (unimproved)***

These are mostly found in developing countries and have evolved a variety of shapes and sizes in order to survive in a range of different environments. Generally they are smaller and shorter of leg than the exotic types (mature weight of females 40- 120 kg), with the typical unimproved conformation of a large head, well- developed forequarters and relatively light hindquarters. This renders them more mobile and better able to forage and root for themselves. They are early sexually maturing and females may show first oestrus as early as three months of age. There are many variations of coat colour, but black and brown are most common and white is infrequent. The degree of hairiness also varies, and hairless and relatively long –haired types are found.

**Exotic breeds of swine**

**A. American Landrace**

* White
* Long Body
* Big loped forward ears
* Large litters
* Good mothering ability
* Originated in Denmark

**B. Duroc**

* The Duroc breed originated in the eastern United States from red hogs raised before 1865.
* Originally, Duroc hogs were known as Duroc-Jersey hogs, but the *Jersey* has been removed from the name.
* All Duroc hogs are red, although the color can vary from very light to dark.
* They have ears that droop forward over the eyes.
* The breed is popular because of good mothering ability, efficient feed conversion, fast growth rate, and prolificacy (the ability to produce large numbers of offspring.
* The Duroc is known as a meat-type hog.

**C. Hampshire**

* Black with a white belt
* Erect ears
* Good muscle
* Carcass leanness

**D. Yorkshire**

* White
* Erect ears
* Large litters
* Good feed efficiency
* Excellent growth and mothering ability
* Long carcass

***Selection of Breeding Stock***

Breeding stock is a group of animals used for purpose of planned breeding. Breeding, feeding and management are the three fundamental ingredients of swine production. No one of these is sufficient in itself. Superior breeding stock can fulfill their genetic potential only under adequate levels of feeding and management. Conversely, superior feeding and management can be fully effective only if applied to pigs of good genetic potential. The most important traits in swine are litter size, vigor or livability, rate of growth, efficiency of feed utilization and carcass quality

***Selecting Gilt/Sow for Breeding***

* They should have at least 12 normal teats. The teats should start well forward and be

spaced evenly to allow adequate suckling for the piglets.

* They should be the biggest and heaviest of the litter
* They should have strong legs and walk well
* Gilts to be selected from sows, which wean 9 -10 or more piglets per litter and are known to be good mothers and first farrowing at one year of age and farrowing interval of seven months.

***Selecting Boar for breeding***

* the same factors should be taken in to account as for the sows includes; the presence of 12 rudimentary nipples so as to pass on this characteristic
* Avoid choosing a boar too highly in-bred from your existing stock ( as in- breeding lead to reduces fertility, poor growth etc)
* Boar to be selected from the herd which is having normal sex organs, active, healthy and strong
  + Check whether it has two testicles or not in the scrotum
  + The testes are suspended by the spermatic cord in to the scrotum
* The boar and the sow should preferably be about the same size
* Selection to be done before castration i.e. at 4 weeks. Select biggest from the litter.
* Boars must be replaced when they become too large to serve most of the sows on the farm.
* Boars usually have a maximum working life of between 18 and 24 months. This means they should be replaced when they are 30 to 36 months old.
* It is very important to keep record of the boars' use so that infertile ones can be detected and replaced as soon as possible.
* A low sex drive (libido) can also be a problem. Some boars are slow workers and are sometimes reluctant and only now and then willing to work. Attention must be given to these boars so that they can be replaced if necessary.

***Breeding Swine for genetic improvement***

Genetic improvement is done through two techniques, selection and cross-breeding.

|  |
| --- |
| * Selection is the process of choosing an animal to be parents of the future generation. Selection in a population makes it possible to increase the average value of one or several characteristics, chosen beforehand to improve the genetic potential of animals of this population. * Cross breeding – is mating of two individuals from different breeds thus introducing into the progeny a gene combination that is different from that existing in either parent or in the breed of either parent. That means cross-breeding makes it possible to combine the advantages of several breeds. In fact, the limits of selection and reproduction in pedigree breeds (such as selecting characteristics with poor inheritance ability, etc.) have led to researching the possibility of mating breeders of different breeds. Crossbreeding is widely utilized in the pig industry to utilize hybrid vigour and complementarity. However, unless properly planned schemes are put in place economical heterosis will not be achieved thus crossbreeding will be a financial liability. In poorly planned schemes where crossing is done haphazardly, the advantage of using crossbred sows to take advantage of maternal heterosis is very small or non existent. |

The production characteristics to be considered in pig breeding are:

Boar Line:

* Daily gain
* Feed Conversion Rate
* Relation between Lean Meat/Fat

Sow Line:

* No. of piglets born alive
* No. of piglets weaned
* Mortality and Longevity

**Important Breeding Numbers**

* Litter Size: 7-15 pigs
* Birth Weight: 2-3.5 lbs
* Weaned at: 21 days
* Sexual Maturity: 6-8 months
* Ideal Number of Teats: 7 per side
* Estrous Cycle: 21 days (range of 19-21)
* Duration of Estrus (heat): 2-3 days
* Gestation: 114 days (3 months, 3 weeks, 3 days)
* (range of 112-115)

**Important Weights of Hogs**

* Birth Weight: 2-3.5 lbs
* Wean Weight: 15 lbs at 21 days
* Slaughter Weight: 250 lbs
* Mature Weight:
* Male 500-800 lbs
* Female 400-700 lbs
  + **(Formula**: lb = kg x 2.20462262)

1. ***Nutrition of Pigs***

***Nutrient Requirements for different classes of swine***

***Piglets***

Each newborn piglet should be fed on colostrums within the first 18 hours after birth. If the sow is hostile, bottle feeding of the colostrums to the piglets is recommended. Sow's milk does not contain enough iron to meet the requirements of baby pigs. Iron should be given to baby pigs within their first 3 or 4 days to prevent anemia. Iron formulations are available and can be given by injection orally. The nutrients to be given must be measured out correctly, preferably using a syringe.

**Creep feed:** The practice of self-feeding concentrates to young piglets in a separate enclosure away from their mother is known as creep feeding. Starting at one week of age, piglets should be given creep feed. Creep feeds should be fed dry and piglets prefer feeding them when pelleted. Water should always be available Creep feeds are commercially available in feed meals. It is very important that the creep feed used between one week and three weeks of age contains 20% crude protein. At 3 weeks farmers may switch to starter feed which contains 18% crude protein and this is fed to the piglets until they reach weaning age where the weight will also be about 15kg.

***Weaners/Growers***

After weaning the pigs should be switched from the creep feed to a lower cost pig grower feed which contains 16% of crude protein. The growing pig (50 pounds) is still in the growth phase in which it is depositing lean tissue at a fast rate. Therefore, high levels of lysine and other amino acids are necessary to promote maximum lean growth. Clean fresh water should be available to the pigs at all times

***Boar***

The great impact of the boar on the swine production (up to more than 6,000 piglets produced by boar and year) determines the great interest in the study of any factor that can have an incidence on its production results. The feeding can, in some cases, be decisive for the sexual behaviour of the boars (libido, difficulties during mountings, longevity, amount and quality of the semen, etc.). At a practical level, with a consumption of between 2.6 and 3.0 kg for boars of between 200 and 300 kg live weight, we will need a compound feed with 3,000 kcal ME/kg, and a 0.5% of digestive lysine will be enough.

***Sow***

***Pregnant sow***

During gestation, the recommended feeding method for gilts and sows is a limited feeding program. However, it should be emphasized that a limit-feeding program is limiting only the energy intake and not other nutrients, such as protein, minerals, and vitamins. The energy is limited in order to keep sows from becoming too fat. Excessive feeding of gilts and sows leads to increased costs and interferes with the potential to maximize reproductive efficiency.

1. Over fat sows (especially when kept in high temperature) are more likely to experience:

* increased embryonic mortality
* farrowing difficulty
* more crushed pigs
* decreased feed intake during lactation
* lower milk production, and
* increased susceptibility to heat stress
* producing smaller litters

1. **Thin sows may exhibit:**

* failure to return to estrus
* lower conception rates
* smaller subsequent litter sizes
* downer sow syndrome (bone breakage   
  and spinal injuries due to excessive mobilization of minerals from bones).

Diets for the pregnant female must meet her daily requirements for all essential nutrients. During normal (spring/fall) weather conditions, about 6,000 kcal of metabolizable energy per head per day will keep sows in good condition. However, this energy intake may need to be adjusted up or down depending on the condition of the sow and as the weather changes. This is usually accomplished by increasing or decreasing the amount of feed given to the sows daily. A good indicator of condition during gestation is weight gain. A sow should gain 75-100 lb and a gilt 100-125 lb during gestation. Sow condition is a critical indicator of performance, thus high-producing sows may require higher feeding rates to maintain adequate body condition.

The daily allowance for protein is .5 pound, lysine 9 g, Ca 16 g, and P 14.5 g. This allowance can be met by feeding 4 pounds of a 14 percent crude protein diet per day. During the summer, feed intake may be reduced to about 3.5 lb per head per day. In this case, the protein in the diet must be increased to about 16 percent to meet the .5 lb per head per day requirement, assuming amino acid levels are adequate. Feeding levels lower than 4 pounds will also require an increase in the levels of minerals and vitamins to maintain proper amounts on a daily basis.

It is important to consider that sow and gilt requirements are expressed as amount-per-head-per-day, not as a percentage as with a growing pig. The success of limit-fed gilts and sows depends upon controlling the intake of each female. Care must be taken to see that each one gets her share. Individual sow feeding stalls are an effective device for controlling boss sows. If sows are group fed, it is imperative that the grain be spread across a larger area to reduce the amount of fighting and to ensure that all animals get the calculated energy requirement.

Interval feeding during gestation is a possible alternative to limit=feeding. Interval feeding is accomplished by feeding the sows every other or every third day. Of course, the amount fed is adjusted accordingly. For an example, instead of feeding 4 pounds each day during gestation, 8 pounds is fed every 2 days. With interval feeding, it is necessary to have sufficient feeder space. Research results have shown that a minimum of 2 to 6 hours out of every 72 hours is an adequate feeding time. Interval feeding is not recommended for gilts.

***Lactating sow***

* Sows during lactation should be full-fed in order to obtain maximum milk production. A sow will normally consume 9 to 15 pounds per day. This intake will depend upon a diet composition, sow's condition, previous gestation diet, and environmental temperature of the farrowing facilities. For maximum milk production, it is recommended that the sow be maintained in an environment of 60-70oF. At higher temperatures, a reduction in feed intake will be evident.
* Feed ingredients with a high fiber content such as beet pulp, oats, and wheat bran, may be used as laxatives to keep sows from becoming constipated. However, they also reduce the energy density of the diet and limit sow energy intake. Chemical laxatives, such as magnesium, potassium, or sodium sulfate, may be a preferred method of controlling constipation problems. The recommended level of magnesium sulfate is 10 to 20 pounds per ton or top dressing about 1 to 2 tablespoons per feeding.
* Bulky ingredients should be removed from the sow ration soon at after farrowing. Sows are fed on rations containing 14% protein and those nursing large litters need full feeding during lactation. Sows that finish lactation with excessive weight losses have delayed estrus beyond the usual 3 to 7 days post weaning. Sows nursing fewer than eight piglets may be fed an amount of 3 kg per day with an added bonus of 0.25 kg for each piglet being nursed.

***Nutrient requirement of all age group of swine***

1. ***Nutrients requirement of breeding stock***

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Breed Gilts** | **Lactating gilts & sows** | **Young boars & adult boars** |
| Live weight (kg.) | 110-250 | 140-250 | 110-250 |
| ***Energy and protein*** | | | |
| DE (M cal/kg) | 3.3 | 3.3 | 3.3 |
| ME (M cal/kg) | 3.17 | 3.17 | 3.17 |
| Crude Protein (%) | 14 | 15 | 14 |
| ***Inorganic nutrients (%)*** | | | |
| Calcium | 0.75 | 0.75 | 0.75 |
| Phosphorus | 0.5 | 0.5 | 0.5 |
| Salt | 0.5 | 0.5 | 0.5 |

1. ***Nutrient requirement of growing stock***

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Weaning** | **Growing** | **Finishing** |
| Live weight (kg) | 5-12 | 12-50 | 50-100 |
| Daily gain (kg) | 0.3 | 0.5 | 0.6 |
| Energy and protein | | | |
| DE ( M cal/kg) | 3.5 | 3.5 | 3.3 |
| ME (M cal/kg) | 3.36 | 3.36 | 3.17 |
| Crude Protein (%) | 22 | 18 | 14 |
| ***Inorganic nutrients (%)*** | | | |
| Calcium | 0.8 | 0.65 | 0.5 |
| Phosphorus | 0.6 | 0.5 | 0.4 |
| Sodium | -- | 0.1 | -- |
| Chlorine | -- | 0.13 | -- |

## Approximate water requirements of pigs per day

|  |  |
| --- | --- |
| **Age group/Age (weeks)** | **Water Requirements (liters)** |
| 8 | 3 |
| 20 | 7 |
| 28 | 8 |
| **Pregnant pig** | |
| First 3 months | 12 |
| Last 3 months | 15 |
| Lactating Sow with 5-8 Piglets | 25 |
| Lactating Sow with  10-12 Piglets | 30 |
| Boar | 20 |

***Antibiotics and other antimicrobial compounds***

**Antibiotics -** Antibiotics are quite effective growth promotants. Researchers believe that the primary reason low-level antibiotic feeding promotes growth is due to suppression of subclinical disease caused by bacteria. Other direct metabolic and nutrient-sparing effects have been observed with low-level antibiotic feeding. Typically, subtherapeutic levels of antibiotics increase growth rate about 15% and improve efficiency of feed conversion 5 to 7%. Use of antibiotics may reduce mortality rate. As the pig gets older and heavier, the growth promoting benefits of antibiotics decrease. There is some question as to the effectiveness of antibiotics in the diet of finishing pigs.

**Additives -** In addition to antibiotics, there are numerous additives that are used to increase acceptability of the diet to pigs, preserve quality of the diet or improve digestion and utilization of the diet. Some of these additives include: probiotics, flavors, sweeteners, pellet binders, clays, antioxidants, mold inhibitors, enzymes, organic acids, yucca extract and electrolytes. It is not our intent to thoroughly discuss each of these additives in this publication. For more information on use and effectiveness of these and other feed additives, contact one of the authors or your consulting nutritionist.

***Guidelines in formulating swine ration***

Feed costs represent 55 to 70 % of the cost of producing hogs. Therefore, close attention to nutrition should carry a very high priority. This includes formulation of swine rations utilizing the most accurate information available. The major goal of a nutritionist or a pork producer in a swine feeding program should be to supply at a feasible cost the nutrients needed at the right time in the animal’s life. Before a person can formulate a swine ration, there are few facts that must be known:

* What are the recommended nutritional levels for pigs at various weights or ages?
* What is contained in the feeds that are used? The Me­tabolizable Energy, protein, calcium, and phosphorus of common feedstuffs must be known.

Many swine producers will use rations calculated by others. Some producers will use the trial and error method of calculating rations with the use of simple electronic calculators. A few producers who have access to computers may elect this method of calculating rations. Computers may be used to calculate linear programmed least cost rations. The method described here in this sheet is the “Square Method.” It is a simple easy method for producers who wish to calculate their own rations but do not feel they need the additional information on amino acid content that computer formulated rations usually furnish.

Example- Formulate a 12.087% CP diet using corn (8.8% CP) and a protein supplement (35% CP), with 3% rye (11.9% CP) and 7.5% milo (11.0% CP)."

Corn (8.8%CP) = 22.913 parts corn

12.087%CP

Supplement (35%CP) = 3.287 parts supplement

26.2 total parts

* 22.913 parts corn X 100 = 87.454% corn

26.2 total parts

* 3.287 parts supplement X 100 = 12.546% supplement

26.2 total parts

89.5 x 87.454% = 78.271 lb corn

89.5 x 12.546% = 11.229 lb supplement

***Check***

3.00 lb rye x 11.9% CP = 0.357 lb CP

7.50 lb milo x 11.0% CP = 0.825 lb CP

78.271 lb corn x 8.8% CP = 6.888 lb CP

11.229 lb supplement x 35.0% CP = 3.930 lb CP

***100lbdiet 12lbCP***

***Feeding of pigs***

* Pigs are mono-gastric animals and can utilize fibrous food only to a limited extent. Adult pigs can utilize fibrous food better than young stock.
* Part of the protein in the diet of pigs should come from animal source such as fish, meat etc.
* Pigs should be fed at regular intervals.
* Fresh feed should be put only after removal of the previous feed from the feed trough.
* Pig rearing based on commercial pig feed is not economical and hence feeding based on swill is recommended. On an average, pig requires 4-8 kg swill (kitchen waste including left over of human food, vegetables, meat and fish cuttings) per day. Composition and quantity vary so greatly that it is difficult to indicate feeding values. It has been observed that pigs weighing 30 kg reached a body weight of 70 kg in 70 days when fed exclusively on kitchen waste. Ensure that swill feed is not old and putrified.
* All categories of pigs can be given small quantity of fodder or may be sent to pasture.
* Ad libitum feeding using an automatic feeder (which can be fabricated using 200 litre oil drum) may be practiced for weaned pigs to avoid post-weaning weight depression

1. ***Care and Management of Pigs***

***Management of baby pigs***

Successful early weaning of pigs requires skill and attention to detail in all areas. Weaning is a great challenge to the young pig. Knowledge of the nutrient requirements, health status and growth patterns for modern breeds of early-weaned pigs continue to develop. Early weaning of piglets at 14-21 days increases sow productivity through the potential increase in the number of litters per sow per year.

* Piglets should be weaned when they are about 8 weeks old
* It is best to take the sow away from the piglets
* Need protein-rich feed as they will be growing fast
* At the age of 3 months new breeding sows or boars can be selected

**In management of baby pigs farmers must note the following:**

* Improved management at farrowing and on through weaning will result in more pigs weaned per sow per year. On the average, farmers lose more than 25 percent of the live pigs farrowed before they are weaned. Many of these deaths occur in the first few days after birth. Stillbirths, injury and starvation account for more than 60) percent of these deaths which normally occur within the first four days after birth. Proper management can reduce these deaths and result in weaning two or more additional pigs per sow per year. Therefore extra time and effort spent is essential for the litter.
* One management factor that will save piglets is to be present at farrowing. The baby pig should have assistance in removing mucus from its mouth and in starting to breathe. It should be wiped dry, and be assisted in nursing for the first time. The farmer can assist with a difficulty of a prolonged birth that might otherwise result in stillborn pigs by summoning for professional help from a veterinary officer.
* Soon after birth the navel should be cut 3-4 cm from the body and if still wet, treated with iodine tincture. The navel is a good route for bacteria to enter the body. Treating the navel could reduce on the navel infection with bacteria. If excessive bleeding occurs from the navel, tie the navel cord off with a piece of string about 2.5 cm from the body.
* Ensure that each newborn piglet takes colostrums from the sow within the first 18 hours after birth. Piglets start suckling immediately after birth. The strongest piglets find the best teat and eventually after a few hours of interchange each piglet keeps to its own teat. Therefore no attempt should be made to make the sow raise more piglets than its number of teats. However many piglets are born. However in a well managed system the surplus piglets can be raised by hand or on a foster mother. This is why it is important that breeding pigs should have at least 12 to 14 teats.
* Sometimes sows may give birth when they have niastitis or inflammation of the mammary glands caused by one or more microorganisms. Similar)/ the sow may have a condition known as agalactia or failure to secrete milk. In such circumstances the sow will not have the milk for the piglets to suckle. If there is failure of the sow to release milk, then do foster nursing by getting milk from another sow which has given birth and bottle feed the piglets with a bottle. Alternatively the piglets can be given to a foster mother.
* Piglets are usually born with relatively small reserve of iron in their body and their mothers milk does not normally provide sufficient iron for their requirements. Consequently, piglet anaemiacaused by iron deficiency often occurs. Therefore to prevent piglet anaemia, it is recommended that farmers put **clean red** soil in the pen each day as red soil is a rich source of iron. Also daily oral administration of 4ml of a 1.8% of ferrous sulphatesolution is recommended. Alternatively farmers may inject the piglets with ferrous sulphate or it may be smeared on the teats of the sow where the piglets will take it in while suckling.
* After considering these aspects the piglets must be well fed as already recommended in the section of feeding until weaning time. At weaning; the sow should be taken away from the piglets and not the piglets from the sow. Weaning should be gradual and not an abrupt process. At first the sow should be taken away for a few hours, then for a whole day and finally all the time

***Creep feeding of piglets***

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.

Creep feed is:

* Creep Feed is the baby piglets’ first and most important dry food. It contains 20% protein that is highly fortified with milk by-products and is available in small, chewable, highly palatable pellets for easy digestion.
* A combination of protein source, milk replacer, vitamins, amino acids and rich feed ingredients makes this complete feed the ideal start for young healthy piglets.
* Feed ingredients in descending order: corn, soya bean meal, barley, wheat bran, vegetable protein, oilseeds extracts, fatty acids, feed phosphate, pig vitamins, and trace minerals.
* Creep feed (about 20g per piglet per day) or a good home-made mixture with fine rice bran, broken rice and milled maize grains. Clean drinking water must always be available.

## ***Management of sows***

* Gilts have to be in a good condition to produce large litters (eight to 10 or more healthy piglets) and should not be too fat when they are ready for mating. Therefore, they should be fed about 2 kg of meal per day from the time of selection until a boar serves them at the age of eight months. This will also ensure that not too much fat is lost during the suckling period and that they are in a good condition after weaning their first litter.
* Energy intake of selected gilts should be restricted to prevent overweight conditions. Nutrients other than energy should be provided to meet the minimum daily recommended allowances. During gestation, gilts should be fed to gain about 75 lb and not become overly fat.
* Mating should be arranged only during the sows period on heat (estrus). Moving gilts to new pens, increased exercise, and daily exposure to boars beginning between 160 and 180 days of age will help stimulate the onset of estrus. Breeding should be delayed until the second or third estrus to increase the probability of large litters and prevent dystocia.
* Gilts that do not conceive after mating at two estrous periods should be marketed. Likewise, gilts that have not expressed heat by 9 months of age should be culled.
* Sows are dewormed about 2 weeks before moving to a farrowing pen. The most common dewormer used is piperazine.and antihelmintic drugs that contain levamisol. Treatment for external parasites, at least twice, should be done within a few days before moving to a farrowing house.
* Before a sow is placed in a farrowing pen, wash her, especially the under side and hindquarters using a mild soap and warm water. This will eliminate soil and fecal material that may contain bacteria and worm eggs, which could infect the nursing pig.
* Farmers must make sure that they attend to the sows at the time of farrowing as this will decrease on the number of piglets that die during the farrowing process or a few hours afterwards. The duration of labour ranges from 30 minutes to 5 hours on average, although it may extend to 12 hours. If the labour is unnecessarily long, then call in a veterinarian for assistance.
* Piglets may be enclosed in the afterbirth or may be covered with excessive mucous. In such circumstances, remove the mucous and afterbirth to prevent suffocation.
* Farmers must ensure a health program that minimizes exposure of the new born piglets to disease carriers. Hygiene practices must strictly be adhered to.
* After farrowing the sow must be well fed to ensure that it maintains a good body condition. This will make it possible for the sow to come on heat within the recommended 3 to 7 days after weaning.

***Management of boar***

* The purpose of keeping boars is to use them for mating with gilts or sows when they come on heat. It is recommended that boars are kept in individual pens to eliminate fighting, riding and competition for feed. Besides, the time when the boar remains serving is improved by penning boars separately.
* Boars in confinement should be kept in individual pens about 8 x 8 feet. In the semi-intensive system, the minimum space requirement is 75x 100 feet and under this system, housing and feeding areas should be separate to encourage exercise.
* Newly purchased boars must be put in an isolation pen for 30 days. The pen should have been disinfected two weeks earlier, should be located away from the rest of the herd and should be well protected from extreme weather conditions. This will enable the farmer to observe if the boar has any disease that may not have expressed itself and thereby avoiding introduction of diseases to the farm.
* Young boars need to be reared in-groups so that they have the opportunity for physical contact and interaction with other pigs during development. This will help in the development of normal sexual behavior.
* Young, healthy and well-developed boars should be mated for the first time when they are 8 to 10 months old or about 120kg in weight. Their first sow should be of their own size or smaller.
* In the early stages the young boar should not serve more than 1 sow per week. The number of services can gradually be increased. If a boar mates more often than this, his health and productivity will suffer.
* In hotter climates a single boar will suffice to serve between 5 and a maximum of 25 sows. It is nevertheless advisable to keep at least 2 boars, an older heavier boar for the bigger sows and a younger lighter one for the gilts.
* A boar should function well until about 5 to 6 years old. Once he gets older than this the younger boar should take his place and a new young boar be selected, or brought in, for the young sows.
* Boars should be kept neither too lean nor too fat. Boars should be fed at a level of energy that will prevent excessive fat deposition. This practice should help ensure that they are physically skilled and sexually active.

1. ***Housing of Pigs***

Pigs are adversely affected by climatic factors viz. low environmental temperature (hypothermia), high environmental temperature (hyperthermia), high wind speed, wet floor, diseases, and energy intake (Shrestha et al., 2002). The normal internal body temperature of a pig is about 38.5°C .Any great deviation from this normal may lead to the animal’s death because pigs lack sweat glands to dissipate by dissipating. A suitable piggery should, therefore, have ample protection against environmental hazard stress, good sanitation, sufficient space, minimal feed wastage and be as cheap as possible.

The way the house is constructed should facilitate proper cleaning, disinfection and maintenance of sanitary conditions e.g. suitable floors, adequate waste disposal, absorbent bedding. Good ventilation is essential in disease control and air must move through the building such that foul air is replaced with fresh. This can be secured by using an open shed, doors, windows and incomplete walls.

There are different types of housing systems of pigs such as:

* **Open ranging**- pigs are let loose through out the day and night.
* **Tethering-** pigs are confined in the home stead/road side by tying with rope.
* **Open enclosure** –pigs are housed in an enclosure made out of locally available materials with or with out temporary roofs.
* **Penning**- pigs are housed in a small pen or room made up of locally available material like bamboo, timber,
* **Scientific housing** – this is house types constructed as per the norms of pig housing prescribed in books. Concrete floors, permanent roofs, drainage systems, feed and water troughs etc. are encompassed in this type of housing.

***points to be considered in construction of pig house***

***Location***

* An open, elevated space sufficiently exposed to sunlight
* At least 50 meters away from the residential house
* Near to a drainage system or fish pond for easy disposal of farm waste
* Should have an approach road
* Nearer to veterinary service, markets, banks etc…

***Orientation of the house***

* The house should be well ventilated and directed longitudinally in North-South direction to allow sun light in the morning as well as in the after noon. Sunlight helps to dry the floor and thus lowers the chance of disease in the farm.

***The different parts of house***

***Roof***

* Pig’s house may have single or double rows of pens or rooms. In large commercial farms, double rows of pens facing each other are constructed (with a corridor in between for movement of the attendant while in small farms, single row pen is constructed. Depending on single/double rows of pen, type of roof may vary. Generally in a single row pen house roof is of shade type (single roof and slopestowards one side). While in double row pen house it is mainly of gable type (double roof, slops towards both sides).



***Floor***

* The floor should be concrete, little rough to avoid slipperiness. It should be slightly sloped for easy drainage of urine and dung. Earthen floor should be avoided as far as possible.
* In case of plat form type, floor material should be strong and durable to avoid injury to the pigs and to reduce the cost of repairing time.
* Floor space should be adequate as per the requirement number of pigs. Inadequate floor space may leads to higher disease incidence and lower productivity. The pigs should live comfortably.

***Wall***

* Walls should be constructed up to 3.5 feet height above plinth area. The part above 3.5 feet may be covered with wire/bamboo netting to prevent crows and predators.
* In highland altitude areas height of the house should be lower in order to reduce heat losses from the surface. Lower houses also protect the pigs from cold winds. In plain areas height of the sheds may be raised a little for free circulation of air.

***Drainage system***

* A drain of about 1 feet wide and 0.5 feet deep should be constructed on the sloped side of the floor.
* Two manure pits should be constructed for disposal of farm wastes and to convert them into farm manure. When one is filled, the other should be filled, the other should be used
* Drain should be gradually sloped towards the manure pit.
* If the pig farm is integrated with fishery or crops, the drain should be constructed in such a way that the farm wastes flow to the fish pond or crop field. Adequate care should be taken to drain out only the required quantity of farm waste to the pond/ crop field in appropriate time.

***Construction material***

* Ideally, concrete material should be used for construction of pig house. However, for small holders it may not be affordable.
* To reduce the investment on housing, floor should be constructed with concrete, while wall and roof can be made of locally available housing materials like bamboo, jungle wood post, thatch, tree leaves, tin, plastic etc.
* Thatch/ tree leaves are preferred for construction of roof to maintain lower room temperature as compared to tin roof.
* If the producer is financially weak, it is suggested to invest less on housing and invest sufficiently on purchasing piglets, feeds, etc. these are more important components for a productive farm. Once earning increases, the owner can gradually improve the housing.

***Provision for pregnant and lactating sow/diseased pig/boar – Isolation house***

* Separate provision should be made for farrowing pigs, boars and diseased pigs
* Farrowing pens should have the provision for a creep area
* Breeding boar should be kept in a single pen so that they can not disturb other males/ female pigs.
* Diseased animal should be kept in isolation in a separate house or in an extreme corner of the same house to prevent spread of infection to healthy pigs.
* Diseased animal should be kept in isolation in a separate house or in an extreme corner of the same house to prevent spread of infection to healthy pigs.
* Under scientific housing system, feeding and water troughs are part of the floor plan. These are constructed on the floor adjacent to a wall. The feeding and water troughs should be 1 ft.deep and 1.5ft.wide. The feeding troughs should be longer than the water trough.
* Those who do not construct concrete floor may use aluminum bowl for feed and water. As a low cost measure tyre, wooden block, concrete bowl etc. can also be used as feeding trough.

1. ***Pig Disease and Control***

Successful swine production requires the application of health-conserving, disease preventing, and parasite-controlling measures to the breeding, feeding, and managing of the herd. By nature, pigs possess clean habits. However, in many cases they are kept in old, crowded, and filthy quarters. Such conditions favor the attack by the common diseases and parasites of swine.

**How do you tell that a pig has ill health?**

A pig is suspected to have ill health if it shows any or a combination of the following signs:

**General signs:** these include dullness, loss of appetite, laboured or rapid breathing, sudden deaths, loss of weight, low weight gain and fever usually manifested by shivering of the pig.

**Signs expressed on the skin:** these include reddening of the skin or skin discoloration, loss of hair and hardening of some parts of the skin, itching of the skin and cracking of the skin.

**Others signs commonly observed include:** lameness, cough, abnormal nasal discharges, diarrhea with bad smelling feces, abnormal contents and colour of feces and abortions.

***Causes of diseases of pigs***

Pig diseases can be caused by bacteria, viruses, protozoa, nutritional deficiencies, and poisonous substances, internal and external parasites.

* Bacterial diseases include swine erysipelas, swine dysentery, infectious poly-arthritis etc.
* Viral and mycoplasrna diseases include African swine fever, swine influenza, enzootic pneumonia of pigs, vesicular exanthema of swine, transmissible gastroenteritis etc.
* Helminthiasis as a health problem in pigs is mainly caused by worms like the Lungworm, Ascaris worms etc.
* Nutritional diseases include piglet anemia, parakeratosis etc
* External Parasitic infestations include mange, lice, jiggers etc.

***Guidelines of Disease Prevention/Control***

To be able to manage and control pig diseases, farmers must take care of housing and ventilation including cleaning and disinfection of the pig pens, manure disposal, proper disposal of the dead pigs and isolation of the sick pigs.

1. ***General approach***
2. ***Proper manure disposal***

* Disease causing agents may be contained in urine, feces, exhalation *and* nose and mouth discharges. These may act as media for growth of disease causing agents. Excrement must be removed frequently from the immediate surroundings. Manure may be heaped so that the heat generated kills the parasites and microbes. It is recommended that manure be kept in a covered concrete pit and the manure in the pit sprayed with insecticides to inhibit development of disease causing organisms and flies.

1. ***Pigs kept on pasture should be rotated in the paddocks***

* Rotation on pasture will disrupt the life cycle of many disease causing agents as these agents are sometimes specific for certain hosts. Pastures may be rotated between different species.

1. ***Isolate new animals***

* When introducing new animals, secure a health certificate from the farm where the animal is being purchased and thereafter isolate them for a minimum of 3 weeks. Thoroughly clean and disinfect the isolation stall after each animal is removed and before animals are introduced.

1. ***Dispose of dead pigs properly***

* Pigs that die can be a source of infection and should be disposed off by burning to eliminate contamination of the surrounding ground. Burial is another disposal technique and the pig should be put in a 4 ft deep pit if this method of disposal is used. On death of an animal, call a veterinarian to carry out examination and ascertain cause of death before disposal.

1. ***Use of disinfectants***

* Disinfectants are used to create conditions unfavorable for survival of microbes. Proper cleaning removes most microbes, but in case of a disease outbreak, the buildings must be disinfected. Foot disinfection for visitors visiting pig pens is a good arrangement in disease prevention and control

***B. Sows***

***1. Farrowing quarters***

1. Clean farrowing quarters thoroughly a few days before parturition.
2. Scrape loose dirt and dust from the ceiling and walls.
3. Remove litter, filth, and manure from the floor.
4. Disinfect the floors and walls with a mixture of one pound of lye to fifteen gallons of water.
5. Disinfect watering and feeding equipment chemically or with scalding hot water.

***2. Sow cleanliness***

1. Before moving the sows into the farrowing quarters, scrub them with soap and warm water, especially around the udder and belly.
2. This removes adhering parasite eggs (especially round worm) and disease germs.

***C. Piglets***

1. Until the newborn pigs are moved to clean ground, place a little uncontaminated sod in the corner of the pen daily. This precaution will help prevent anemia. Commercially available iron supplements can be given as injections in areas that have access to these products.
2. When the pigs are ten days to two weeks old, haul the sow and litter to a clean pasture, preferably one that has been plowed since it was last used by hogs. (Because of the hazard of worm contamination, haul, don't drive, the animals to the pasture.)
3. Vaccinate all pigs for cholera.
4. When swine erysipelas exists, the baby pigs should receive the serum treatment at a few days of age and again just before weaning time. In highly infected areas where death losses are excessive, vaccination may be used to good effect.
5. In valuable purebred herds, a brucellosis herd test should be made annually and more frequently if the disease is encountered.

***D. Housing and lots***

1. Satisfactory housing is essential because hogs are more sensitive to extremes of heat and cold than other farm animals.
2. Divide the hogs into small groups based upon size, age, and sex. Young hogs do not thrive when forced to pile up in sleeping quarters or when crowded away from the feed trough by larger animals.
3. Sanitation
4. Housing should be dry, easy to clean, sanitary, and well ventilated.
5. Keep the bedding clean, fresh, and dry at all times.
6. Disinfect the floors and walls at frequent intervals. When weather conditions permit, open housing to direct sunlight.
7. Avoid muddy lots and wallows. Keep the fence rows clean and free from weeds.
8. Do not allow manure, food remains, and other litter to accumulate in the lots. Spread pig manure onto a field where pigs do not run.
9. Destroy all rats and bum or deeply bury all carcasses of hogs that die on the farm.

***E. Feeding and watering areas***

1. Concrete feeding floor
2. Especially desirable during the rainy season.
3. A concrete floor is a necessity for successful garbage feeding and it should be cleaned daily.
4. Provide clean fresh water in a suitable trough or drinking fountain.
5. Feed a balanced ration at all times.
6. To prevent contamination by excreta, design the feed and water facilities so the pigs cannot get their feet or bodies into them.

***F. Breeding***

1. Avoid both overweight and underweight breeding animals.
2. Select breeding stock from disease-free herds.
3. Quarantine all new animals for at least two weeks before introducing them into the herd.
4. Do not permit commercial truckers of stock to drive on the premises unless the truck has been thoroughly disinfected.
5. Force the brood sows and the herd boar to take plenty of exercise.

**Common Diseases and Disease conditions that affect Pigs**

|  |  |  |  |
| --- | --- | --- | --- |
| **Disease** | **Clinical signs** | Treatment | **Control** |
| African swine  fever | Fever, dullness, loss of  appetite, huddling together, in- coordination, coughing, discoloration of the skin to bluish, serous mucopurulent ocular and nasal discharges vomiting and diarrhea | Attempt control measures only | Restrict movement of pigs  or meat from affected areas.  Slaughter of all pigs on the affected farm.  Disinfection |
| Swine erysipelas | Sudden death, loss of appetite, red and bluish appearance of the skin and ears. Diamond shaped skin lesions which may become necrotic | Penicillin is very  effective and is the  drug of choice | Clean the pen and disinfect. Treat the in-contact pigs  with penicillin |
| Mastitis, metritis  and agalactia  (MMA) | Sow fails to release milk after farrowing. The udder may be swollen and painful | Use antibiotics and  oxytocin | Good hygiene in the pig pen |
| Foot and mouth  disease | Fever and vesicles on the  coronate and sometimes on the lips and tongue | Advisable to institute  control | Slaughter of pigs in the affected  Houses and Vaccination |
| Piglet anaemia | Signs appear mostly in piglets of 3 weeks of age, pale mucous membranes and skin, dullness and diarrhea | Give Ferrous sulphate injections or oral formulations | Put red soil in pig pen or give iron injections to young piglets |
| Mange | Itching and scratching,  especially at mid-day, scabs on the skin, wrinkling and  hardening of the skin, loss of hair and shaking of the head if the ear isaffected | Use Ivermectin  (lvomec), tactic at  recommended dosage  levels | Treat the pigs when ever they  are entering a new pen which has been cleaned and disinfected |
| Parakeratosis | Similar signs to those of mange but with no itching and scratching | Give Zinc formulations like *zinc* carbonate or Zinc sulphate | Ensure that there is enough zinc in the diet. |
| Lice | Louse will be seen in the folds of the pig skin especially in the neck and at the base of the ears | Use insectcides like  Ivomec and Tactic  acaricide | Use insecticides like  Ivomec and Tactic  acaricide |
| Worms | Poor performance of *the* pigs with low growth rate, coughing in case of lungworms | Antihelmintics like  levamisol and  Piperazine are helpful | Deworm pigs every three months after weaning |

1. ***Essential farm production records for pigs***

***Importance of record keeping***

Record keeping is important because records provide: early warning of developing problems, clues to basic weaknesses in the management program, information for budgeting or feasibility studies and can be used to monitor herd health. Records are also used to identify major costs, comparison with other producers and to provide a basis or seasonal adjustments in management.

***Types and characteristics of good records***

Records must be as simple as possible and kept where they are easily accessible in a way which minimizes transfer from one record sheet to another. There *are many types* of records and they are broadly categorized into individual, herd and financial records.

***• Individual records***

These include, animal identification number, age, breeding date, health status, date of birth, weight at birth, growth rate and weight at weaning. This type of records is mainly used in culling of nonproductive animals and in selection of animals for future breeding purposes.

***• Herd records***

These are the records where information is kept regarding feed consumption by different classes of pigs, new purchases, death losses per a given period, herd reproductive performance which gives number of breeders and the number that has farrowed in the herd and still have suckling piglets. In pig farming farmers first and foremost ensure that they have record on the expected date of farrowing, correct identification of the sow and boar with which it was bred. Also keep the feed and live weight record for measurement of feed efficiency, cost to produce a kg gain in weight, mortality record and use health record cards to show vaccinations and treatments. Other records which must be kept by the farmer as a routine include:

* Heats and services record where farmers must record the dates when the pig was on heat and the dates when the next heat is expected.
* Financial records which include: feed costs, pig purchases, and sales, health and treatment costs, labour costs, charges for electricity, taxation, fuel costs, machinery operation costs and transport costs for feed, animals etc.