CHAPTER ONE

Introduction

Animal agriculture is one of the most important components of global agriculture and is one of the main users of the natural resource base. Ethiopia has the largest livestock population in Africa with an estimated 54 million heads of cattle, 41 million sheep and goats, 7 million equines, 2.3 million camels, 53 million poultry and immense colonies of bees and fish resources. The livestock production systems are determined by climate, the types of crop grown, livestock species reared, and their economic importance to the producer. In the highlands, livestock provide traction power, which is vital contribution to the overall farm labor requirement as well as milk, meat, cash income, manure and serve as capital asset against uncertainty. In the semi-arid lowlands, cattle are the most important species because they supply milk for the subsistence (survival) of pastoral families. In the more arid areas, however, goats and camels are dominant where goats provide milk, meat, and cash income while camels kept by the nomadic pastoral population for milk, transport and to a limited extent for meat.

1.1. The Role of Livestock Production

Livestock play a vital role in the livelihood of many people in the world. In Ethiopia, livestock are an integral (essential) part of the farming community in the highlands; while they are the entire/ major basis for the livelihood of pastoralists and agro-pastoralists in the lowlands. In general, livestock production in tropical countries of the less-developed world has been and will be one of the most important economic and social activities of human culture. They are valued for one or several (sometimes all) of the following traits: capital, credit, traction, milk, meat, hides, fuel and fertilizer. Thus, for families without land, livestock are primarily a means of increasing the family income.

In general livestock have the following roles:

i. **Sources of food**: they provide high quality food **(meat, milk and eggs)** by converting large quantities of materials that cannot be used directly for human food.

ii. **Sources of power:** livestock provide the power to cultivate at least 320 million hectares of land (FAO, 1994), or one-quarter of the total global cropped area. In Ethiopia, livestock are the major sources of power for cultivation, threshing and transportation. They provide power for about 96 percent of the cultivated land.

iii. **Sources of natural fertilizer and fuel**: livestock provide organic fertilizer which help to enhance soil fertility and vegetation cover. One tone of manure provides about 230 kg organic matter, 4.6 kg Nitrogen, 4.6 kg potassium and 2.3 kg phosphoric acid. Manure can also be used for fuel either as manure cake or methane gas and hence reduce the pressure on natural vegetation.

iv. **Sources of income and living bank:** Livestock are important sources of income for at least 200 million smallholder farmers in Asia, Africa and Latin America. Since the rural capital market is limited, livestock are farmers' largest capital asset (live bank), and cash at hand. They are often sold to generate cash for purchase of food and agricultural inputs and to meet **social obligations** etc. In Ethiopia, livestock contribute about 30-35 % of agricultural domestic product (GDP).

v. **Source of employment**: Some of the livestock (dairy, the meat sectors and small scale processing and marketing, etc.) enterprises are labor intensive. Backyard goat, sheep and poultry are an important sources of work for landless households especially women and children.

vi. **Foreign currency**: livestock also play a significant role in producing export commodities such as hides and skins, live animals, meat, honey, beeswax to earn foreign exchange to the country. They also enable good use of the resources available to farmers-land, labor, capital, and management ability. In mixed farming, livestock reduce the risk through diversification of production and income sources. Moreover, they are able to fulfilling social, cultural, religious requirements and obligations of the community.

1.2. Constraints for Livestock Production and Productivity

The major problems identified from the review of previous studies in Ethiopia include

- Shortage and poor quality of feed,
- The scarcity of land for the production of forage
- Inadequate health service
- Low genetic potential of the indigenous livestock
- Traditional husbandry practices
- Absence of marketing infrastructure and lack of improved technologies**.**

1.2.1. Inadequate Feeding

A major constraint to livestock production is feed scarcity. Poor-quality feed and fluctuating feed supplies are the biggest constraints to increase livestock productivity in Ethiopia. However, a scarce feed is the major factor frustrating livestock development mainly due to shrinkage of grazing land, uncontrolled grazing and overgrazing. Natural pastures are overgrazed leading in most areas of the country to their replacement by inferior and often unpalatable species (noxious weeds). The development of improved pasture and fodder crops is still in its infancy indicating that a lot of work should be done in the country.

Feed resources are based on natural pastures, crop residue and aftermath grazing. Areas of improved pastures and fodder crops are insignificant. In the country, natural pastures are traditionally found on areas unsuitable from cropping. Ownership of land is communal, and all livestock are grazed together with no special attempt to provide special treatment for different classes of livestock. Stocking rate is generally high, and closely related with population pressure and with cultivation intensifies. Grazing pressure is continually increasing with increasing arable cropping. Generally, the estimated quantity of feed available from the various sources is below the livestock feed requirement in the country.

1.2.2. Disease Problem

A wide range of **devastating disease** exists in Ethiopia, which is a major constraint to livestock production. For eg. Gross estimate for annual direct losses could reach mortality rates of 10 % in cattle, 16% in sheep and 12 % in goat flock in the Amhara region. Apart from high mortality and morbidity, disease affects

- Fertility
- Growth rate
- Loss of livestock products such as milk, meat, egg, etc.
- Decrease in draft power output.

Losses in live weight, lead to an economic loss greater than suffered from mortality causes. Furthermore, the value of hide and skin exports is downgraded due to skin disease, and scarring from traditional disease treatment**.**

1.2.3. Scarcity of Land

The major constraint in the central high lands is the scarcity of land for the production of forage. Most of the lands are covered with cereals pulses and other crops. With the increasing in population, more and more additional land including grazing land is being converted into agricultural land. With diminishing grazing land and increasing herd size, over stocking and over grazing of pastureland is becoming a common phenomenon. There is also a severe deterioration of communal grazing lands (pastureland).

1.2.4. Poor Livestock Breeding and Husbandry Practices

The genetic of the country's livestock have involved largely because of natural selection influenced by environmental factors. Selection has been for survival under high disease challenges and inadequate feed and water supplies rather than for high level of production. The livestock are not selected for specific purpose but rather are multipurpose animals. There is no

selective breeding. Even though, the indigenous livestock are believed to be well adapted to the environment, their low genetic potential interims of reproduction and weight gain is considered as a critical problem to improve livestock production. Moreover, such uncontrolled breeding practice may also result in inbreeding, which has a negative effect on productivity and survival of the animals.

The use of AI in the country is limited due to the remoteness of the area and lack of good road, and thus leading to problems of transportation of semen and liquid nitrogen. Rather the use of properly selected local or upgraded sires is advantageous with proper health, feeding and other management practices.

Overall, the husbandry of livestock is traditional in the country. There is no planned and controlled feeding. Animals are allowed to breed any time of the year irrespective of the availability of feed. As a result, livestock numbers are not proportionate with available feed and water.

1.2.5. Livestock Marketing Constraints

The primary reason for selling livestock in the country is to generate income to meet unforeseen (unexpected) expenses. Sales of live animals are taken as a last option and animals are generally sold when they are old or unproductive. Thus, livestock are not kept for the primary purpose of producing marketable products. On the other hand, inefficient marketing system reduces financial return to the sub-sector. Prices depend mainly on supply and demand, which is heavily influenced by the season of the year and the occurrence of religious and cultural festivals. There is no market information and promotion. Conditions are aggravated because of the unofficial (illegal) traders, who export livestock by tracking outside of the country.

1.2.6. Uncontrolled Over-Grazing System

Overgrazing is a widespread problem in country. The traditional uncontrolled and free grazing system causes severe degradation of the grazing lands, mainly due to excess removal of vegetation cover and compaction of the soil. Most of the grazing lands are grazed and trampled year round without any resting period, resulting in depletion of palatable species and invasion by less palatable (noxious plants).

1.2.7. Poor Credit Service

Credit institutions and the credit services in the country, especially in rural areas, are at rudimentary (undeveloped) stage. As a result, the major constraint of livestock credit situation is the requirement for collateral. Some of the credit Institute in the country needs group guarantee; because of this poor farmer who do not have titles to land are ineligible for loans.

1.2.8. Lack of Trained Manpower

The livestock services are restricted by lack of trained manpower both in number and quality. There are complaints that the field staffs are lacking up-dated information in their field of activities. No regular in-service trainings are given due to unaware of the importance and finance. Moreover, it is observed that there is frequent and continuing re-organization within the Agricultural Bureau with shifting in area of responsibilities. As a result, staff members are frequently reshuffled and sometimes even assigned outside their field areas. This turnover is creating unsuitability in the entire staffs of the Agricultural office which result in lack of dedication and continuity of the development activities.

1.2.9. Management and Technology Constraints

Introduction of technology is easy, but fully adopting and sustaining is very difficult. Technologies like vaccine productions, tick control by accuracies, forage propagation, water resource development, feed conservation and artificial insemination can be cited as good technological introduction in Ethiopia. However, there are still problems in the adopting and

sustaining them. This is mainly due to lack of investment, shortage of skilled manpower in the country and lack of information and knowledge about the available recommendations on improved technologies.

Improvement Measures of Livestock Production

1. **Improve the quality and quantity of feed**
    a. By adjusting the stocking rate in the highlands and by selling animals in nomadic areas.
    b. Introduction of improved forage species.
    c. Fertilize the grass lands with chemical fertilizers like urea to increase the biomass of forages and increase the nitrogen content.
    d. Cultivation of improved grass and legume species.
    e. Practicing supplementary feeding.
2. **Improve livestock through systematic breeding programs**
    - Through selection and culling.
    - Proper mating of the selected progeny.
3. **Protecting the animals from the diseases.**
4. **Use improved management practices.**
5. **Strong extension services.**

CHAPTER TWO

Livestock Production Systems and husbandry

The principal livestock production system in Africa is extensive grazing by large ruminants. However, livestock production systems in the tropics can be divided into two major types, namely traditional and modern. They are distinguished mainly through the following four general points

1. **General production factors, such as** land, labor and capital.
2. **Feed sources**, namely range, pasture, crop residues, forage, household waste, concentrate feed.
3. **Movement of people and their herd** such as Nomadic, transhumance, semi-sedentary, sedentary and
4. **Intensity of management** (intensive, semi-intensive and extensive).

2.1.1 Range Livestock Production System

- Are production systems based on the use of the natural vegetation the main product is milk and the main function of livestock is subsistence, although social and cultural functions are also important.

- Management is characterized by the adaptation of the feed requirements of the animal to the environment through migration; land tenure is communal are associated with the arid zone where it is too dry for cropping

2.1.2. Mixed Crop- Livestock (Agricultural) production system

- Here livestock production is secondary to crop production.
- The system is sedentary extensive in the sense that the number of animals per total area of land is low.
- Accounts for about half of all cattle reared in the tropics.
- Characterized by small holdings (1-3 ha of land and 2.4 heads of cattle).
- Cattle are used primarily of work purposes, meat and milk production are secondary activities.

- Multiple purpose breeds are needed for work, milk and meat production.
- Some crossbreds may be found.
- In this system, less than **10 % of household income** is derived from livestock.

2.1.3. Landless livestock production systems (LLPS)

- ❖ LLPS the importance of land for livestock production is significantly reduced
- ❖ This is particularly the case with species that do not obtain their feed requirements through grazing, notably pigs and chickens
- ❖ Ruminants can also be kept in landless production systems, but require high levels of capital intensity and management (e.g. in beef lots)
- ❖ are also less dependent on the specific ecological conditions
- ❖ Availability and quality of feed need not be determined by the environment and the more advanced production systems provide protection from the direct climatic influences

2.2. Feeds and Feeding of Farm Animals

A major constraint to livestock production is feed scarcity. Poor-quality feed and fluctuating feed supplies are the biggest constraints to increase livestock productivity. Poor nutrition results in slow growth rate in growing animals and low production and reproduction performance. Nutritional problems also lead to delayed age of onset (beginning) of puberty, long parturition intervals, low conception rates and low overall lifetime reproductive performance. Poorly fed animals take too long to reach optimum slaughter weight and the meat produced by such animals may not satisfy the desired quality attributes (tenderness) to fulfill the demand of the consumers. When the quality of the fodder is low, animals are not able to eat what is required to put on weight. Feed utilization is very inefficient as most of the feed (about 85%) is used for body maintenance.

2.2.1. Feedstuffs or Feed Resources

Traditionally livestock feeding was based on grazing of natural pastures and fallow lands. However, due to rapidly increasing human population and expansion of cropping areas, the importance of natural pasture as source of animal feed is decreasing from time to time and fallow

(uncultivated) lands have virtually disappeared from most of the densely populated and intensively cultivated areas of the country.

- ❖ Animal feed resources can be classified into two general groups based on their fiber content namely Concentrates and Roughages

1. Roughages

The predominant roughage sources are natural pastures, crop residues and aftermath grazing. Because of expansion of cultivation and shrinkage of traditional grazing areas, crop residues are assuming greater importance as sources of roughage feeds than natural pastures in most places.
Animal feed that contain more than 18 % of crude fiber in the dry form are called Roughages. Fiber (cellulose, lignin) is the hard to digest part of the feed. Roughages can be given to the animals in the form of hay, silage, pasture and fodders. There are two types of roughages, legume roughages and non legume roughages. Legume roughages are higher in protein content than non legume roughages. Plants that can take nitrogen from the air are called legumes. These plants have nodules (swellings) on their roots that contain nitrogen fixing bacteria. Non legumes cannot use nitrogen from the air. The common Non legume roughages are corn, grass, straw**.**

A. Natural pastures

Natural pastures are naturally occurring grasses, legumes, herbs, shrubs and tree foliage that are used as animal feed. The availability and quality of natural pastures vary with altitude, rainfall, soil type and cropping intensity. The level and distribution of available soil nutrients and water are the main limiting factors. The quantity and quality of feed obtained from natural pastures declines as the dry season progresses. The protein content and digestibility of most grass species decline rapidly with advancing physiological maturity of the plants and reaches very low levels during the dry season.

Natural pastures are the main sources of livestock feed. However, they cannot fulfill the nutritional requirements of animals, particularly during the dry season, due to poor management

and their inherent low productivity and quality. While the population of livestock is increasing, the areas of grazing land are decreasing from year to year because of increasing cultivation. Moreover, large areas of grazing land in the pastoral areas are becoming unsuitable for grazing due to bush encroachment. Fodder conservation for use during the dry season is not common in most parts of the country.

Improving Natural Pasture

The yield and quality of natural pasture can be improving by

- Changing the species composition – introducing legume species
- Improving management like apply controlled grazing
- Supplement with concentrate usually for dry pastures.

A. **Conserved forages**

During the dry season, the quality of pasture is low and forages are scarce. The only way to solve this problem is to conserve forages. The objective of forage conservation is to maintain the feed value of the forage in order to use during feed scarce seasons. Forages can be conserved as hay or silage.

i. **Hay**

Hay is dried forage. To produce high quality hay, it is essential to harvest the forage at the right time. When forage is harvest too early, its moisture content is too high resulting in hay with reduced dry matter content. If the forage harvest is delayed, the plants develop high lignin content, which is not digestible by the animals. Hay can be sun dried to 10-15 % moisture content.

There are many method of making hay. The simplest and cheapest method is drying the forage on the ground. The grass is cut early in the morning and spread on the ground in the field. The masses of the forage are turned over many times to avoid picking of moisture from the soil. Hay should be protected from rain and the sun, because exposure of hay to these factors reduces its feed value (rain cause decay and mould, sun reduces some vitamin contents). Livestock may refuse hay of low quality unless they are starved.

The nutritive value of the hay could be variable depending upon

- Species of forage crop: - legume hays are superior to grass hays in their nutritive value.
- Stage of maturity at the time of cutting: - forage quality is highest when the forage crops (grasses and legumes) are in the vegetative stage.
- Drying and storage condition: - poorly dried and stored hay have less nutrient content and poor digestibility.

ii. Silage

Silage is produced by fermenting the sugar in green plant under anaerobic condition. Anaerobic condition is a type of respiration in the absence of oxygen in which sugar is converted into carbon dioxide and organic acids by the anaerobic bacteria. Anaerobic bacteria can respire or generate their energy from sugar without oxygen. During silage making the anaerobic bacteria will convert the simple sugar in the forage into many volatile fatty acids and carbon dioxide. The common volatile acids produced in the silo are acetic acid, propionic acid, and butyric acid. The desired product is reached when enough acids are produced (low pH or high acid which prevents bacteria decomposition) and fermentation stops. Silage can be stored for at least a year.

Silage can be made in silos of various types; the easiest method is to use pit and trench silos which can be built using simple materials. The wall of silo used for silage making must be completely airtight to prevent the forage from putrefying (decay of organic matter by aerobic bacteria).

B. **Crop residues**

Crop residues are becoming increasingly important as sources of roughage in feeding livestock. Animals make better use of crop residues in crop-livestock production systems. Major Field crops produce large quantities of crop residues (*Straws, stovers and haulms*) in addition to grain. These include cereal straws (teff, wheat, barley, maize, sorghum etc.), grain legume haulms (haricot beans, filed peas, chickpeas, lentils, groundnut). *Nutritive value* of crop residues is variable depending upon the species and variety of the crops, time of harvest, handling and storage conditions and other factors.

☞ The feeding value of Crop residues can be improved by:

- Adding energy supplement, protein and minerals, which will give an adequate supply of nutrient
- Supplementation with forage legumes is sustainable way of improving low quality feeds in poor countries
- Grinding or chopping the straw or heating it with steam to increase voluntary intake
- Treatment with chemicals like urea will increase digestibility and nitrogen content, but they are expensive

C. **Cultivated Forages and Pastures**

Cultivated forages and pasture crops are mainly important as cut-and-carry sources of feed and as a supplement to crop residues and natural pastures. The type of cultivated forage crop produced is variable from place to place depending upon the prevailing climate and soil factors. The most common cultivated forage crops include like elephant grass, Rhodes grass, Guinea grass and oats in the highland. Among the herbaceous legumes, the most common ones include desmodiums, vetch, Lucerne, lablab and cowpeas. The most common fodder tree legumes include leucaenas, sesbania, pigeon pea and others. The leguminous forages are important as sources of nitrogen, fermentable organic matter and minerals in crop residues and poor quality natural pasture based diets.

2. Concentrates

Animal feed that contains less than 18% crude fiber are called concentrates. There are two types of concentrates, namely Protein and Energy concentrate feeds

I. Protein concentrates (supplements): are animal feeds that contain 20% or more crude protein. They can be either animal or plant origin.

- ✓ Protein supplements that come from animals are called animal origin protein supplement. Some of the common animal proteins are meat meal, fish meal, meat & bone meal, milk, blood meal. Most animal proteins contain more than 47% crude protein with essential amino acids.

- ✓ Some common plant proteins are: soybean meal, cotton seed meal, linseed meal, noug meal, peanut oil meal, brewers dried grain, etc. most plant proteins contain less than 47% crude protein.

II. Energy Feeds: are concentrate feeds *with less than 20% crud protein*. Most grains and *grain by-products such as wheat, corn, oats, barley, different grain bran, etc.* are energy feeds. Corn is the most widely used energy feed.

Agro-Industrial by-products

Agro-Industrial By-products are the by-products of the primary processing of crops, including bran and related by-products of flour mills, oilseed cakes from small and large-scale oil processing plants, brewery by-products and by-products of sugar factory such as molasses. They make up part of concentrate rations. Oilseed cakes serve as protein supplements in concentrate mixtures. They usually supplement other roughage feeds like straw and hay. They are rich either in energy or protein as compared to roughages.

Feed Nutrients

The aim of animal husbandry production is to transform humanly inedible products such as roughages and agro-industrial by-products to highly desirable and nutritious human food (milk, meat, and egg), wool, manure, hide, skin, power. Thus, Animals to produce optimally need to be supplied with the necessary nutrients in the appropriate proportions and quantity.

A nutrient is defined as a chemical element or compound that aids in the support of life. Nutrients are also being defined as chemical ingredients included in a given feed. They are necessary for cells to live, grow and function properly. Generally, their function can be described as follows

- Providing raw materials for synthesis of body tissue for growth.
- Serve as raw material for production of milk, meat, egg, wool, etc.
- Serve as energy sources for vital body functions as work, movement, production, growth, etc.
- Generating heat for body temperature maintenance.

Animals need many different kinds of nutrients. In addition, they must have the right nutrient in the proper balance. Too much of one nutrient and too low of another may result in unhealthy stock and high feed cost. The lack of one or more nutrient may result in slow production of animals.

Nutrients are divided into five general groups

1. Energy (carbohydrates, fats and oils)
2. Protein
3. Vitamins
4. Minerals
5. Water

These nutrients can be derived from feeds obtained from different sources such as:

- Natural pasture or planted forage
- Crops residues
- By products of crop and animal products processing industries
- Synthesis from non biological materials (e.g Urea)

Water

Water plays a vital role in almost all life processes (digestion, absorption and oxidation). Almost all life processes take place in water solution, which is the universal solvent. It is one of the most vital of all nutrients comprising over 60% of the animal body. The percentage of water in the animal body varies with species, age and condition of the animal. Younger animals have more water proportion in their body than old ones. Normally the proportion of water in the body decreases as the animal matures. Milking animals require relatively more water than dry ones.

Function of water

- Water acts as medium and universal solvent in all life processes i.e., all life processes take place in water solution.
- Being a neutral by itself it regulates the PH of the body

- It is a vehicle for everything in animal body, transporting all nutrients to the cells and wastes away from the cells
- Controls the temperature of the animal's body (body temperature regulation)
- It is also an important component of some products e.g. milk, meat and egg

Water sources for animals

1. Drinking water: drinking water obtained from any sources like river, tape water, etc.
2. Feed moisture: water contained in feeds up to 90 % in succulent feeds (as fresh grass) and 10-15% in dry feeds (hay, straw, grain stem)
3. Metabolic water: water produced as a by- product of feed metabolism. E.g. carbohydrate break down to release energy ($C_6H_{12}O_6 + O_2 \longrightarrow CO_2 + H_2O$ + energy)

2.2.2. Feeding strategy

Strategies for ensuring appropriate nutrition of LS include;

1. Matching LS production systems to available feed resources
   - strategies for increased feed availability is through increasing off take of animals through sale (destocking).
   - increase the amount of feed available to the remaining animals.
   - Feed efficiency can also be increased if older, mature animals are sold leaving younger, growing animals that utilize feed nutrients more efficiently
2. More efficient use of agricultural and industrial by-products as sources of feed

Various means of improving the efficiency of utilization of available feed resources

i. Supplementation

- ☞ LS diets are generally based on fibrous feeds that have low digestibility & are deficient in protein, minerals & vitamins.
- ☞ these characteristics keep intake & productivity low.

- ☞ Provision of appropriate supplementary feedstuff during critical periods of the year is important to enhance productivity or at least avoid body-weight loss. This is especially true for livestock consuming poor-quality pasture and crop residue-based diets.
- ❖ A supplement is a semi-concentrated source of one or more nutrients used to improve the nutritional value of a basal feed

  e.g. protein supplement, mineral supplement
- ❖ Supplementation may be at various levels for different reasons.
- ➢ It may be for survival, maintenance or for production & reproduction.
- ➢ It can be done by providing a complete feed or by giving specific nutrients.
- ➢ It can enable animals to consume more forage, to digest the same quantity of forage more efficiently or to overcome a nutrient deficiency that critically limits performance
- ❖ Grazing stock may sometimes be supplemented with hay or straw for prevention of nutritional disorders (when the pasture is very lush with high moisture or protein content or where there is a danger of bloat in legume-rich swards).

ii. Fodder conservation

- The supply of feed fluctuates in most parts of the tropics
- Any surplus forage should be conserved for use during the dry season (supply is scarce and feed quality is poor.)

Hay & silage-making are two main **forage preservation** methods

- Moreover, browse remains green and high in protein content when pastures become dry.
- Proper & strategic use of these feed resources as supplements during dry periods can help minimize seasonal fluctuation in productivity

3. Encouraging increased intake

2.4. Reproduction and Methods of Genetic Improvement of Farm Animals

2.4.1. Reproduction of Farm Animals

Reproduction is the process of an individual perpetuates (bring about) its own kind. Higher animals especially mammals produce specialized reproductive cells known as female and male gamete. These two gametes unit as a result of sexual intercourse and products the Zygote. The process of fusion of gametes known as fertilization. The sex gametes are haploid where as the Zygote is diploid. The gametes produced in the male and female reproductive organs.

2.4.1.1. The Male Reproduction System

The anatomy of the male reproductive system consists of the following

a. Testis
b. Epidydimis
c. Vas(ductus) deferens
d. Urethra
e. Accessory reproductive organs and
f. The copulatory organ (penis)

a. Testis

Testis is an organ of production which produces spermatozoa and reproductive hormones. Testis together with the Epidydimis is enclosed by the scortum. The scortum gives size, shape and location for testis. The scortum is composed of externally skin, fibro- elastic tissue and cremaster muscle.This muscle retracts (pulls) the tests up against the external inguinal ring, particular in cold weather. The temperature of the scrotum is 4-5^{o}c below the body temperature. This helps for storage of spermatozoa. In cold temperature the cremaster muscles under the skin of the scrotum contract and pull the testes closer to the warm body.

Failure of the tests to descend from the body to scrotum is known as *cryptorchidism*. This condition affects production of sperm and the bull becomes sterile. If only one testis descends

spermatozoa production will be reduced by half. But fertility is still normal. Such type of bulls must be culled.

b. Epididymis

It is along coiled tubule that connects vas efferent to vas deferens. It consists of head, body and tail (storage area). The epididymis provides spermatozoa nutrition, storage, area of maturation and transportation**.**

c. **Vas Deferens**

It is a muscular tube that extends from tail of epididymis through angular ring (canal) in spermatic cord and separates in to two tubes in abdominal cavity which converges near urethra and enters in to the cranial portion of pelvic urethra by forming enlarged glandular terminal end (ampulla).

d. Urethra

It is a common passage for urine and spermatozoa.

e. Accessory sex Glands

Accessory glands secret most of the seminal plasma which is important in transportation of spermatozoa and stimulate sperm motility by providing fructose. All activities of the accessory glands are controlled by testosterone hormone. Accessory sex glands produce a fluid. This fluid and the sperms make up what is called the semen.

1. ***Seminal vesicles (vascular gland*)**: - They secrete a clear fluid that adds volume, nutrient and buffer to the semen. The secretion contains high level of fructose and citric acid. The seminal fluids also provide an energy source for sperm and help neutralize the natural acidity of the vagina.
2. ***Prostate gland*:** It secretes alkaline solution and adds its secretion at the time of ejaculation. The secretion gives specific odour to the semen.
3. ***Bulbourethral glands (cowper's glands)*: -** it secret mucus like material which is alkaline fluids in to the urethra to neutralize the acidity of any remaining urine.

f. Penis

Penis is a copulatory organ of male which is composed of connective tissue and cavernous tissue (erectile tissue) and encloses the extra pelvic part of the urethra.

Puberty (sexual maturity): - is the period during which the reproductive organ first becomes functional. It is characterized by the development of secondary sexual characteristic in both females and male animals (viable ovum, spermatozoa and sexual desire development). The female experiences her first estrus cycle at puberty.

The age of puberty varies in different species of animals and also there is a great variation with in single spices depending on

- climatic condition,
- mode of nutrition,
- heredity (individual genetic)
- management factor and health of the animals

Approximate average age of puberty

Species	**Male**	**Female**
Cattle	6-9 months	8-14 months
Sheep	6-8 months	7-8 months
Horse	18-24 months	15-24 months
Swine	5-8 months	5-8 months

Hormones of male reproduction

FSH (Follicular stimulating hormone): - its function is stimulation of spermatogenesis.

LH (Luteinizing hormone (ICSH) interstitial cell stimulating hormone) as the name indicates this hormone stimulates interstitial cell (Leydig cells*)* to produce testosterone. The release of FSH and LH is controlled by gonadotropin-releasing hormone (GnRH) from the hypothalamus. They are produced by the anterior pituitary gland and are chiefly responsible for stimulating spermatogenesis and testosterone secretion. Testosterone is produced by interstitial cell in the tests and small amount of testosterone produced by the adrenal cortex, female ovaries and placenta. Its function includes

- Promotes development and function of accessory sex glands.
- It aids in the development of secondary sexual characteristics (horn, thick muscle, sexual desire, the ability to copulate)
- It controls the secretion of LH.

- It increases protein metabolism which aids in body building (testosterone with muscularizing effect known as Androgen)
- It aids the completion of spermatogenesis process

2.4.1.2. Female Reproductive Systems

The reproductive anatomy and physiology of the female is far more complex than that of the male, since after fertilization they also nourish, carry and protect the developing embryo. Then their mammary glands produce milk to nurse the new born after it is born. The female reproductive organ consists of ovary and tubular reproductive tracts.

a. **Ovaries:** - are paired glands that produce the female germ cell (ova) and female sex hormones. They are located caudal to the kidney suspended from the dorsal wall of the abdomen by a ligament. They are oval shaped in most species of animals.After the ovum is released (ovulation) from the matured ovarian follicle, the follicle collapses and filled with blood. This latter develops in to *corpus luteum*, which produces a female sex hormone known as *progesterone.* However, if the egg is not fertilized the corpus luteum develops into scar tissue (regress it (go back).

b. **Tubular Reproductive Organs**

1. **Oviducts** (fallopian tube/ uterine tube): - is paired twisted muscular tube that extends from each ovary to the horns of the uterus. Anatomically the oviduct consists of **three regions**
   (segments)

Infundibulum is a proximal funnel shaped structure which surrounds the ovary during ovulation. It receives the ova from the ovary and transports the ova to middle of the oviduct.

Ampulla is the middle portion of the oviduct. It is the site of fertilization

Isthmus *is the distal portion of the oviduct which joins the uterine horn.*

Generally, oviduct transport ovum and Zygote to uterine horn and transport sperm towards ovum. The movement is achieved by the contract of smooth muscles in the oviduct and the oviduct is suspended by the part of broad ligament.

2. **Uterus: -** is a "Y" shaped hallow muscular organ which continuous with the oviduct cranially and open into the vagina caudally, it has three parts (Two horns, Body and Neck or Cervix)

Structurally the uterus consists of three layers.

a. *Endometrium* (mucosa): - is the inner layer which is made from glandular cells except in ruminant where the caruncles are located. Caruncles are non glandular mushroom like projection serves as part of placental attachment in ruminant animals during pregnancy period.
b. Myometrium is the middle muscular layer of uterus
c. Perymetrium is the most outer layer

Cervix – is a thick walled cylindrical tube functioning as sphincter at the caudal part of the uterus. It has 3-5 internal folds which is difficult to open in the normal circumstance except during parturition and estrus.

3. **Vagina**: is a muscular membranous tub locate within the pelvic cavity between the uterus cranially and the vulva caudally. It is highly elastic.
4. **Vulva:** is the external part of the female gentalia, which extends from the vagina to the exterior
5. **Clitoris**: - is an erectile tissue which is located in the ventral part of the vulva .it has similar embryonic origin as the penis in the male.

Female Reproductive Hormones

The reproductive cycle and pregnancy are controlled by hormones, principally estrogen, progesterone, FSH, LS, prolactin and GnRH (stimulates the ovaries to produce estrogen).

- ☞ ***Estrogens***: - is produced by the ovarian follicle especially granulosa cells of the follicle. Its function includes regulation of the female secondary sexual characteristics and it has uterotonic effect.
- ☞ **Progesterone*: -*** is produced by corpusluteum and placenta

Its function includes

- Prepares the uterus for acceptance of a fertilized ovum or embryo.
- It maintains pregnancy by inhibiting uterine motility.

- It stimulates uterine glands to secrete uterine milk (feed of Fetus) and stimulate their development
- It prepares the mammary gland for lactation

N.B. during parturition the progesterone level suddenly drops, this results in the rise of estrogen level which sensitize the myometrium.

Gonadotropin hormones: - (FSH, LH and Prolactin/Lactogenic) they are produced in the anterior lob of pituitary gland. Their functions are

- **FSH-** Stimulates ovarian follicle development
- **LH**- stimulates ovulation and luteunization (corpus luteum formation)
- **Prolactin**- maintain corpus luteum lactation (production of milk)
- **Relaxin**: - is produced by corpus luteum. Its function is stimulating dilation of cervix and pulvic ligament during parturition.
- **Oxytocin** is produced by posterior pituitary gland. Its function includes stimulating uterine contraction and relaxation during parturition and contraction of the mammary gland which causes milk letdown.

2.4.1.2.1. Estrous Cycle

It is the interval from the begging off one heat period to the beginning of the next heat period. It has four phases.

- **Proestrus**- is a period of self-preparation for typical estrous. The follicles are become enlarge in size, there is thickness of vaginal wall and uterine vascularity increases (new blood vessels are formed)
- **Estrous** – is a period of heat which is characterized by rapture of ovarian follicles (ovulation) in most farm animals. Signs of estrous include mounting of other animals, swellown vulva, hyperemia of the vagina cavity and ready to accept the male and others.
- **Metestrus** is the period of corpus luteum development and preparation of uterine wall to accept the zygot.

- **Diestrus** is a short period of inactivity before the next proestrous period during the breeding seasons of polyestrous animals. (Cow, Sow, Ewe, Women)

If the cycle is no continued the diestrus phase replaced by another alternative. The alternative includes. Pregnancy if the ovum is fertilized by spermatozoa after measures pregnancy follows.

Estrous cycle of different specious of animals & duration of estrus

Cow	21 days …….	14 -18 hours
Mare	21 days …….	5 day
Ewe	17 days …….	3-84 hour

2.4.1.2.2. Heat Detection

The most suitable method of heat detection will depend on the production system. If cows are continuously tired, there are no opportunities for them to manifest interactive sexual behavior. In such systems cows should be checked at least three times per day. Sometimes the only signs visible may be swelling of the vulva and a discharge of clear mucus.

The main signs of estrus are:

- swelling and reddening of the vulva
- secretion of clear, stringy mucus from the vulva
- relaxation of pelvic ligaments
- restlessness and/or bellowing
- decreased appetite and milk yield
- desire to interact with other animals
- Standing still when mounted by a bull or another cow.

Gestation period – is the period from the time of fertilization to the time of parturition (the expulsion of the Fetus from the uterus).

Gestation period of different animals

Mare	11m (336d)/327-357d/
Cow	9m (282) /273-296D/
Ewe	5m (150d) (140-155d)

Doe	5m (148-156)
Sow	3m 3w63 (114d)
Camel	315-35od dromedary
	333-430 Bacteria
Elephant	615-650 day

2.3.2 Selection and crossbreeding

Genetic improvement of livestock depends on access to genetic variation and effective methods for exploiting this variation.

There are many ways of changing the productivity of livestock these includes:

- Feeding
- Management (including the physical environment)
- Health care
- Animal breeding (genetic improvement)

Genetic improvement thus does not come free of cost but once attained it is genetically there without the need for further effort.

The genetic options that bring about genetic change can be

- Substituting one breed for another
- Crossbreeding
- Inbreeding
- Selection (within a breed or population, e.g. a herd)
- And any combination of these

2.4.2.1. Selection

Selection: - is the process of choosing some individuals in preference to others as the parents of the next generation. It is the basic method used by both nature and by humans to change the attributes of animals.

Natural selection: - it depends up on the genetic difference among the individuals in fitness characters such as disease resistance, libido, mating behaviors and anatomy and physical superiority. It is the survival of the fittest. Only strong and those adapted to the environment can survive and produce large number of offspring.

Artificial selection: - it is a type of selection performed by man. It is the most powerful with which the breeder determines which animal to be reproduced and which to be retained for replacement. Thus, selection acts by allowing selected individuals to be parents of the next generation and contribute more traits to the next generation than other individuals in the same population.

Methods of Artificial selection

1. **Tandem selection:** - here selection is practiced for only one trait at a time until satisfactory improvement is done in this trait. The second trait is considered for the selection and so on. If there is a positive correlation between the first trait selected and any other trait both will improve. If there is negative correlation, progress in one trait is affected by a decrease in another and will invalidate the effect. E.g. Milk yield and fat percentage, heat tolerance and milk yield

Disadvantage: - it is least efficient method and more effort and time consuming. Negative correlation between several economic traits will invalidate the improvement.

2. **Independent culling method:** - selection is practical for two or more traits at a time. For each trait a minimum standard is set. Animal should meet standard for selection. Failure to meet the settled standard for any one trait will disqualify the animal.

   E.g.

Character	Birth wt	Age at first caving	Milk yield	fat %
Minimum standard	30kg	30 month	2000kg/lactation	5%

   Advantage

   a. Selection for **more than two traits** at a time will bring about **simultaneous improvement**.

   b. Animal can be **culled at an early age for failure to meet the minimum standard**, thus ***reduce the cost of maintenance***.

   Disadvantage

a. Animal is culled for failure to meet the minimum standard set for one trait although it is superior in other traits.
b. Animal may be culled at an early age for its failure to meet the minimum standard without giving chance to reveal superiority in later stages of its life.

3. Selection Index*: -* In this method value is separately determined for each of the trait to be selected. And these values of each trait selected are added to give *a* total score for all the traits. However, the value for each of the trait depends upon

a. Relative economic value of the trait
b. Heritability of the traits, higher h^2 more the value
c. Genetic correlation with other important traits

Advantage

a. If animal is slightly deficient in one trait and superior in other trait it will be saved
b. The efficiency of this index selection is more than that of independent culling level.

Disadvantage

a. It is highly complex
b. The genetic parameters (heritability, correlation) and economic values are not constant for all the population and in all the time and depends on many factors thus lead to revise the index.

Basis for selection/the production records

1. **Individual selection (performance test/mass selection): -** selection is based on the performance of individual itself. The phenotype of individual is the sole criteria for estimating his genotype. This is also most commonly used basis for selection in livestock.

Advantage

a. Simple since the characteristics such as milk yield, growth rate, weight gain etc can be directly evaluated from the individual itself.
b. Selection can be made even without the knowledge of the pedigree.
c. Less time consuming compared to progeny testing (son and daughter).
d. It can be used as preliminary selection before progeny testing.

Disadvantage

- ☞ Many of the economically important traits are sex limited and hence expressed in one of these sexes (female). Therefore, selection of males cannot be based on their own performance for the traits (milk yield, egg yield).

2. Pedigree selection

This is a method of selection based on the performance of ancestors. Pedigree information is most useful when no data are available for the individual animals, either because it is too young or because the expression of the trait is sex linked**.**

3. Progeny testing

The assessment of the breeding value of an animal on the basis of the performance of its offspring is known as a progeny test. As in most livestock species males produces many more offspring during their life time than females, progeny tests are usually applied to males. It is particularly valuable method to employ where a trait such as milk production is not measurable in mature animals of both sexes, where the heritability of a trait is low.

4. Selection on the Basis of Collateral Relatives

Collateral relatives are those individuals who are not directly related either as ancestor or progeny. Eg. Full sibs, half sibs. These is most useful

- when family size is large
- when traits are highly inherited
- when there is a close genetic relationship between members of the family
- When the mean generation interval is short. It is, therefore, obviously of more important in selecting for productive traits in poultry than in cattle.

Major traits/characters to be considered for Selection of Breeds

- ☞ Rapid growth rate
- ☞ Feed conversion ratio (efficiency)
- ☞ High resistance to disease and parasites
- ☞ High fertility (reproductive ability)
- ☞ Meat or carcass quality
- ☞ Adoptability and condition of management

➢ 2.4.2.2. Breeding

The aim of breeding is to produce outstanding and improved types of animals which can give better services to man. Selection and system of breeding constitute the only tools available to the breeder for improvement of the animals.

General Objective of Breeding

- ☞ To produce the future progeny of good genotype to make further profit.
- ☞ To bring together the desirable gene combination after selection.
- ☞ To enhance the effect of heterozygosis.
- ☞ To overcome hereditary defects.
- ☞ To form a base for synthesis of new strain/line/breed.

Systemic breeding (mating): It is mating of female animal with male, which are either closely related or distantly related. Common types of systemic breeding include the following:

- **Inbreeding:** mating of closely related individuals such as families. This system results in more homozygous traits.
- Cross breeding: mating of distantly related breeds. They can be two pure breeds. In this system of breeding more heterozygous is expressed.

NB: Mating system alone doesn't change the expected gene frequency. But, if it is used together with selection, it gives successful result.

2.4.2.3. Artificial Insemination (AI)

One of the oldest reproductive technologies applied in animal breeding was AI and it continues to be the most important one even today in many livestock production systems in the temperate as well as in the tropical regions. With AI one ejaculate from a bull can be used to serve 400 to 500 cows and therefore one bull can produce sufficient semen for more than 50,000 cows per year.

Advantage of AI technology

1. For farmers having no access to undergo the costs or hazards of rearing breeding bulls and can have access to a wide range of bulls.
2. Many of the infectious reproductive diseases can also be controlled by the use of AI.

Disadvantages of AI technology:

1. The overhead cost of establishment and maintaining AI centers, equipment personnel and their training is high
2. It requires a good infrastructure such as a network of AI points, semen distribution, field inseminators and,
3. If frozen semen is used, a regular supply of liquid nitrogen is required.
4. The farming community must also be educated in heat detection and timing of service and a reliable system of communication with the AI service should be in place.
5. Transmissions of undetected genetic defects or disease are possible hazards in use of AI.

2.5. Livestock Housing

Objectives

At the end of this chapter students will be able to:

- ✓ Discuss the importance of housing?
- ✓ Describe the type of housing?

2.5.1. Importance of Housing

Environmental condition must be controlled by suitable housing so as to protect animal from severe weather condition. Building and equipments should be designed to meet the basic nutritional and health needs of the animal at the lowest possible cost. This can be done almost entirely with local materials and labors.

☞ **Advantage of adequate housing**

- ✓ Helps to increase milk production by giving comfort and helps to get higher quality milk and milk products in case of dairy.
- ✓ Better health of animals by controlling disease and better care /hygiene and supervision of animal.
- ✓ Better utilization of labor.
- ✓ For better productive and reproductive efficiency.
- ✓ For proper and controlled feeding of animals.
- ✓ To minimize the risk of injury.

- ✓ To control disease and insect attack.
- ✓ To keep the animals from predators
- ✓ To make ease use of manure for farming crops.
- ✓ For the comfort of managers and products management.

2.5.2. Types of Housing

The type of housing constructed depends on climate, geographical, economical and the type of farming, which has impact on the growth, and productivity of the animal.

- ❖ Generally, there are two types of livestock houses namely loose and conventional barn (stanchion type).

A. **Loose housing: -** is the types of housing where by the cows are kept in an open paddock or pasture throughout the day and night except at milking time.

- ✓ The open paddock is provided with shelter along one side under which the animals can retire when it is very hot or cold.
- ✓ A common watering tank is provided and fodder is fed in common managers.
- ✓ Concentrate are fed at the time of milking.

This type of housing system is suitable to most countries except temperate region and heavy rainfall area.

☞ **Advantage of loose housing**

- ✓ It is cheaper to construct.
- ✓ Easy to construct.
- ✓ Flexible in utility (It can be used for fattening or dairy).
- ✓ Feeding and management of stock is easier (common feeding and watering).
- ✓ Animals are more comfortable as they can move about freely.
- ✓ Facilitate easy detection of animals in heat.
- ✓ Animals get optimum exercise which is important for better health and production.

☞ **Disadvantage of loose housing**

- ✓ Difficult to regulate intake of individual animals as feeding trough is in group. So productive and non-productive animals benefited equally.

- ✓ There is also a chance of competition, so that some low yielder over feed.
- ✓ Concentrate feeding can be a problem as animals are fed in milking house. This time, may not be enough for higher producer to consume enough concentrate to meet nutrient requirement.
- ✓ There might be fighting and injury on the body due to competition.
- ✓ Difficult to do record of feed intake of individual animals.

B. **The stanchion type of housing (conventional barn)**

- ✓ This refers to housing in which the cows are confined together in the house and secured at neck by stanchion of neck chain.
- ✓ The cows are fed as well as milked in this barn.
- ✓ Has pens equipped with feed and watering trough and also drainage.
- ✓ The barns are completely roofed and walls with better ventilation.
- ✓ The cows are kept and fed individually using manager.
- ✓ The animals are kept tied the whole day except 2 or 3 hours when they are allowed on the paddock for some exercise, cleaning, washing.

The arrangement of cow shade in conventional barn can be single row or double row based on the number of animals. In double row, the housing can be arranged in tail to tail system or face to face housing system. There are different sections of this housing type.

It should be simple and easily done from the available material.

a. Cattle crush
b. Feeders
c. Waterers
d. Feed stores
e. Offices
f. Isolation pen
g. Calf pens
h. Maternity pens
i. Loading and unloading rump

2.5.2.1. Housing beef cattle

Building and equipments should be designed to meet the basic nutritional and health needs of the animal at the lowest possible cost. This can be done almost entirely with local materials and labours.

☞ **The advantage of beef cattle houses**

- ✓ To create suitable level of environment
- ✓ to control wastage of feed and to provide ample time to be well fed
- ✓ It provides an area for specific handling (to treat sick animals, for diagnostic work).
- ✓ To minimize the risk of injury.
- ✓ To control disease and insect attack.
- ✓ To keep the animals from predators
- ✓ To make ease use of manure for farming crops.
- ✓ For efficient use of labour.

Generally, the house should have rough concrete floor, easy to clean, well ventilated, prevent decomposes, adequate shelter with water supply and feed trough.

2.5.2.2. Housing for Sheep and Goats

Requirement of building units are more or less the same for sheep and goats, except that additional buildings are required for goats kept for milk. Shoats don't require any elaborated buildings. Simple, dry, clean, well drained and with plenty of fresh air sheltered enclosures are all that is needed.

☞ **Houses for different classes of shoats are**

- ✓ General flock shed: - for adult breeding ewes.
- ✓ Shed for ram or buck- individual pen
- ✓ Lambing or kidding sheds: - maternity pens.
- ✓ Lamb or kid shed
- ✓ Sick animals shed (isolation room)
- ✓ Milking room mainly for goats
- ✓ Shearing room-only for sheep for wool production
- ✓ Accessory buildings

CHAPTER THREE CAMEL PRODUCTION

Objectives

At the end of this chapter students will be able to:

- Discuss breeds of camel.
- Discuss importance of camel.
- Describe the peculiar feature of camel.

Camels act as an essential element of human life supporting, over vast dry land areas. This is due to its unique physiological features and it's complementary of resources use with other domestic species. Camel utilizes resources in friendly manner with the ecosystem. In Ethiopian pastoral communities, camel is greater than any material wealthy.

3.1 Breeds of Camel

The genus camelus has two species. The heavily built, two-humped Bactrian camel (camelus bactrianus) which inhabits the deserts of central Asia. The Bactrian camel is very strongly built and copiously covered with long dark brown hair on its humps, neck and shoulders which is essential to Asiatic mountainous terrains which experience extreme low temperature. In the hot summer it sheds its thick hair for a much lighter and shorter covering.

The other species is single-humped Arabian (camelus dromedaries) commonly known as dromedary widespread throughout the Middle East, India and North Africa. Ethiopian camels are all single humped.

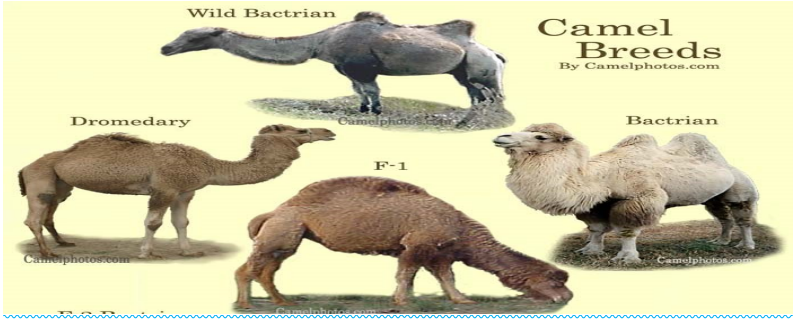


Fig: two common breeds of camel

3.2 Importance of Camel

1. Draught power: - a camel can pull a load equivalent to 40 % of its body weight.
2. Camel serves as means of transport especially in the desert area (salt).
3. Milk is another valuable product obtained from camel. A female may yield about 3-5 liters daily. Camel milk on average consists of 5.1% lactose, 4.8% fat, 3.8%protein and 0.9% ash. The milk composition varies with breed, plain of nutrition, stage of lactation etc. the milk is consumed mostly as liquid milk. It usually gives milk 10 to 18 months since parturition.

4. Camel hide is used for making suitcases.
5. Camel meat is coarse and tough but still is eaten.
6. Camels can halt the desert's advance.

3.3. Anatomical and Physiological characteristics of camel

Nature has provided innumerable special features for camel to make it fit to thrive in desert areas without water for a much longer period than other mammal. Morphological and physiological characteristics, makes camel to have the ability to survive well under *hot, dry and harsh desert conditions.* These includes

1. **Camel has a large body mass:** - it is of an adaptive advantage as it heats up slowly when exposed to sun, as compared to a smaller body mass.
2. **Long limbs help** to keep the body away from the ground and thus decrease the camel of heat load in summer due to reflected radiation from the ground.
3. The **lips are thickened** to enable it to browse on thorny plants. Due to long neck it is possible for the camels to browse upper level plants, usually remains untouched by other ruminants.
4. **Nostrils contain abundance of hairs** which prevents the sand from entering during stormy atmosphere. Furthermore, the camel can close the opening of the nostrils voluntary to prevent entry of sand or dust.
5. **Respiration rates of camels remain low** even at high temperatures. T**hey lose less water through respiration** than a cow, which may breathe twice as fast.
6. **Eye lashes are long and heavy,** which protects the eye from windblown sand.
7. **Camels have usually low metabolic rates.** They can exist on dry food for 2 weeks or more.
8. The camel makes use of fat in the hump on its back as it is filled up mostly with fatty substances.
9. **The rate of urine flow is low** in camel. The kidneys of a camel are very efficient at absorbing water and excreting concentrated urine. Urea is recycled as a source of nitrogen.
10. **In the dry period** when camels are provided with water, it takes in, at one time, as much water as was lost.
11. **The colon has a greater ability to absorb water** resulting less loss of water through faces especially during the scarcity of water period.

☞ **Generally, camel may live to the age of 40 years or more.**

CHAPTER FOUR. SHEEP AND GOAT PRODUCTION

4.1. Origin and domestication of Sheep and Goats

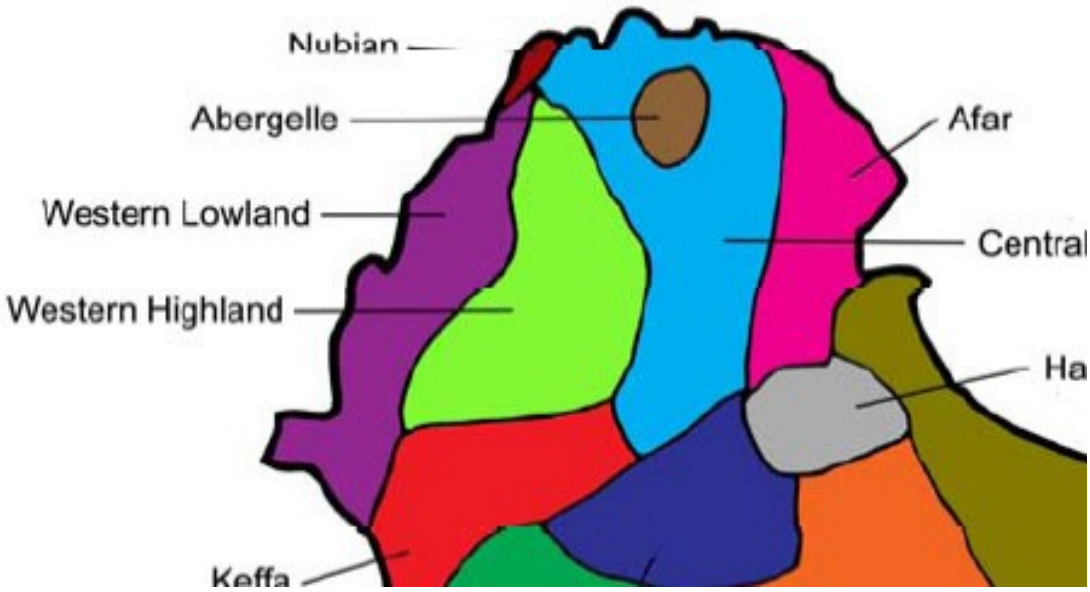
sheep

- Sheep (*Ovis aries*) are believed to have been among the first animals to be domesticated, preceded by the dog and goat.
- It is also believed that most domestication took place in western Asia where the majority of the present day small ruminant breeds likely originated.

Goats

- Goats (*Capra hircus*) are believed to be the second animal domesticated following the dog
- It is also believed that the first goats reached Egypt around 5000 B.C. and then spread south and west throughout Africa
- The ancestors of Ethiopian goats are closely associated with goat types which migrated from the Middle East and North Africa

Gaot Types of Ethiopia and Their Distribution



4.2. Attributes of Sheep and Goat Production

sheep is mainly confined to the near east countries such as Turkey and Iran, and to the southern and central Europe. Asia and Europe together produce 90% of the total milk production from sheep.

Skin Production

Skins are usually by products from meat produced from both sheep and goat. Asian having the greatest number of sheep The major contributions of sheep are in the production of meat, wool, milk and skins. Meat and wool are the two major products of sheep. Economic Importance of Goats, in pastoralist areas, goats are considered very important for households to meet routine cash income needs. They are considered as the most important means of wealth storage for pastoralists. They contribute a lot as a source of meat, milk and skin. The following are the economic importance of sheep production

Meat production

Asia and Africa produce 37 % of the world sheep production. The percentages of sheep meat (mutton and lamb) produced in the tropics and-sub tropics were 34 %.

World production of mutton and lamb, and goat meat (1000 tones, FAO, 1978)

Region	Mutton and lamb	Contribution	Goat meat	Contribution
Africa	651	11.7	425	24.7
N. America	189	3.4	23	1.4
S. America	289	3.7	64	5.2
Asia	1409	25.1	1075	62.5
Europe	1027	18.4	92	5.3
Oceanic	1061	19.0	1	0.1
U.S.SR	960	17.2	40	2.3
World total	**5586**	**100**	**1720**	**100**

Milk Production

The production of milk fromproduces the greatest number of skins in the world. Small ruminants are important livestock resources in Ethiopia providing 35% meat consumption (2.7kg per capita per year) and 14% of milk consumption. Skins are the most important items in the livestock trade, accounts for 12-16% of the total value of exports.

Wool production

Sheep are outstanding in wool production. In some countries such as Australia and New Zealand, sheep are raised primarily for wool production. The bulk of wool production is made in the temperate regions (72%), while the tropics, which are unsuited for this produce in relatively small amounts.

4.3 Criteria for breed classification

GOAT BREEDS

Goat breeds are classified according to: -

origin,

ear shape and length,
function, body size/weight and
height at withers

SHEEP BREEDS

- Various breeds of sheep have been identified in the world
- They are classified based on
  - place of distribution,
  - tail type,
  - coat cover and
  - function/use

4.4. Sheep and goat breeds

There are about **800 breeds of sheep** domesticated in the **world**. The most common types of sheep are

Wool type, Fat ramped, Fat tailed and long **tailed**

4.4.1. Common Sheep breeds in Ethiopia and in the world

Ethiopian Sheep Breeds

Major breeds in Ethiopia include Horo, menz, Adal, Dangila (Washera), Black head Somali. The Horo sheep have a wide distribution in western Ethiopia. The good merit of Horo breeds relative to other Ethiopian breeds is its relative larger size and it's prolifically (number of lambs born twining). They have a high potential for meat production.

As to the feeding behavior, sheep is the most economical of all farm animals in its feed requirements. It is known that sheep has area record of a more efficient utilization of feed than beef cattle. It is also known that sheep eat a wider variety of plant growth, especially in the green stage than cattle. Sheep has several advantages over cattle in the grazing of poor, naturally occurring non-tillable grazing lands.

General Advantage of Sheep Production

The production of sheep has the following advantages over the production of other animals.

- ✓ They have short generation cycles and high reproductive rates which lead to high production efficiency
- ✓ Marketable at 5 to 6 months of age.
- ✓ Every year they provide wool and lamb.
- ✓ Adapted to wider climatic condition areas, where crops cannot be produced.
- ✓ Require less capital and less complicated management knowhow i.e. their production is easily manageable by women and children.
- ✓ Sheep are small enough to be consumed by an average rural family in a day or two, where there is no refrigeration facility.

Limitation of sheep production

- ✓ High mortality rate
- ✓ Sheep are subjected to contacting and they are susceptible to diseases.
- ✓ More subjected to be attack by wild animals.

EXOTIC BREEDS OF SHEEP

AWASSI

- The Awassi is a fat-tailed type of sheep breed
- The breed becomes the highest milk producing breed in the Middle East
- The Awassi is well suited to a grazing production system (natural hardiness and grazing ability) as well as a confinement operation
- The Awassi has a brown face and legs with the fleece varying in color
- The average ewe has single lactations over 300 liters per 210-day lactation and it is uncommon for outstanding females to have 210 day lactations above 750 liters

CORRIEDALE

- ➢ The breed is distributed worldwide and mainly found in the temperate, higher rainfall zones supporting improved pastures
- ➢ The Corriedale was developed in New Zealand & Australia for medium wool and meat production
- ➢ The Corriedale is a dual-purpose sheep and it is the second most significant breed in the world It is large-framed, polled with good carcass quality
- ➢ The Corriedale produces bulky, high- yielding wool ranging from 31.5 to 24.5-micron fiber after Merinos

TEXEL

- ❖ The Texel originated in The Netherlands
- ❖ The breed is characterized by a distinctive short, wide face with a black nose and widely placed, short ears with a nearly horizontal carriage
- ❖ The most outstanding feature of the Texel breed, however, is its remarkable muscle development and leanness
- ❖ The Texel has become the dominant terminal-sire breed in in many countries as production systems have shifted away from primary emphasis on wool to greater emphasis on lamb meat production

DORPER

- ❑ Dorper is recently developed tropical meat bred
- ❑ Dorper is bred in South Africa
- ❑ They have little or no fat on the ramp
- ❑ The dorper is big sheep and has the same coloring as Black head Ogaden, namely a white body and a black head
- ❑ Under favorable conditions ewes can weigh about 60 kg
- ❑ Lambs grow fast and their conformation is good for meat production

- ❑ The dorper is not prolific breed and well adapted to dry conditions, although it does not thrive in extremely arid environments

Goat was domesticated about 9000 years ago. The Bezoar of south west Asia is the main ancestor of most domestic goats.

4.4.2. Common Goats breeds in Ethiopia and in the world

Goat was domesticated about 9000 years ago. The Bezoar of south west Asia is the main ancestor of most domestic goats.

Goat Types and Breeds in Ethiopia

There are over 200 breeds of goats in the worlds. In Ethiopia we have some breeds.

a. **Nubian breed:** - They originated in the *Middle E*ast (Iraq, Syria and Israel) and moved through Egypt to Sudan. In Ethiopia, they distributed in North Gondar. The management systems for Nubian breed are predominantly pastoral. They also kept mainly for milk and meat production.

a. **Afar (Adal, Dunakil) breed**
Adal breeds are the descendent of the rift valley goat thought to have entered to Ethiopia from Yemen and Saudi Arabia. They are distributed in arid and semiarid agro-climatic zones. Free grazing on rangeland areas is the dominant feeding system. They adapted to arid environments, infrequent watering (every 3-4 days) and traveling long distance. Afar goats are extensively milked for food, medicine and sale.

b. **Abergelle breed**
It is the descendent of the rift valley goat type from southwest Asia. They are distributed along the Tekeze River in Southern Tigray, northern Wollo and eastern Gondar. They have good potential in providing milk.

c. **Arsi-Bale breed**
They are part of the Rift valley origin. They are distributed in Arsi and Bale up to an altitude of 4000m. They prefer Woyna dega and Dega agro-climatic zone. They are often hairy. They are extensively milked. Their meat is widely eaten. They are prolific than other goat types in the region.

d. **Woyto-Guji breed**
Origin*:* - derived from the rift valley family of goats.
Distribution: - in North and S. Omo, Southern Sidamo and parts of Wolayta.
Ecological zone*:* - kolla and woyna dega.
The breed is an important milk producer in pastoral areas.

e. **Hararghe Highland breed**
Origins: -most likely drived from the Somali goat type

***Distribution**:* - In the highlands of East and W. Hararghe.
Ecological zone: - moist woyna dega and moist kolla.
Commonly they are **milked for home consumption**. Here goat meat is widely eaten and preferred to sheep meat.

f. **Short-eared Somali breed**
Origins: - They were introduced from Arabia.
Distribution: - Northern and eastern parts of Ogaden and Dire Dawa.
***Agro climatic zones**:* - Dry kolla
They are widely milked and they have social function as prestige.

g. **Long-eared Somali breed**
Origins: - They were introduced from Arabia
Distribution: - Ogaden, low lands of Bale, Borana and southern sidamo
Agroclimatic: - Bereha and dry kolla
They are extensively milked by the Somali and Boran pastoralists.

h. **Central Highland**
***Origins**:* -derived from mixing of different types in the past.
Distribution- central high lands west of rift valley.
***Agro climatic**:* - dega and woyna dega
Goats are extensively milked in Tigray. It is believed to have medicinal value

i. **Western Highland**
***Origin**:* - from past mixing types
***Distribution**:* - Highlands of S.Gondar, Gojjam, Wollega Western Shoa
Agroclimatic*:* -Woyna dega and dega
There is a cultural taboo against goat milk in parts of Gojjam.

j. **Western low land**
Origin*:* -from past mixing types
Distribution*:* -Western low lands bordering Sudan in Gojjam, Wollega and Illubabor.
Milk is used extensively by pastoral and Agro pastoral groups

- ❖ Goats consume wide varieties of feeds and vegetation than either sheep or cattle. By means of their mobile upper lips and very prehensible tongues, goats are able to graze on very short grass and to browse on foliage not normally eaten by other livestock.

Advantage of goats over large ruminants

- ✓ Requirement of low initial investment.
- ✓ Keeping goats is not risky (little purchasing power).
- ✓ Quick maturing with high fertility rate.
- ✓ They have short generation interval.
- ✓ Easy way of income generation.
- ✓ Easier for home consumption.
- ✓ Low cost of feeding, health and management.

- ✓ Goats are more effective at grazing selectively
- ✓ The efficiency of converting feed into milk is higher in goats than in other dairy animals

EXOTIC GOAT BREEDS

SAANEN

- ❖ Saanen is totally white colored large goat originally bred for milk production
- ❖ They are usually hornless. Saanen goats are used around the world as leading milk producers
- ❖ The breed is best known as the Holstein of the goat world, producing a large quantity of milk with somewhat low fat levels
- ❖ Adult female averages 65 kg, adult males 75 kg. Daily yield of milk can reach 3 liters with a butter fat of 3.5 %.

TOGGENBURG

- ❖ This is a chocolate brown or fawn colored goat. It has white markings down the side of the eyes to muzzle, on the ear tips and on the rump and tail
- ❖ Mature males weigh on average 65 kg and females 50 kg
- ❖ Milk yield averages about 1 liter in the tropics
- ❖ They are shorter and lighter than the Saanen

ALPINE

- ❖ Alpine are as tall and strong as the Saanen
- ❖ They are black or rusty-colored with marking similar to Toggenberg, although its conformation is like the Saanen
- ❖ They produce less milk than Saanen or Toggenburg. Daily milk yield is around 1 liter with a 3.6% butterfat
- ❖ Adult males weigh 65 kg, adult females 60 kg

ANGLO-NUBIAN

- ➢ Anglo-Nubian is a breed developed in England by crossing British goats (Does) with Nubian goats (bucks) and Indian origin
- ➢ The Anglo-Nubian goat is named for Nubia, in North Eastern Africa
- ➢ They have heavy arched noses and long, pendulous ears, spiral horns (when horns are present), and short hair
- ➢ The Anglo Nubian is an all-purpose goat, useful for meat, milk and hides production
- ➢ It is not a heavy milk producer (produces 0.8-1.2 liters) but has a high to average butter fat content (4.5 %)

ANGORA

- ✓ The Angora goat originated in the district of Angora in Asia Minor
- ✓ The Angora goat is a small animal as compared to sheep, common goats, or milk goats and both sexes are horned

- ✓ The ears are heavy and drooping
- ✓ The mohair is very similar to wool in chemical composition but differs from wool in that it is has a much smoother surface and very thin, smooth scale
- ✓ Consequently, mohair lacks the felting properties of wool
- ✓ Mohair is very similar to coarse wool in the size of fiber

Ethiopian Goat Breeds and Their Characteristics

- ❖ According to recent estimates, the goat population in Ethiopia is about 23.3 million
- ❖ A large proportion is found in the lowlands of the country, raised in large flocks by pastoralists
- ❖ Nearly 10 million goats (42% of the total) are found in the highlands.
- ❖ There are three major families of goats in Ethiopia
- ❖ They are: -
- ➢ the Somali family (Short-eared Somali, Long-eared Somali and Hararghe Highland),
- ➢ the smaller Rift Valley family (Abergelle, Worre, Afar, Arsi-Bale and Woyto-Guji) and
- ➢ the more heterogeneous Small East African family (West Highland, Keffa, Central Highland and West Lowland)

CHAPTER FIVE: POULTRY PRODUCTION

Objectives

At the end of this chapter students will be able to:

- ☞ List the role poultry production?
- ☞ Discuss poultry production system?
- ☞ Describe poultry breeds of exotic and indigenous breeds?

Most village chicken production systems in Africa are based on the indigenous or native domestic fowl (Gallus domesticus) and are characterized by a low level of inputs and output. The main input is the feed from household refuse as well as that scavenged around the village. Provision of other inputs such as housing, additional feed and health care vary greatly between and within countries, depending on the farmer's or household's socio-economic circumstances. With such low inputs, the village chicken is capable of generating cheap and readily harvestable meat and eggs for immediate home consumption and sale for income generation. In some community's small livestock, particularly village chickens, are important in breaking the vicious/cruel circle of poverty, malnutrition and disease.

The management of village chickens is complicated by the presence of multi-age groups in the same flock. High chick losses have been attributed to poor feeding, housing and health control practices. Predation is also a major cause of high chick losses, because the young stocks are more vulnerable. This management problem also leads to the failure or poor performance of health control programs. Feeding and health improvement programs will only be successful if this situation is given due consideration to ensure that the different age groups are covered.

5.1. The Role of Poultry production

1. **Supply of nutritive food**: - it is evident from the composition of egg and poultry meat. Its protein contain essential amino acids hence supplies protective food to human beings.
2. **It can be start with little initial investment**. i. e. it requires
    - Low cost to purchase the animal.
    - Low cost to purchase the feed.
    - Space requirement is also low.

3. **Stock number can easily be increased** due to fast reproductive rate which is because of high prolificacy and short lifecycle which makes them very important.
4. **Provides more food at low cost.** Eg. 1kg BW of broiler is obtained from 2 kg feed.
5. Better feed conversion efficiency.
6. Poultry meat has no religious and /or culture restriction.
7. Provides quick return eg. Broiler of 1kg can be easily obtained in 4 weeks.
8. Income in poultry farming is round the year.
9. Expansion of poultry enterprise is easy.
10. Provides self-employment to unemployed educated youth.
11. Utilization of all type of labor (retired persons, women, and children) is possible.
12. Provides good organic manure.
13. Provide poultry litter as feed for ruminants.
14. Poultry enterprises require relatively less space, capital and labor.

5.2. Poultry Production System

There are three poultry management systems, which are differentiated on the basis of flock sizes and input-output relationships. These are

a. Extensive System of Production
b. Semi-Intensive System of Production; and
c. Intensive System of Production

a. Extensive System of Production

Here the birds are allowed to run free in large or unlimited area of land. It is a traditional system in which the chicks experience natural condition.

The extensive production systems have the following unique characteristics.

1. They are not high producing; egg production is about 30 – 60 egg /year/ bird;
2. Chicken kept are small in number,
3. Not provided water, feed and health care properly.
4. Raise chickens with mixed age, breed and sex.
5. They are not specialized and market oriented, but only produced as subsistent.

Advantage of this production system

1. It requires low input or low production cost.
2. Birds require less management

Disadvantage

1. Very low in production of both egg and meat.
2. It is low quality production /spoil rapidly/.

3. Chickens are small in size, they are bony and the meat is not tender.
4. Product loss is often high.
5. High mortality rate and disease transmission is also high.
6. Loss of birds due to predators is high.

b. Semi-Intensive System of Poultry Production.

- ☞ It is a system where by chickens wonder within enclosure during day time and is shed up at night in a house. They are provided with feed and water. The birds are restricted to certain amount of land. In this production system, the quality and production performance of chicken is better than the extensive system of production.

c. Intensive Production System

- ☞ This is a system in which chickens are totally confined in a house and do not run outside at all. All things required for them are provided in the house. The chickens are high in production due to provision of balanced food, appropriate shelter, proper health care and other necessary management aspects, which reduce loss from predator and diseases.

Major Characteristics of the System

- ✓ High production of good quality eggs and tender or soft meat.
- ✓ Large flock size is kept.
- ✓ Chickens are kept separately based on their age.
- ✓ Loss due to predator and disease is minimum.
- ✓ The operation is specialized and market oriented.
- ✓ The cost of investment is high.

5.3. Poultry Breeds

The word breed denotes an established group of birds, which have the same general body shape, weight and some common characteristics such as origin and color.

<u>Exotic breeds introduced to Ethiopia</u>

a) **White leg horn**

- Varieties: - single comb dark brown, single comb light brown and Rose comb types.
- Skin color: - yellow
- Egg shell color: - white
- Use: - egg type chicken and light in weight
- Origin: - from the city of leghorn, Italy where they considered to be originated

b) **Ply Mouth Rock**

- Have different varieties
- Medium in standard weight
- Skin color: - yellow

- Egg shell color brown
- Use meat and eggs
- Origin: - America

Characteristics

They are docile, normally show broodiness.

c) **Rhode Island Red**

- Varieties: - Single comb, Rose comb
- Skin color: - Yellow
- Egg shell color: - Brown
- Use: - A dual purpose medium heavy fowl
- Origin: - England

Characteristics

- Good choice for the small flock owner.
- They handle marginal diets and poor housing conditions than other breeds.

Performance of Poultry in Ethiopia

The different breed types of poultry in Ethiopia are Tukur, Melata, kei, Gebsima and Netch. There characteristics in terms of body weight, egg production, egg weight, fertility and hatchability for each breeds are provided below.

Local Chicken Breeds of Ethiopia.

Traits	Tukur	Melath	kei	Gebsima	Netch
24 wk body wt (g)	960	1000	940	950	1180
Age at 1st egg (day)	173	204	166	230	217
Eggs /bird/ yr	64	82	54	58	64
Egg wt (g)	44	49	45	44	47
Fertility (%)	56	60	57	53	56
Hatchability (%)	42	42	44	39	39

Annual egg production from local birds in Ethiopia ranges from 54 – 82 eggs. The local birds have slow growth rate. Male birds weight not more than 1.5 kg. Chick mortality is high. Indigenous village birds in Ethiopia attain sexual maturity at an average age seven months (214 days).

Major Constraints of Poultry Production in Ethiopia

1. Low genetic potential of the birds
    - Low weight
    - Low meat and egg production
    - Slow growth
    - Low feed conversation efficiency and broodiness character.
2. Disease and inadequate health care.

3. Low level of Technology. There are no hatcheries and equipments of watering and feeding.
4. Lack of formulated ration.
5. Limited use of poultry products in the diet.
6. Inadequate capital
7. No market regulations
8. Poor handling of the product

5.4. Poultry production and management

5.4.1. Incubation

There are two methods of incubation

a) Natural method: are a regular incubation practice /method under scavenging system of poultry keeping.

In this method, eggs are incubated with the help of broody hens.

Selection of the best brooding hen

A broody hen used for incubating should be

- ✓ healthy
- ✓ show specific broody characteristics (i.e. be good sitter)
- ✓ They should not be too small (i.e. it should have good body size).
- ✓ be able to collect as many eggs as possible in her nest.
- ✓ Have good amount of feather.

Optional number of eggs to be kept under the brooding hen.

The size of the hen, the size of the egg and the state of the weather decide the number of eggs to be placed under her. Birds which have good size & feathers can incubate & hatched about 14 eggs under favorable conditions. The right time of incubation or the best time to set a hen is at night because at this time she is more likely to settle down to her job.

b) *Artificial Methods of Incubation; -* is a method that used to incubate and hatch out a larger number of eggs without a broody hen by artificial incubator.

Types of incubator

All of the incubators exists in two forms namely as

a. Flat type incubators and
b. Cabinet (forced air) type incubator

The most important requirement for artificial hatching is that the incubator should be clean and disinfected.

Eggs serve for hatching purpose should have proper size. The size of eggs depends up on breed and strains of chicken. *Medium size eggs* are preferred over too small or too large for hatching purposes. The size of medium egg varies from 50-60 gm average 56.7 gm. Small size eggs hatch earlier and the chickens subject to stress as the result they may not grow well. The shape of hatching eggs should be oval. Moreover, avoid mis-shaped which reduced hatchability.

The eggs that selected for hatching purposes must be fertilized. On average, one cock is needed for every 10 hens for high fertility. Hatching eggs should not be stored for more than seven days. The temperature and the R. humidity during storage should be 10-20^{0}c and on average 75%).

Position and Turning of Eggs in the Incubator.

Normally, hatching eggs store and incubate in the small- end down position. For the 1st days of incubation, egg should be turned at least twice a day starting from 24 hours after setting for about 17 days. On 18th day, on wards there should not be any turning. However, modern incubators turn eggs in every hour at 45^o as it

1. Prevent embryo from sticking to one side of the shell.
2. Helps for equal distribution of heat or temperature.
3. To avoid malformed chicks & reduce possibility of embryo mortality.

The physical conditions like desired level of Temperature, Humidity, Ventilation and Frequent Turning of Eggs are essential for proper incubation. The eggs maintained at a Temperature and Relative humidity of 37.5^{0}c- 37.8^{0}c and 50-65% in the first 18 days of incubation and 36.1^{0}c-37.8^{0}c and 75- 80% for the last three days in hatching unit respectively. Hence, the hatchability of eggs affected by Temperature, Relative humidity, ventilation, turning, position and storage condition of eggs and quality of eggs.

In 18-21 days of incubation the embryo developed well so, it produces its own heat therefore we have to reduce the Temperature of the incubator. However, in 0-18 days of incubation the embryo has not that much developed that is why it is necessary to increase the temperature in 18 days of incubation.

5.4.2. Managing Young and Growing Chicks

Brooding period: is the period of growth, during which supplementary heat is provided for the chicks. It is a period where young chicks require a lot of care such as provision of heat, ventilation, feed, water and health care etc. It ranges from day old up to four weeks in tropic (or from day old up to eight weeks in temperate areas).

Method of brooding

There are two types of brooding methods

a) ***Natural brooding:*** means the taking care of chicks (supplementation) of heat by the hen. A good mother brood about 12-15 chicks or twice more number than the eggs incubated by herself, even if the number of chicks to be brood depend upon.
    a) The size of the hen
    b) Weather condition
    c) The feather covers of the birds.

b) ***Artificial brooding: -*** is taking care of chicks by the use of special appliances or instrument that supply heat, which is called foster mother.

Based on the heat sources available there are different kinds of artificial brooder like: Kerosene brooder, Electric brooder, Hay – box brooder, Charcoal brooder, Battery brooder

The necessary condition for successful brooding is Temperature.

Young chicks must be exposed to a relatively higher temperature to assist its development. The optimum Temperature of brooding 35-32^{0}c during 1st week and then reduced by 2-3^{0}c each week until the ambient temperature is attained at 20 ^{0}c.

Heating guidelines

Age (weeks)	required ambient temperature
0-1	35-32^{0}c
1-2	32-29^{0}c
2-3	29-26^{0}c
3-4	26-23^{0}c
4-5	23-20^{0}c

The best guide of the temperature requirement of the chicks is the state of the chicks.

a. When chicks are crowded together near the heat source this shows the surrounding temperature is too cool so it is necessary to increase the heat source of the brooder or to add another brooder.
b. When chicks move further from heat source it is an indication of excessive heat supply of the brooder.
c. If the chicks are evenly distributed from heat source, this indicates the adequate heat supply of the brooder.
d. If the chicks huddled together to one side of the brood guard, this indicates a draft (force) of heat in one side only.

Importance of Ventilation.

- To supply fresh air (O_2) to chicks
- To remove CO_2 & ammonia, which cause respiratory problem.

5.4.3. Managing Layers and Broilers

Managing layers

Lighting: - If the day length is increased by using artificial lighting, laying hens are encouraged to lay more eggs. However, day length must not be increased during the growing period of the young chicks until just before they start laying. So, it is important to have 14 to 16 lights in layers' house. But, if we do not do so, egg production will decrease due to the shorter day length.
Debeaking*:* - is the cutting of the points of the beaks. It can be done at any age of the bird except during the laying phase because if it is done at this time, the egg production decreases due to stress.
Health care*:* - To avoid disease outbreak in the area. Vaccinate the chickens at the right time. General sanitary measure is the best to prevent disease outbreak and transmission.
Culling: is removing unproductive hens and sick chicken from the flock during production period.

Advantages of culling

- High level of egg production can be maintained.
- Extra cost of feeding for unproductive birds and unhealthy birds is minimized.
- More space provided for the remaining birds.
- Incidence of disease will be reduced.

Equipments and Materials in Layers Houses

1. Feeder and waterier
2. Laying nest: is very important equipment in layer house.
   - Should be relatively dark because birds do not want to lay in light place.
   - It can be made from sheet metal, wood, wire mesh, clay, mud, e.t.c
   - It should be place in laying house at least two weeks before the onset of egg laying. The reason is to accustom the bird to use the nest. There are at least two types of nests. A. Individual nest and B. Community nest
3. Perch: - It can be made from wood or metal
4. Egg collection basket
5. Drooping boards
6. Weighing scales of feeds and the birds

Managing of Broilers

Broiler: - is a young chicken of either sex below 8 to 10 weeks of weighing 1.5 to 2.0 kg body weight, with a tender meat soft, pliable smooth textured and flexible breast.

Environmental Requirements of Broilers

Broiler housing

The broiler house should be located in such a way

i. to take advantage of prevailing wind for ventilation and sun for light
ii. on sloppy area to permit good water drainage away from building
iii. Should be readily accessible to power, water supply and sewage.

Ventilation

The main function of ventilation is to maintain co_2 at low level, to remove ammonia from the house and to maintain required temperature. Air movement requirements are best determined by observing birds comfort, litter condition and odor build up.

Litter using of dry, fresh and clean litter with a depth of 5-7cm is necessary during broiler production.

Debeaking: means cutting of the points of the beaks. In addition to preventing cannibalism, debeaking usually minimize mash feed wastage. It can be at any time of age except during egg laying phase. But it is important to debeak at day old to prevent from cause of much stress.

Culling: The main purpose is to make the flock profitable because unhealthy and non-productive birds are removed by culling.

Manipulating factors towards getting profitable average daily weight gain and managing broiler breeder are

1. Selection of breeds

Parental broiler flocks consists of a female line and a male line and those which weigh the most are selected at their eight weeks of age for breeding purposes.

2. Feeding

Broiler are usually fed with two types of ration, broiler starter and broiler finisher. The former ration is fed up to 5weeks of age and the later is continued till the age of marketing. The starter ration contains more protein (21-22% cp) and less metabolisable energy than finisher ration having 19-20% protein and more energy.

3. Lighting

Advantages of light

-Encourage birds to consume more food and therefore they grow faster.

-will encourage activity and increase metabolic rate.

4. Effect of Temperature in Weight Gain

The ideal temperature for broilers in the post brooding period is within the range $20\text{-}25^0$c. Research suggests that each degree of deviation from the optimum may results in a reduction of body weight at eight weeks of about 20g per bird. Each degree rise in temperature is probably associated with a depression in cumulative food intake of about 50g per bird. thus, Care must be taken with respect to heat stress in the tropics because broiler breeders are more susceptible to heat stress than birds of laying strains.

5. Disease control

A similar control program is advocated as for laying chickens. The birds should be vaccinated against

Marek's disease at day old, for Newcastle disease at four to six days and 2^{nd} vaccination should be given at forty days of age and also for Infectious bronchitis at twenty-one to twenty-eight days.

Broiler Breeders: are laying hens that have been bred especially for the production of chicks that will be fattened as broilers.

Characteristics of Broiler Breeders

- they have rapid growth rate, are efficient in food conversion, are much heavier than the birds used for egg production, but produce fewer eggs as compared layers (egg laying birds)

- Continuous assessment = 50%
  - ✓ Quiz = 10 %
  - ✓ Tests = 20% (Two time 10 in each)
  - ✓ Assignment and presentations = 20 % (out of 10 in each)
- Final exam = 50%

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