RUMINANT FARMING

ANHRF302

Perform ruminant farming

Competence

Credits: 6

Learning hours: 60

Sector: Agriculture and Food processing

Sub-sector: Animal Health

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Purpose statement

This core module provides the skills, knowledge and attitude for a learner to be competent in a range of routine tasks and activities that require the application of practical skills in a defined context of:

- Ruminant breeds description
- Ruminant shelters site and material description
- Ruminant shelter design
- Ruminant reproduction management
- Ruminant feeding

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Learning Unit 1 – Identify ruminant breeds

LO 1.1 – Identify cattle breeds

Introduction

Ruminants are characterized by their "four" stomachs and "cud-chewing" behavior. The cud is a food bolus that has been regurgitated. There are about 150 different ruminant species including cows, goats, deer, buffalo, bison, giraffe, moose, and elk. Ruminant species can further be classified as grazers, browsers, or intermediates. Grazers, such as sheep, cattle, and buffalo consume mostly lower quality grasses while browsers such as moose and mule deer stay in the woods and eat highly nutritious twigs and shrubs. Intermediates, such as goats and white-tailed deer have nutritional requirements midway between grazers and browsers.

The primary difference between ruminants and simple-stomached animals, like people, dogs or pigs, is the presence of a four-compartment stomach that includes the rumen, reticulum, omasum, and abomasum. Often, it is said that ruminants have "four" stomachs. Horses are also not ruminants; however they have a "cecum" that performs a similar function as the cow or sheep's rumen.

- Content/Topic 1: Main characteristics of Boss Taurus

The *Boss taurus* are characterized by:

- ✓ Absence of hump;
- ✓ Absence / presence of short and small horns;
- ✓ Less resistance to tropical conditions;
- ✓ Less resistance to tropical diseases and parasites; Less resistance to poor diet;
- ✓ Less resistance to shortage of water;
- ✓ High yield of production: meat and milk;
- ✓ Require high management;
- ✓ Dewlap and navel flap lacking;
- ✓ Have short legs except the dairy breeds

A. Friesian /Holstein

- **Origin:** Originally bred in North Holland

- **Phenotypic characteristics:**
  - ✓ The primary color pattern of this breed is black and white
  - ✓ The head is long ,narrow and straight with straight thighs and slightly rounded shoulders
  - ✓ The cows are docile and quiet but bulls may be vicious
  - ✓ They are excellent grazers and have large feeding capacity and udder



Figure 1 : Female Friesian and male Friesian

- **Genotypic characteristics**

Holsteins are most quickly recognized by their distinctive color markings and outstanding milk production. Average production for all Holsteins enrolled in official U.S. production-testing programs in 1987 was 17,408 pounds of milk 286 kg of butterfat and 249 kg of protein per year

B. <u>Jersey</u>

- **Origin:** Jersey breed is originated on the Islands in the English Channel
- **Phenotypic characteristics:**
  - ✓ A small fine-skinned hardy animal.
  - ✓ Its color is various shades of fawn and white; normally has black ring around the eyes.
  - ✓ Bulls can be blackish in color.
  - ✓ The average weight of adult is 350-450 kg.



Figure 2 : Jersey cow(female and bull)

- **Genotypic characteristics**

Early maturing and with excellent dairy characteristics. Although the milk yield of breed is not high, (4000l / lactation) the breed is popular all over the world. There are several reasons for this popularity: a high percentage of butterfat in the milk compared to other breeds.

C. <u>Brown Suiss</u>

- **Origin:** A native of Switzerland and it is the oldest of the pure dairy cattle
- **Phenotypic characteristics:** The skin color is pure brown varying from light to dark pigmentation. The nose and tail are black. They have strong legs. The head is short and large. The female may weight 600-700 kg body weight while a male weight from 900-1000 kg body weight.



Figure 3 : Brown Suiss cows

- **Genotypic characteristics:**
  - ✓ It is a dairy and meaty breed.
  - ✓ The milk production can reach 5000 kg / lactation of 300 days the milk of this breed has high protein rate.

- ✓ It has resistance to the heat to the cold and food shortage
- ✓ It can well survive on high altitude of more than 4000 meters

- Content/Topic 2: Main characteristics of Boss indicus (zebus)

The characteristics of *Boss indicus* are:

- ✓ A prominent hump*;*
- ✓ A large surface area per unit of body weight, due to a well-developed dewlap, hump and large ears; this enables them to lose heat quickly;
- ✓ Superior adaptation to high temperatures and intense solar radiation;
- ✓ Late maturity and rather low fertility;
- ✓ Ability to live on poor quality fodder;
- ✓ Greater stress-tolerance to shortage of water;
- ✓ Resistance to tropical diseases and parasites;
- ✓ Long face;
- ✓ Long or short horns;
- ✓ Long legs and developed naval flap.

A. Ankole zebu

- **Origin:** Originate from East Africa as a crossbreed between breeds from Egypt, Ethiopia and Asia. The spread of Ankole cattle covers an area between longitudes 27^{o} and 32^{o} East; and latitudes 3^{o} and 5^{o} North corresponding to the following regions:
  - Uganda in the district of Tori; Kigezi and Ankole
  - Tanzania in the District of Bokula ' kibondo, kasulu and ofipa
  - Republic of Burundi
  - Republic of Rwanda
  - D.R.C: the territoiries of Bunia ; District of Bukavu(kivu) territories of Rutshuru; Uvira and Ouvenga.
  - **Phenotypic characteristics:**
    - ✓ The Ankole cattle are animals of an average to superior stature; with a straight back; a rounded hump which is nevertheless hardly noticeable in the female.
    - ✓ The horns are long and fine but there are varieties without horns or with short horns and others with very developed horns (Inyambo cattles).

- ✓ Uniform colored coats are most frequent mostly being dark-red brown or dark red and sometimes red pie**.**
- ✓ Bulls weigh between 330-500 kg while the cows are 200-410 kg.



Figure 4 : Ankole cow and bull

- **Genotypic characteristics:** Ankole breed produces good quality milk up to 1100 liters per lactation (180 days) and the beef is of relatively good quality. It greatly tolerates heats, parasites and diseases (tick borne diseases), thus can adapt to a wide range of climates

B. <u>Sahiwal zebu</u>

- **Origin**: The Sahiwal is originated from PAKISTAN.
- **Phenotypic characteristics:**
  - ✓ The animal is heavily built short-legged lethargic in appearance with reddish or light brownish- red color; sometimes bearing white markings;
  - ✓ The skin is loose and pliable;
  - ✓ The hair very fine and glossy;
  - ✓ The forehead is large, horns directed towards the back, with medium format;
  - ✓ Its fetlock is very large;
  - ✓ The udder is generally large and pendulous.



Figure 5 : Sahiwal cow and bull

- **Genotypic characteristics**

This is a very good tropical dairy breed. Although it cannot compete with the exotic breeds from the temperature climates as far as milk yield is concerned. A good cow may give 3000-3500 kg per lactation.

C. <u>Brahman</u>

- **Origin**: Is an exotic breed developed in USA using the following breed: Guzerat, Nellone and Nir**.**
- **Phenotypic characteristics:**
  - ✓ The coat color ranges between light grey, red and black. Bulls have darker shoulders, thighs and neck regions. Mature bulls weigh between 720-900 kg while the cows are 440-630 kg.
  - ✓ They have a prominent hump, dewlap and drooping ears.



Figure 6 : Brahman bull (male and female)

- **Genotypic characteristics:**
  - ✓ They have the fast growth rate which makes them good beef cattle;
  - ✓ They are tolerant to excess heat and diseases

LO 1.2 – Identify goat breeds

- <u>Content/Topic 1: Main characteristics of goat breed</u>

There are many breeds of goats recognized over the world but, we are detailing the most important goat breads farmed in Africa especially in Rwanda and east Africa.

A. Local breed

- **Origin:** The local breed is originated from East African.
- **Phenotypic characteristics:**
  - ✓ It is an animal of small size with well-proportioned body whose females are thin and males more stocks.
  - ✓ Its hair is short and fine.
  - ✓ The body weight of males is 25 kg while the female is 22 kg.
  - ✓ The coat color varies from black to white but may be brown mottled.
  - ✓ The horns are small and light while ears are short, pointed and lie horizontally.



Figure 7 : Local breed goat

- **Genotypic characteristics**
  - ✓ It is a meat breed only
  - ✓ It fits into the ecological conditions of the country.

B. Exotic breeds:

B.1. Galla goat

- **Origin :** East Africa
- **Phenotypic characteristics :**
  - ✓ Thin and small goat, completely white, relatively small head with concave profile;
  - ✓ Ears with medium length, little erect and slender;
  - ✓ Long neck;
  - ✓ Long limbs;
  - ✓ Body weight varies between 35-55 kg for buck and between 30 to 45 kg for goat;

- ✓ Horns are relatively short and turned outwards.



Figure 8 : Galla goat

- **Genotypic characteristics**
  - ✓ It has the good aptitude for fattening, thus it meat breed;
  - ✓ This breed is adapted to high temperatures in hot regions.

B.2. Boer

- **Origin :** South Africa. It is a crossbreed of European, Angora and Indian breeds to increase meat size and productivity.
- **Phenotypic characteristics:**
  - ✓ It is white on the body with a brown-red head and white line on the snout, with long ears and hair;
  - ✓ Ears are pendulous;
  - ✓ Have prominent horns;
  - ✓ It is a medium size goat: 50 to 70 kg for female and 80-100 kg for male.



Figure 9 : Boer goat

- **Genotypic characteristics :**
  - ✓ Very prolific breeds' kidding rate of 1.5, 50% twins and 7% triplets.
  - ✓ Mean daily milk is 1.2- 1.8 kg ; with average milk yield over 160 kg / lactation period of 120 days
  - ✓ Butter fat (BF) Content is about 5.6%
  - ✓ Valuable for meat, milk and skin but has been promoted for its meat potential.
  - ✓ This goat is well adapted to tropical conditions but it hardly tolerates too moist air.

B.3. Alpine



Figure 10 : Alpine goats

- **Origin:** Alps in Europe (Swiss breed).
- **Phenotypic characteristics:**
  - ✓ Hair coat varies from short to long;
  - ✓ Color is dark brown to black color with light stripes on either side of the face which are often very distinct;
  - ✓ Many have long horns;

- ✓ Limbs are solids, dry joints and well conformed;
- ✓ The udder is large, well set forward as backwards, retracting well after milking;
- ✓ Teats, separate from udder, are forward facing and substantially parallel;
- ✓ The chest is deep;
- ✓ Basin is wide and gentle slope;
- ✓ Mature body weight is 50-70 kg in female and 80-100 kg in males;
- ✓ Average height range to 75-80 cm.

- **Genotypic characteristics:**
  - ✓ They are imported for its milk production;
  - ✓ Average daily milk yield approximately 0.9-1.3 kg with average of 274 kg over 209 days of lactation period
  - ✓ Butter fat content is 3.6%.
  - ✓ Relatively hard and has adapted fairly well to tropical conditions but does not tolerate too moist air;
  - ✓ It suits both in housing and in pasture or mountain life

LO 1.3 – Identify sheep breeds

There are many distinct breeds of sheep over the world. This section will includes basic information concerning the most common breeds of sheep we are likely to find in Rwanda Countryside along with inclusion of some of our rare breeds.

- Content/Topic 1: Main characteristics of sheep breeds

A. Local breed



Figure 11 : Local sheep breed

- **Origin:** are obtained from the different breeds raised in central Africa.

- **Phenotypic characteristics:**
  - ✓ Small in size, which is a sheep with tail;
  - ✓ Color of its coat varies from black to white and even to brown;
  - ✓ Resistant to ecological condition of Rwanda
  - ✓ Body weight varies between 30-35 kg
  - **Genotypic characteristics:**
    - ✓ It is a sheep raised exclusively for meat production and can accumulate up to 5 kg of fat in the tail;
    - ✓ This sheep is resistant and adapted to a variety of environments ranging from arid to sub-humid areas and from the sea level up to 3,000 m altitude.

B. <u>Exotic breeds</u>

<u>B.1. Mountain white</u>

- **Origin :** French Pyrenees Mountain
- **Phenotypic characteristics:**
  - ✓ This is big and heavy wool sheep, with a slightly miter head and long hanging ears;
  - ✓ White coat color
  - ✓ Hornless



Figure 12 : Mountain white sheep

- **Genotypic characteristics:**
  - ✓ This sheep is wool producer with 4.5 to 5.5 kg annual production for ewe and 6.5 to 7.5 kg for ram;
  - ✓ Resistant to diseases and climatic conditions optimal Tº of 5 to 18ºc) but low tolerant to high humidity air content.

B.2. Mérinos

- **Origin:** Spain but was developed in Australia.
- **Phenotypic characteristics:**
  - ✓ Merino is medium sized sheep, hornless;
  - ✓ Its wool is white all over its body;
  - ✓ The body weight of adult female is about 70 kg and ram from 120 to 140 kg for meaty bread. For dairy breeds, ewe weighs 40-60 kg.



Figure 13 : Mérinos sheep

- **Genotypic characteristics :**
  - ✓ This is a hardy wool sheep yielding 6 kg in ewes and 8 kg in rams;
  - ✓ It is a good diseases resistant;
  - ✓ It is slow maturing with a light narrow body;
  - ✓ It will survive in the harsher, drier areas;
  - ✓ Little tolerant to high air moisture content

Learning Unit 2 – Perform site and materials selection for ruminant shelters

LO 2.1 – Select Site for ruminants shelters

- Content/Topic 1: Characteristics of good site and selection criteria of site for ruminant shelters

A. Characteristic of good site

Easy accessibility to:

- **Main road**: The road for transportation to all inputs and outputs used in farming
- **Feed and Water supply**: feed and Water is vital elements for livestock, reason for why the infrastructures for feed and water supply must be taken into consideration.

B. Selection criteria of site for ruminant shelter

- **Nature of the soil**

The soil type will determine the type of foundations that are necessary, and may also provide materials for walls. The land should be cleared of bushes, rocks and any other obstructions.

Avoid damp areas or near creeks over flowing in rainy reason. The slope of land and drainage should be considered so as to avoid flooded; conversely, it is difficult to construct a building on land that slope too much. The ground should be as permeable as possible to avoid mud and puddles of matter near the buildings. It must be sufficiently strong to ensure proper collection of urine and manure to facilitate cleaning and proper disinfection. It must be resistant to insulation. It should not be slippery to man and animals. It is essential to give the soil a slight slope (1to2 cm/m^2).

- **Temperature**

In tropical regions, the problem is to protect animals against temperature and excessive sunlight. The room temperature depends on the outside temperature of nature, the wall thickness of the material (the insulating wall).The orientation allows buildings protection against too heavy sun stroke, or against the rain and winds

- **Wind direction and air supply**

In choosing the site for building it is necessary to consider the direction of prevailing wind. The back wall should face the wind unless special ventilation is required. It ensures the circulation fresh air in room. The ventilation play important role in thermal regulation. The ventilation can be natural or artificial

- **Humidity**

Generally animals are better suited to a dry atmosphere. Many diseases are favored by the moisture in environment favorable to development to the diseases causing agents

- **Light**

The direction the building will face towards or away from sunlight (the hot rays of the sun should not come into the house) at different times of the day and during different seasons.

C. Environmental and animal welfare considerations

- **Code and regulation:** Animal buildings must respect the local government regulations which often do not allow certain types of buildings to be constructed in certain places.
- **Ventilation:** Ample air movement without a draft is essential. Fresh air brings in oxygen while excess moisture, ammonia or carbon dioxide are removed the stale air moves out of the house. For small coops windows or vents on one side of the house usually provide plenty of ventilation. Well-ventilated houses must also have plenty of insulation and a good vapor barrier. Failure to insulate or ventilate properly causes moisture to accumulate on the walls and ceiling in cool weather.

The necessary ventilation of livestock buildings can be realised by:

- ✓ Using forced ventilation,
- ✓ Natural ventilation or
- ✓ The combination of both kinds of ventilation.

In cattle barns the most commonly used ventilation system is the natural ventilation. In some cases an additional forced ventilation system is used – especially during the summer period if the outside temperature is high and the outside air velocity is low. Under such weather conditions additional ventilation system is used to achieve more air movement in the animal zone to improve the heat dissipation of the animals. During wintertime such system can be used for a better mixing between fresh air and room air for a better using of the heat production of the animals inside the building.

- **Noise and vibration:** Animal building must not be built in the areas dominated by too heavy noise for example machines and other noising activities.
- **Distance to human habitation:** The distance from other buildings as animals for examples, may need to be within view of human building quarters, but not necessary close enough to be heard or smelled
- **Distance to water source, swamps and marshland:** The water problem remains essential to consider. The setting of buildings is carried out according to its situation. This will reduce the long movements which are costly.
- **Distance to salubrity places:** Dead animals decomposed organic living and other sources of contamination to the farm are considered before setting of buildings any ruminant shelter.

L O 2.2 –Select construction materials for ruminant shelters

- Content/Topic 1: Construction materials for ruminant shelters

Foundation materials: Cement**,** Bricks, Stones, Leveler, Cement concrete mixture, Cement mortar and Soil.

Wall materials: Building bricks, Vitrified paving bricks**,** Glazed bricks, Granite, Whin stones, Sand stones, Timber, Nails**,** Poles, Lime stone

Floor materials: Cement concrete floor, Vitrified paving bricks, Stones, Building bricks, Gravel, Spade, Wheelbarrow

Roofing materials: Nails, Hammer, Tape measure, Metallic bars, Timbers, Poles**,** Ladder, Iron sheets, Tiles

LO 2.2 – Identify ruminant shelter equipment

- Content /Topic1: Tips on basic ruminant shelter equipment and its functions

A. Feeding equipment

Feeding troughs: Keep passage clean and clear, keep animal food clean and within reach, rust and corrosion resistant and encourages animal to eat the whole diet mix.

Chopper machine: The **chopper** is mainly used for stalk **forage**, such as rice straw, wheat straw, maize stover and maize for ensiling.

Feed grinder: *Grinding* or particle-size reduction of feed for better use in term of nutrient, intake and mixing.

Feed mixer: is to blend **feed** ingredients – no matter the particle size, density or water content – into a uniform, consistent mixture

B. Watering equipment

Water troughs: A watering **trough** (or artificial watering point) is a human-made or natural receptacle intended to provide drinking **water** to animals, livestock on farms or ranches or wild animals

Water tank: a water *storage* facility.

C. Milking equipment

Milking machine: is designed to harvest **milk** efficiently and maintain healthy teats

Milking can: a container used to transport **milk** from farms

Milking buckets: a container for holding milk

D. Cooling equipment

Cooling fun: Keeping cows, sheep and goats cool to prevent heat stress.

E. Thermometer

Temperature monitoring in *ruminant* body and its products core *temperature* was easily obtained through *use* of a rectal *thermometer*.

F. Crush

Overall purpose of a crush is to hold an animal still to minimise the risk of injury to both the animal and the operator while work on the animal is performed.

G. Scale

Platform **scales** weigh out small amounts of feed, monitor feed usage, weigh 55-gallon drums of fluids, and can even be used to track the weight of **animals**. Large floor scales can be used to weigh cattle or larger amounts of contents. Bin **scales** may be used to keep track of the amount of feed used

H. Hand pump sprayer

A *sprayer* is a device used to *spray* a liquid, where *sprayers* are commonly used for projection.

I. Breeding equipment

Artificial Insemination kit: contain all that is needed to achieve successful insemination

J. Lighting equipment

Solar panel: **Solar** energy can cut a farm's electricity and heating bills. Solar heat collectors can be used to dry crops and warm homes, livestock buildings, and greenhouses. ... Photovoltaic (solar electric panels) can power farm operations and remote water pumps, lights, and electric fences

Generator: Need to *use* power tools while building a new she A portable *generator* can supply you with a steady source of power.

Learning Unit 3 – Design ruminant shelters

LO 3.1 – Classify production systems

- Content/Topic 1: Classification of ruminant production systems

A. Traditional system

A.1. Pastoral system

Is to raise completely outdoors, free, in pasture or rangeland, where the animal finds its own feed. No extra feed is provided to them. It implies a low density of animals per area unit, and so it requires having very large areas of unexploited natural pastures. In terms of equipment, it requires only a very small investment, since no construction is required.

Those pastures must be naturally rich to satisfy animal feed requirements. In addition, veterinary monitoring is difficult because animals are released, and it is often limited to prophylaxis (vaccines). For those two reasons, it is usually local breeds that are raised in that way because they are resistant to

local epidemics and require less feed than high-yielding exotic breeds. Nevertheless, theft risks are very high since they are not continually monitored by the farmer.



Figure 14 : Pastoral farming system

A.2. Agro-pastoral system

Traditional agro pastoral systems, which occur in arid and semi-arid areas with annual rainfall between 400 and 600 mm per annum, with an LGP(length of growing period) of 75 to 90 days and whose main crops are millet and sorghum; and other indicators are shown below

Table 1 : Characteristic of agro pastoral system

Indicator	breeds	Species	Livestock movement	Tsetse challenge	Output	Cultivation intensity
agro pastoral	Indigenous	Cattle, sheep ,goat	Semi- sedentary	absent	Milk, meat	low

B. Non-traditional system

B.1. Ranching or Commercial system

This system of production involves raising animals entirely in buildings from which they cannot leave or in well controlled ranges. They are fully and properly fed by the farmer, from industrial feed or fodder crops. This type of farming requires considerable investment (feeding, sanitary monitoring, use of exotic breeds, housing) and is therefore very expensive.

However, its productivity must be very high to ensure the profitability. Veterinary monitoring is intensive as well, since animals are continuously monitored by the farmer; and in addition, epidemic spread risks are very high because animals are continuously put together.

For those two reasons, this type of farming is mainly practiced for high yielding exotic breeds. Ranching systems consist of labour-extensive enterprises specializing in one or more livestock species and

producing mainly live animals for slaughter (for meat, skins and hides), but also for wool and milk. Management is characterized by grazing within the fixed boundaries that delimit tenure. Ranches are generally commercial enterprises, with generation of a cash income as the primary function of the livestock raised on them.

B.2. Rotational system

Paddocking (Rotational grazing) involves fencing a pasture into several small paddocks. Subdivision is a useful way to balance livestock needs with forage supply .The recommended paddock size is 1ha but this can be varied depending on the land available and the number of animals on the farm.

Livestock graze paddocks in series, moving to a new paddock when the forage is ready for grazing. In general, put livestock into a paddock when the forage is 25-30cm tall; remove livestock when the pasture is grazed down to 8cm .A relatively high stocking rate for the size of the paddock forces the animals to be less selective.

LO 3.2 – Identify ruminant shelter

- Content/Topic 1: Free/Cubicles and Tie stalls shelters

A. Free/cubicles stalls shelter

- **Concepts**

The cows are not tied up, they can walk around freely. In this type of housing there is usually a loafing area and a lying area, with a feeding area separated from the lying area. The habitat is cut up in 3 parts: a feeding area covered, a rest area covered and an exercise area not covered.

- **Purpose**

The cows are forced to walk frequently and this help in getting a good manure.

- **Advantage:**
  - ✓ The manure is spread over a large floor (high quantity of the manure) because there is accumulation of coarse straw on the rest area and disposal of manure once or twice a year.
  - ✓ Each animals have access to feed and rest area
  - ✓ The animals are free in room
- **Disadvantages:**
  - ✓ Contamination of udder caused by accumulation of manure spread over a large floor
  - ✓ Application of high quantity of straw for mulching (litter).
  - ✓ Demand a large area.

B. Tie stalls shelters

- **Concepts**

It is a barn in which each animal (cattle) is attached and has a definite place, designed for rest, feeding, milking and for some care.

- **Purpose**
  - ✓ To have the cows in roofed shelter with individual stall.
  - ✓ The cow is tied to prevent the motion.
- **Advantages**
  - ✓ The animals are separated or in groups: adult males and females, heifers,, calves individually.
  - ✓ The animal is tied to give place to control his behavior and to give to each according to his needs.
  - ✓ The barn avoid harmful contamination for animal
- **Disadvantages**
  - ✓ The animal are not free in stall
  - ✓ Low quantity of manure

- Content/Topic 2: long, short stalls

A. Long stall

Is the stall which the distance between the edge of the manger (animal side) and of the slurry trench is greater than the length of the animal? It requires a lot of litter and large manpower. The dimensions of long stalls are: 1.10 m wide and 2 to 2.50 m long.

B. Short stalls

Is the stall which the distance between the edge of manger (animal side) and the slurry trench is equal to the distance between before leg and hind legs of the animal, plus 10 cm. it allows a reduced use of clean straw and is less expensive to labour, but the yield in manure is lower? There is also possibility of clean with water. The dimensions of short stalls are: 1.10 m wide and 1.60 m in length.

Note: The stall must have a slope of 1 to 3% and should be perpendicular to the trench slurry. The stalls can be separated by dividers fixed at 1 m height, tubular steel, without bumps (roughness surface0, while the width of the stall is 1.50 m especially for animals with large horns.

- Content/Topic 3: Beef cattle and fattening shelter

In free stall barns, the building for meat production is very open. The provision of areas can be in full light for the exercise, in the darkest corner for rest and near the storage of forage for food.

- **Dimension**

The surface of all three areas must be given to each animal: 14m^2 for alien races, 10m^2 for local breeds. The feeding area is such that on its length, all animals are on line; its width is 3m. The soil is cemented or non-mulched or slatted.

- **The sleeping area**

4-5 m^2/animal with soil cemented or clay, sheltered and heavily mulched. The exercise area is 6m^2/animal. Not covered it may be cemented to avoid the drawbacks of the mud or paved if the compaction is done.

- **Local schedules**

Box calf, bull box room, preparing and storing concentrates food.

- **The disposal of manure is:**
  - ✓ Fork in the wheelbarrow;
  - ✓ Shovel, the trucks;
  - ✓ The excavation tractor.

Between the feeding area and the rest, there should be a covered drainage ditch of urine, to evacuation area.

- Content/Topic 4: Dairy cattle shelters

The primary buildings and structures on the dairy farm are:

- ✓ **Cow sheds:** for large farms the various categories would include the milking cow's shed and the dry cow's shed.
- ✓ **Heifer sheds:** open and pregnant heifers should be housed independently.
- ✓ **Calf pens:** young calves, less than one month old, are housed individually in their pens while older ones are grouped according to age and size. Above 3-4 months of age, the male calves should be raised separately from the female.
- ✓ **Bull pens:** where natural service has been adopted as a method of breeding, and more than one bull is being kept on the farm, you should separate them in individual boxes with strong walls.
- ✓ **Calving box:** two to three weeks to calving, transfer pregnant heifers and cows to the calving boxes. Each animal is kept in an independent box, fed, watered and protected from inclement weather and predatory birds. The animals are watched to ensure smooth delivery.
- ✓ **Milking parlor:** adjacent to the parlor is a milk recording room where milk is recorded, chilled and stored ready for dispatch. A feeds/concentrate store is attached to the milking parlor.

- ✓ **Draught animal shed:** this is for draught animals if used at the farm for transporting fodder and other items.
- ✓ **Crush and weighing shed:** for restraining animals during operations, treatment and weighing.
- ✓ **Isolation unit:** this should be isolated from the rest of the farm buildings. It is where sick animals are kept for treatment. They are fed and watered separately from the healthy ones. Attendants at this unit do not work with the rest of the animals.
- ✓ **Quarantine unit:** where newly purchased animals are first kept and observed for 2-3 weeks for any signs of disease. It is also a separate unit and a distance away from the rest of the farm buildings.

- Content/Topic 5.Permanent free stall and fattening shelters for small ruminants

A. Permanent free stall shelters for small ruminants

Small ruminants need to be provided with a reasonable shelter to protect them from rain and other factors. Goats in particular are less tolerant to rain and will more readily seek shelter in wet weather.

- **Free/Cubicles stall shelters**

✓ **Concepts**

The small ruminant are not tied up, they can walk around freely. In this type of housing there is usually a loafing area and a lying area, with a feeding area separated from the lying area. The habitat is cut up in 3 parts: a feeding area covered, a rest area covered and an exercise area not covered.

✓ **Purpose**

The small ruminant are forced to walk frequently and this help in getting a good manure.

✓ **Advantage:**

- The manure is spread over a large floor (high quantity of the manure) because there is accumulation of coarse straw on the rest area and disposal of manure once or twice a year
- Each animals have access to feed and rest area
- The animals are free in room

✓ **Disadvantages:**

- Contamination of udder caused by accumulation of manure spread over a large floor
- Application of high quantity of straw for mulching (litter).
- Demand a large area.

- Content/Topic 6: Small ruminants' Fattening shelter

- **Concepts**

It is a barn designed for rest, feeding, and for some care.

- **Purpose**

To allow the small ruminants a required place for qualitative feeding with a rapid growth and a finisher feeding before slaughter.

- **Advantages:**
  - ✓ The animals are well kept with lower or no loss of energy.
  - ✓ The barn avoid harmful contamination for animal
- **Disadvantages:**
  - ✓ The animal are not free in movement,
  - ✓ Skeleton is not strong enough due to little physical exercise.

LO 3.3 – Correct design of cow shed

- Content/Topic 1: Types of cow shed shelter and Cow shed lay out

A. Type of cow shed:

- Open cow shed
- Closed cow shed

B. Cow shed lay out

- **Single row system**

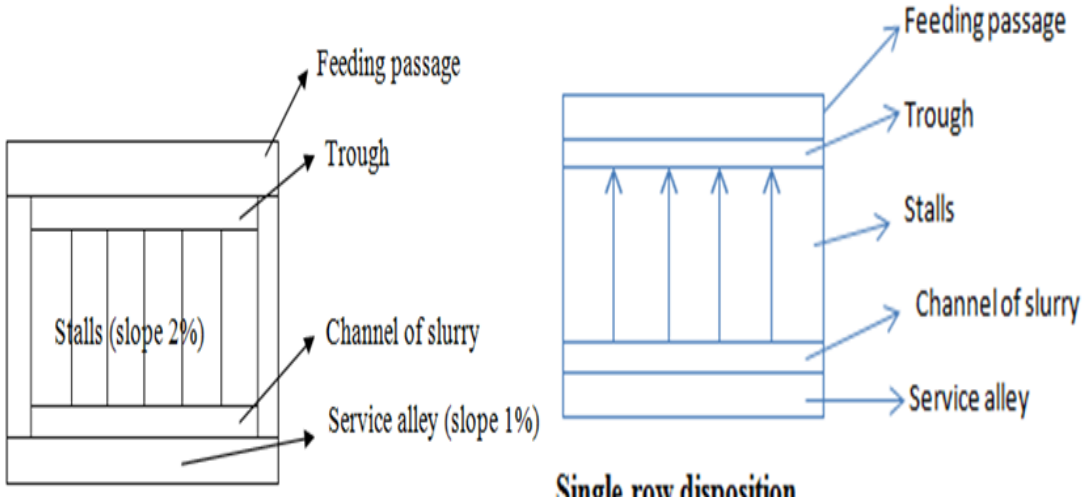


Figure 15 : Single row system of cow shed lay out

- **Double row system**

✓ **Face to face**



Figure 16 : Double row system (face to face)

Advantages of face to face system:

- Cows make a better showing for visitors when heads are together
- The cows feel easier to get into their stalls.
- Sun rays shine in the gutter where they are needed most.
- Feeding of cows is easier; both rows can be fed without back tracking.
- It is better for narrow barns.

Tail to tail



Figure 17 : Double row system (tail to tail)

Advantages of tail to tail system

- Under the average conditions, 125 to 150 man hours of labour are required per cow per year. Study of time: Time motion studies in dairies showed that 40% of the expended time is spent in front of the cow, and 25% in other parts of the barn and the milk house, and 60% of the time is spent behind the cows. Time spent at the back of the cows is 4 times more than the time spent in front of them.
- In cleaning and milking the cows, the wide middle alley is of great advantage.
- Lesser danger of spread of diseases from animal to animal.
- Cows can always get more fresh air from outside.

- Content/Topic 2.Tips to Design cow shed

A. Characteristics of a good cowshed

A good cowshed should have the following characteristics:

- It should provide an internal environment that allows the animals to produce at their best, so it should be neither too hot nor too cold.
- It should protect livestock against direct sun light cold winds and excessive heat.
- It should be well ventilated.
- It should protect livestock against predators, other vermin and thieves.
- It should be easy to clean and to disinfect.
- The structures within the house should be easy to adjust and/or remove so that a farmer can quickly adapt the house for another use without paying a lot of money for renovation.
- The cowshed should be placed so that it is easy to reach and enter, and so that services such as water and electricity can easily be provided. In addition, a livestock house should be near feed stores, loading areas and other services.
- The floor should be made of rough concrete for easy cleaning. It should have a slight slope leading down to a drain so that no water is retained in the building

B. Main parts of cowshed

- **Floor**

The most efficient floor is made of concrete in other to support the heavy weight of the cattle. The concrete consists of a number of materials mixed together to make a very hard, rock-like substance that can be used to make the floors and pillars of building.

The floor should be hard, durable and impervious to water and urine. It should be easy to clean, slopping towards the drainage and should not be slippery.

- **Walls**

  The walls may be made up of stones, wood, concrete reinforced steel, bamboo, mud or any material available and suitable to the local environment. They ought to be very strong.

- **Roof**

  The roof should be light, strong, and durable in addition to being weather proof. It should also be a bad conductor of heat and free from tendency to condense moisture. For high rainfall areas, sloping roofs are a must. Materials include galvanized iron sheets, wood, bamboo, papyrus and grass thatch.

C. <u>Dimensions and spaces requirements</u>:

Table 2 : The space requirements of dairy animals

Type of animal	**Floor space) per animal (m^2)**	
	Covered area	**Open Area**
Young calves (< 8 weeks)	1.0	2.0
Older calves (> 8 weeks)	2.0	4.0
Heifers	2.0	4.0-5.0
Adult cows	3.5	7.0
Bulls	12.0	120.0

Table 3 :Ground area and feeder space recommendations for beef cattle

Floor or ground area and feeder space recommendations for beef cattle		
	Calves, 400 to 800 lb	Finishing cattle, 800 to 1,200lb
Area or space	ft^2	ft^2
Barns (unheated cold housing)		
Open front with dirt lot	15 to 20	20 to 25
Enclosed, bedded pack	20 to 25	30 to 35
Enclosed, slotted floor	12 to 18	18 to 25
Feeder space when fed:		
	in	in
Once daily	18 to 22	22 to 26
Twice daily	9 to 11	11 to 13
Free choice grain	3 to 4	4 to 6
Self-fed roughage	9 to 10	10 to 11

D. <u>Components of cowshed are</u>:

- Milking yard
- Calving box
- Calving accommodation
- Lying and strewed yard

- Exercises area
- Feed store
- Drug store
- Equipment store
- Compost Slurry pits
- Crush
- Isolation and quarantine area
- Fence
- Passage and gates

E. <u>Drawing techniques</u>

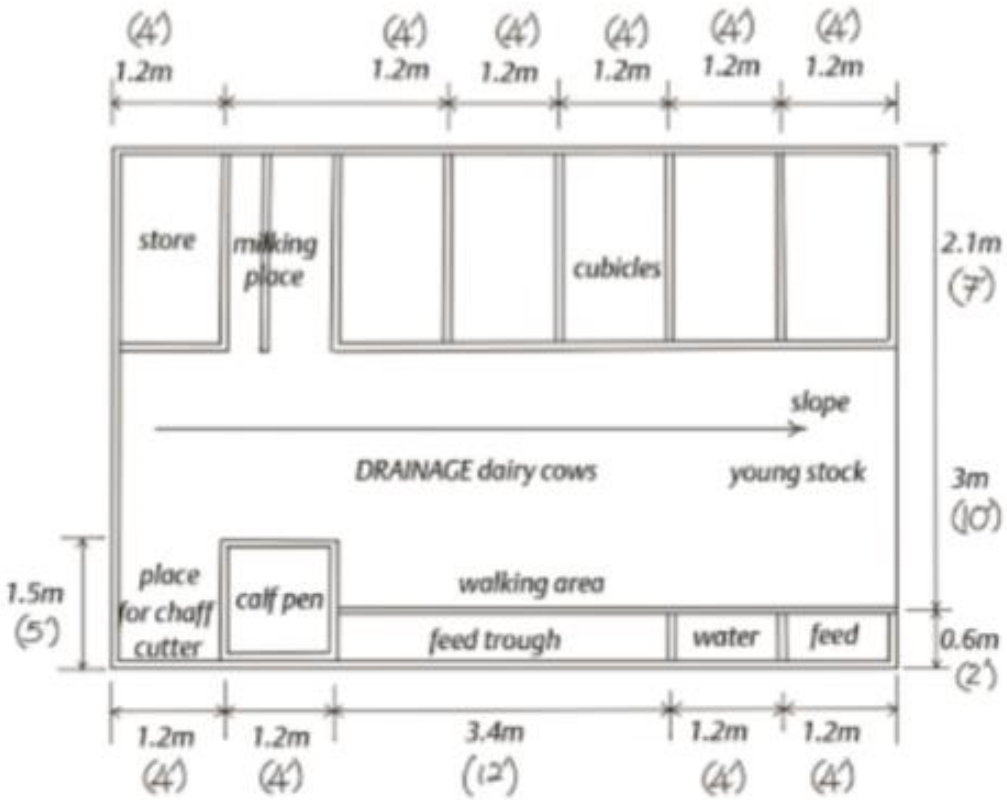


Figure 18 : Drawing technique of cow shed

LO 3.4 – Correct design of small ruminants shelter

F. <u>Content/Topic 1. Types and Layout of small ruminants shelter</u>

A. <u>Types of small ruminant shelters</u>

- Open shelter

- Closed shelter

B. Lay out of small ruminant shelters



Figure 19 : lay out of Small ruminant shelter

- Content/Topic 2.Tips to design small ruminants shelter

A. Characteristics of good small ruminant shelters

✓ Housing for small ruminants should provide protection from winter weather.

✓ Small ruminant barns or sheds are often open to the south

✓ The barns must be dry, draft free and well ventilated

✓ The windows of the sheds should provide an adequate light

✓ Small ruminants shelter should provide access to pens for cleaning

✓ Doors should be wide so that animals do not crowd each other as they go through.

B. Main parts of small ruminant shelters

✓ **Floor**: the ground floors may be made of concrete, murram or compacted earth. The floor should be regularly cleaned to avoid accumulation of parasitic eggs and larvae in small ruminant house.

✓ **Walls**: imitating a room to another and provide fencing structure to the ruminant against divagation and escaping motion.

✓ **Roof**: protection from rain fall sunshine

C. Dimensions and spaces requirements for floor:

The barn type shed is wide open, the peripheral wall having a height of 1.20 m. Its surface is 12mx6m for 60 adult sheep or goats.

Place required:

Table 4 : Floor space requirement per animal (small ruminant)

Floor space requirement per animal (BIS)

Types of animals	Minimum floor space per animal (sq.m)
Ram or buck in groups	1.8
Ram or buck - individual	3.2
Lambs or kids - in group	0.4
Weaner in groups	0.8
yearling or goatlings	0.9
Ewe or doe in groups	1.0
Ewe with lamb	1.5

Feeding and watering space requirement

Type of animal	Space per animal (cm)	Width of manger/ water trough(cm)	Depth of manger/ water trough (cm)	Height of inner wall of manger/ water trough (cm)
Sheep and goat	40 - 50	50	30	35
Kid/lamb	30 - 35	50	20	25

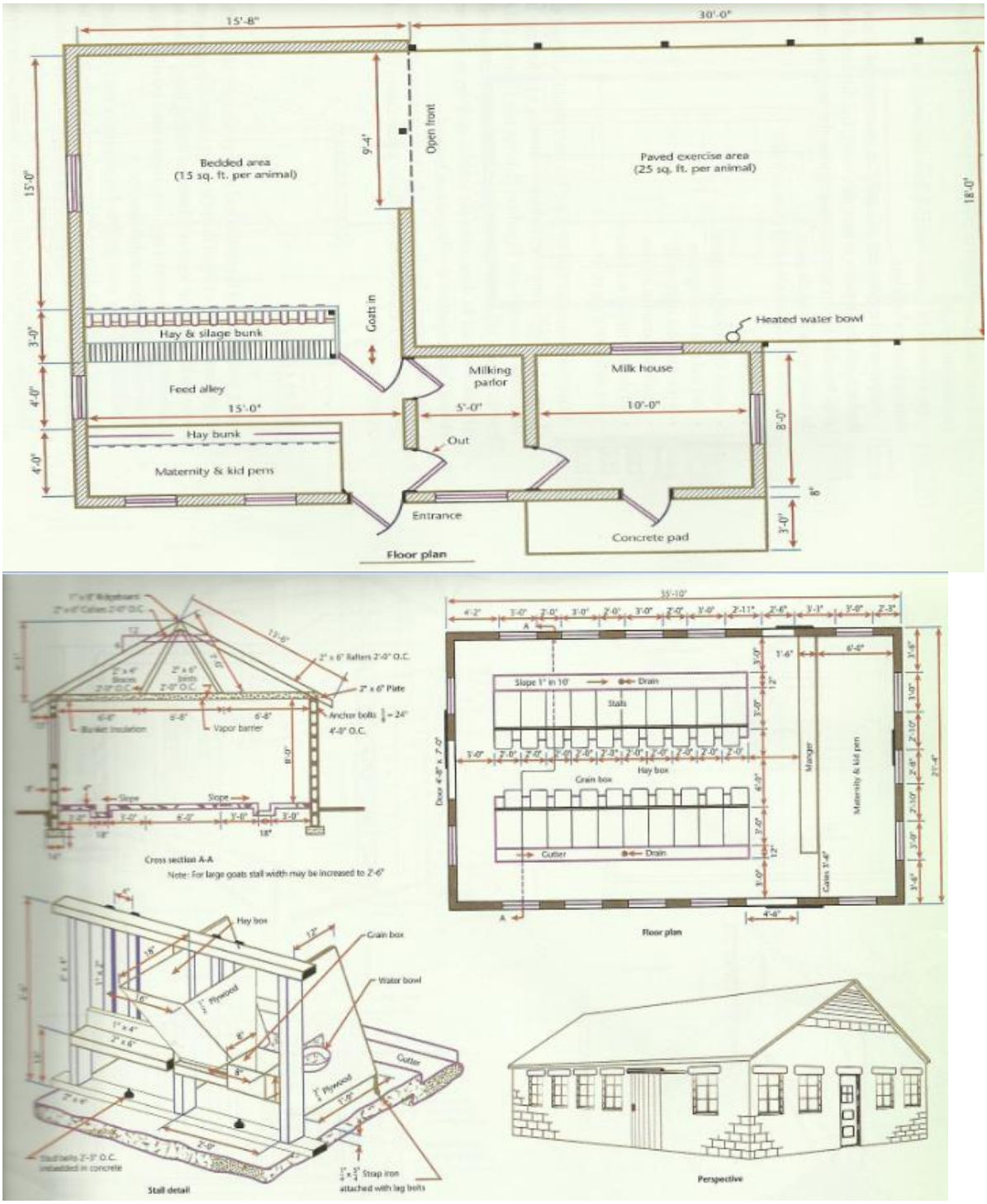


Figure 20 : Drawing technique of Small ruminant shelter

Learning Unit 4 – Manage ruminants reproduction

LO 4.1 – Choose ruminant breeding stock

- Content/Topic 1.Control zootechnical parameters

A. Growth

Ruminant growth is the increasing in size depending on age and feed, depending from a multiplication of living cells of the body.

A.1. The cattle growth stages are:

- ✓ **Calf**: young (male or female) cow from birth to 6 months.
- ✓ **Heife**r: young female cow over 6 months until her first calving.
- ✓ **Young bull**: young male cow from 18 to 24 months.
- ✓ **Cow**: adult female of 2 years and more.
- ✓ **Bull**; adult male and breeder.

A.2. Goats growth stages are:

- ✓ **Kid**: refers to the goat from birth until the age of 6 months.
- ✓ **Goat** or doe: is the female adult goat, in breeding age (from 7 months).
- ✓ **Buck (or Billy goat)**: is the male adult goat, in breeding age (from 7 months)

A.3. Sheep growth stages:

- ✓ Lamb (male or female) gimmer lamb (female): it is the male and the female of sheep aged 0 to 4 months.
- ✓ Hog (male) / gimmer lamb (female): it is the male and the female of sheep after weaning between 5-9 months.
- ✓ Ewe: is the female adult in breeding age.
- ✓ Ram: is the male adult in breeding age.

B. Reproductive performances

Table 5 :Reproductive parameter per species animals

Parameter \ species	**Cattle**	**Goat**	**Sheep**
Age at puberty	9-12 months	7-10 months	7-10 months
Age at first parturition	18-21 months	12-15 months	12-15 months
Gestation period	282-285 days	150 days	150 days
Length of oestrus cycle	21 days	20 days	17 days

Oestrus duration	19 hours	39 hours	36 hours
Lactation period	10 months	10 months	5 months
Interval between parturition	12months	8-9 months	8-9 months
Weaning period	6 months	3months	3months
Dry period	2 months	45-60 days	45-60 days
Sex ratio	1male/10 females	1male/10 females	1male/10 females
Number of services per conception Heats spotted or heats missed	2 services	2 services	2 services

- **Drying Off Dairy Animals**

Due to the amount of milk they produce, the drying-off process is often more complicated for dairy animals (cattle, goats and some sheep). Preparation for dry off should begin at least two weeks prior to the dry-off date with a significant change in the animal's diet. Slowly reducing the energy content of the diet and feeding primarily a high-fiber diet will reduce the nutrients available for the animal to make milk; this is often all that is needed to reduce milk production to a level that makes dry off safe and simple.

- **Fecundity**

Fecundity of animal is the ability to produce offspring's frequently and in large number. Other authors define fecundity as an aptitude/ performance of females' animals individually or in herd of producing a fertilized semen or ovum able to be fertilized.

- ✓ **Fecundity rate** $= \frac{\text{number of newborns}}{number\ of\ mated\ female\ in\ herd}$

- **Fertility**

Fertility in a herd of cattle is a performance of a herd shown by fertilized female.3 ways can be used in fertilizing a female: -natural mating practice,-Artificial insemination practice and Embryo transfer practice

- ✓ **Fertility rate** $= \frac{\text{number of female which give birth}}{number\ of\ female\ presented\ in\ mating}$

This shows the success or failure of natural mating or artificial insemination, it concerns the performance of female animal produce zygote or eggs.

- ✓ **Appear fertility**

This shows the performance of female to produce ovum and zygote which will grow to give the birth.

- **Appear fertility rate** $= \frac{\text{female given birth}}{all\ female\ in\ breeding} \text{x } 100$
- **True fertility/ actual fertility**

This parameter shows the performance of female to produce fertile semen and performance of becoming pregnant.

- **True fertility** $= \frac{\text{pregnant female}}{all\ female\ in\ breeding} \text{x } 100$

- **Length of oestrus/heat**

Is the interval between the end of one heat period and the start of the next heat period. The basic pattern of the estrous cycle is the same in all domestic animals, but some species differences are found in specific parts of the cycle.

The estrous cycle may be divided into several phases based on behavioral changes or structural changes in internal and external genitalia. These phases are called *proestrus, estrus, metaestrus,* and *diestrus.*

Proestrus: The first phase of the estrous cycle is the building-up phase. During this phase the ovarian follicle (under the influence of FSH and LH) enlarges and begins to secrete estrogens.

Estrus: Estrus, the period of sexual receptivity, is primarily initiated by the elevation in estrogens from mature follicles just prior to ovulation. In most domestic species, ovulation occurs within a day or two after the onset of behavioral estrus, which is about the end of behavioral estrus.

Metaestrus: The end of sexual receptivity marks the beginning of *metaestrus,* the postovulatory phase dominated by corpus luteum function. During this period, serum estrogens decrease and progesterone increases.

Diestrus and Anoestrus: Polyestrous animals have a short period of inactivity before the proestrus phase of the next cycle. This is *diestrus.* Animals with long periods between cycles or Polyestrous animals that stop cycling (e.g., due to change in season) enter a long period of inactivity termed *anoestrus.*

- **Maturity and precocity**

Maturity

Corresponds to the period an animal reach its maximal development. This means that they can reach the production or breeding stage quickly. This will contribute to an increase in the number of animals on the farm.

Precocity:

Is the ability of an animal to have an early development of mental or physical traits. In this case sexual activity an animal can have precocious puberty.

- **Prolificacy**

Prolificacy is measured as the ability of a female animal to produce large number of young ones in their life span through high ovulation rate and high embryo survival. But, it is very difficult to obtain selection improvements in traits associated with reproduction, since kidding/lambing percentage is lowly heritable. Differences among does/ewes in litter size (single, twin, triplet) are largely due to non-genetic factors, such as management and nutrition. Genetic change is permanent but, nutrition and management vary from year to year

Reproductive life cycle of cow

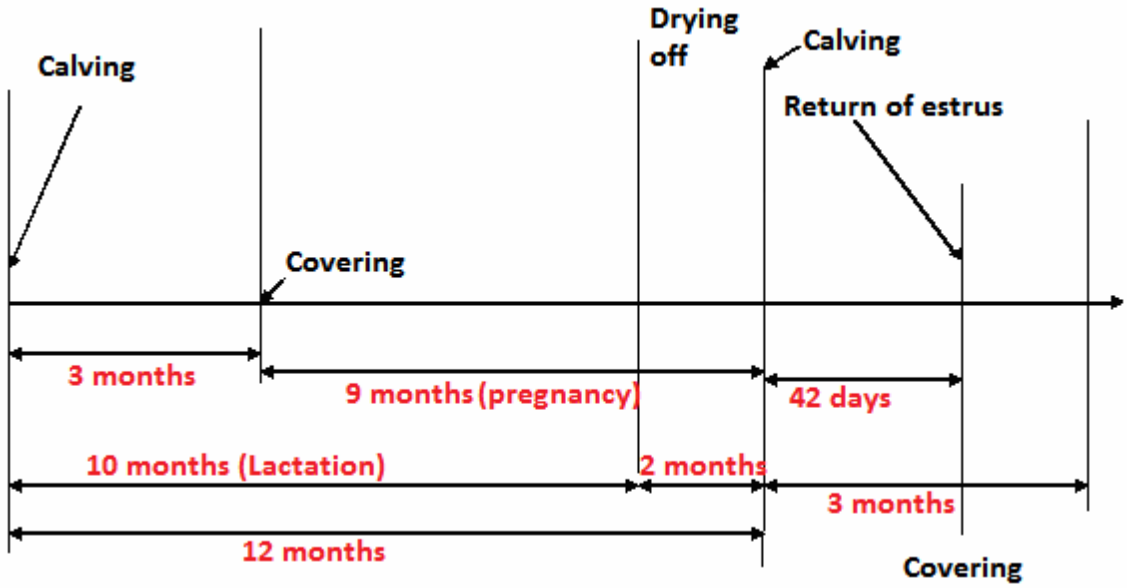


Figure 21 : Reproductive cycle of cow

- Content/Topic 2.perform selection

A. Basic genetics of ruminant breeding

A.1. Heredity and Mendelian principles of inheritance

Inheritance is the ability of animals to pass on their characteristics to their offspring. Male and female gametes contain small units called **genes. Genes** are found in the chromosomes and are responsible for carrying characteristics of an individual animal. Animals therefore pass on their characteristics to their offspring through genes.

B. Selection purpose

Selection is defined as the process of allowing certain animals to be parents of future generation. The selection aims at preserving the good traits in animal breeds and eliminating bad ones. This is accomplished by studying the production and reproduction records of the animal to be selected.

C. Selection criteria

For selection to be carried out effectively, the farmer should consider the following:

- **Production improvement**

Choose animal that can produce enough and for a long time in terms of milk or large amounts of beef.

- **Hardness and rusticity**

Animal chosen should be able to adapt to environmental conditions without losing weight. Animals chosen should not have health problems. When selecting animals avoid those whose parents have inheritable diseases.

- **Diseases resistance:**

Animals which show resistance to common diseases should be selected. This enables them to survive in case there in outbreak.

- **Docility**:

In case of dairy breeds, choose those which have good temperament. This enables easy handling during any intervention (milking, ploughing...).

D. Selection methods

Before selection is carried out effectively, one should consider the effects of genes on inheritance and environmental influence on the characteristics of individual animals. This greatly determines the methods of selection to be use.

- **Mass selection**

Selection based on gene influence, for example: skin color/color coat, other than environmental is carried out using mass selection method. Mass selection is the choosing of individual purely on the basis of their external appearance and allowing them to mate randomly.

This is the most reliable and efficient method when considering inheritable characteristics.

- **individual selection**

Selection based on performance of individual bulls and heifers/bucks and goats/ rams and ewes in a herd is regarded as individual selection or contemporary comparison. The animals compared are of about the same age. The method requires a high level of record keeping.

To be effective, it has to be carried out on large herds. In small herds where only one bull is used, the method may not be effective.

- **Selection on descent with pedigree/Pedigree selection**

This method is based on performance of the parents (ancestors). This requires presence of well-kept records. It is a useful method when the animal to assess is too young or the traits under investigation are sex-linked.

- **Selection on offspring/Progeny testing**

This is the same as performance testing. An animal is evaluated on the performance of its offspring after which it is selected or rejected. It is common when selecting breeding bulls. It is valuable when considering traits/ characteristics like milk production which cannot seen in males.

- **Collateral relative selection**

This method of selection is based on the performance of many animals that are closely related. It should be used traits/ characteristics that are highly inherited and when there is limited interval between generations (very close animal).

E. Male (sire, genitor) and female selection

- **Cattle**:

✓ Conformity to the breed, for example; beef, dairy or dual purpose.

✓ Fecundity (ability to calve down regularly).

✓ Longevity (ability to stay in production for a long time)

✓ Temperament (easy to handle)

✓ High growth rate

- ✓ Well-developed udder and well-spaced teats
- ✓ Healthy and without inheritable diseases
- ✓ Quick adaptation to environmental conditions
- ✓ Resistance to common parasites and diseases
- ✓ Age (choose animals which are still young).

- **Goats:**
  - ✓ Conformity to breed type (either beef or dairy)
  - ✓ Developed udder with two well-spaced teats
  - ✓ Fast growth rate
  - ✓ High fecundity (regular kidding rate)
  - ✓ Free from inheritable diseases
  - ✓ Normal physical appearance (not deformed)
  - ✓ Should still be young enough
  - ✓ Resistant to common parasites and diseases
  - ✓ Adaptation to environmental conditions should be good.
- **Sheep:**
  - ✓ As for the above but the ram should have the ability to take service
  - ✓ Should be able to produce high quality products

- Content/Topic 3.perform cross breeding

Pure breed and cross-breed animals.

It is important to understand the differences between pure breeding and cross breeding.

A.Pure breeding: is the mating of organisms that belong to the same breed (animals) or variety (plants). This means that any of the offspring of pure-bred parent pair is extremely likely to show the same traits as any other offspring of the same parent pair.

B.Cross-breeding

It is the mating of plants or animals that do not belong to the same breed or variety.

B.1.Heterosis effect

Crossbreds often perform at a higher level than the average performance of the purebreds that make up the crossbred. The offspring produced perform better than parents.

Example for cross-breeding would be mating a Friesian bull with a Sahiwal cow.

B.2 .Cross breeding purpose

Introduction of good genes formerly missing in the herd. This may result in the development of a new breed. The offspring of cross-breeding usually perform better than either of the parents. This is known as hybrid vigour or heterosis. Diluting effect of bad treats found in a particular breed, for example, genetic diseases.

B.3.Type of cross breeding

- **Upgrading or absorption cross-breeding**

  Is a form of cross-breeding in which cross-bred females are crossed back to a male of a superior pure breed for several generations. For example, in the first generation a Friesian bull with desirable characteristics such as high milk yielding and Ankole cow with good resistance to tick borne diseases. Subsequent generations of cows are also mated with Friesian bulls or with the original Friesian bull. They will acquire more and more Friesian characteristics as time goes on, while maintaining the basic Ankole ones.

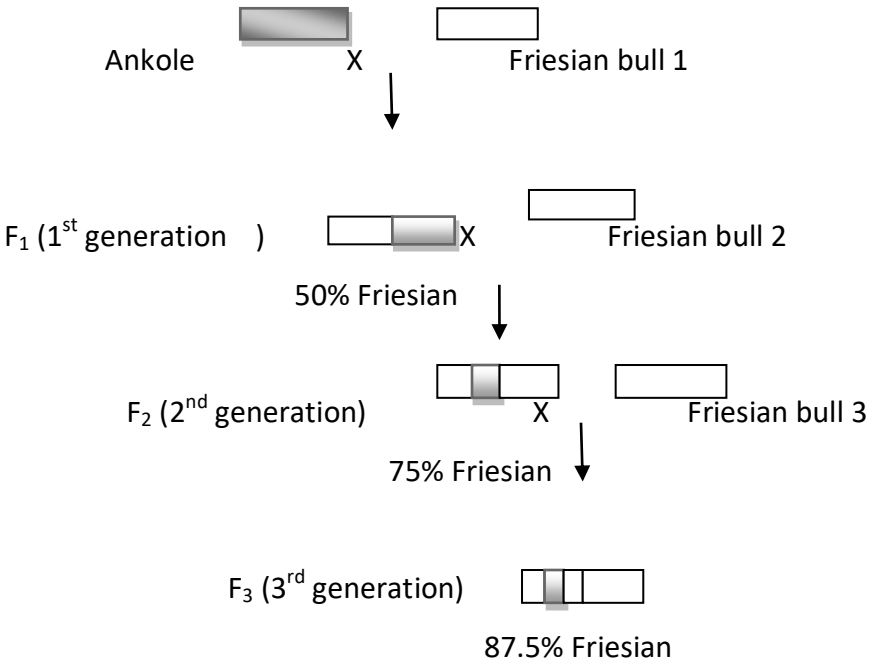


Figure 22 :up grading cross breeding

- **Back crossing:** In a backcross system, heifers from a first cross are mated to a bull from one of the breeds in their own breed makeup. For example, a black-baldy heifer might be mated to a Hereford bull. The backcross is most often used when a particular breed is well suited to the production environment such as indigenous breeds in tropical areas. Backcrosses yield maximum

maternal heterosis but only 50 per cent of maximum individual heterosis. The reduction in individual heterosis is due to the common breed makeup between bull and cow in the backcross.

- **Rotational/alternating cross-breeding**

The aim of rotational cross-breeding is to combine 2 breeds while benefiting from hybridization effect and thus from heterosis, in each cross breeding. We first crossbreed the A breed female with B breed male, then we crossbreed the daughter with A 50% and B 50% with an A breed male, then we crossbreed the obtained grand-daughter with a B breed male, and so on, by every time alternating as a father an A breed male, then of B breed.

The father must of course be always different to avoid inbreeding. With that cross breeding type, we finally make a hybrid that has around 50% A, 50% B, by benefiting from heterosis effect.

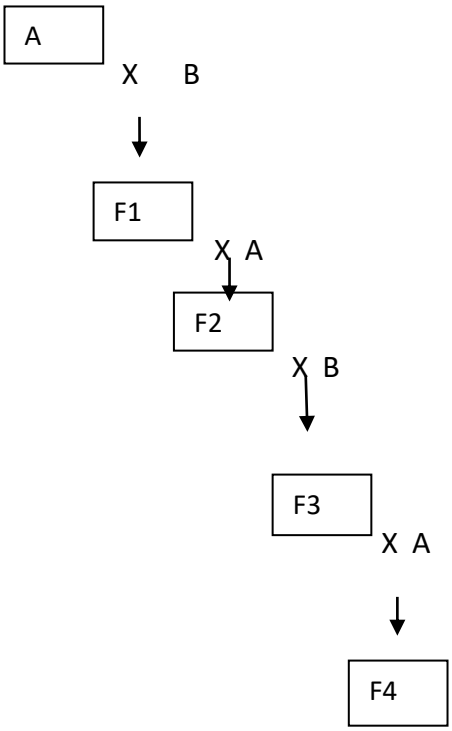


Figure 23 : Rotational cross breeding

C. <u>Consanguinity/inbreeding</u>

Inbreeding occurs when very closely related individuals of the same species are mated. For example, in cattle, a bull is mated to its daughter or sister, or a cow is mated to its own bull calf.

LO 4.2 – Apply mating techniques

- <u>Content/Topic 1.Anatomical and physiological characteristics of the reproductive organs of a non-gravid and pregnant female</u>

The female reproductive organs consist of the ovary, uterus, cervix, vagina and vulva. A sketch of the reproductive tract of the cow is shown below

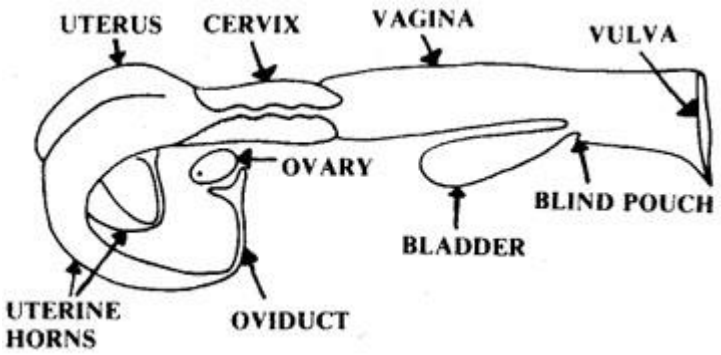


Figure 24 : female reproductive tracts

The reproductive cycle of the cow consists of a series of events that occur in a definite order over a period of days. In the cow, this cycle averages 21 days in length (range is 17 to 24 days) and is concerned with preparing the reproductive system for estrus or heat (the period of sexual receptivity) and ovulation (the release of the egg).

- **Days 0-1**

The cow is in for estrus (standing heat) on Day 0 for an average of 18 hours (range 12 to 24 hours). About 12 hours after the end of the standing heat, the mature Graafian follicle ruptures (ovulates) in response to a surge of LH released by the pituitary gland.

- **Days 1 and 2**

The cells that formerly lined the follicle change and become the lutein cells of the corpus luteum. This change in cell forms is caused by hormonal action, primarily that of LH.

- **Days 2 to 5**

The corpus luteum grows rapidly in both size and function. Numerous follicles may be seen on the ovary at this stage, but by Day 5 they have begun to regress.

- **Days 5 to 16**

The corpus luteum continues to develop and reaches its maximum growth and function about Day 10. It secrets the hormone progesterone, which inhibits (blocks) LH release by the pituitary gland. During this period, the ovaries are relatively inactive except for the functional corpus luteum. No follicles reach maturity and/or ovulate because of the existence of the high levels of progesterone.

- **Days 16 to 1**

The corpus luteum regresses rapidly due to some luteolytic activity of the uterus. Evidence is increasing that this may be a prostaglandin.

- **Days 18 to 20**

The corpus luteum is almost non-functional and this releases the blocking action of progesterone. Of the several follicles that commence growth, one becomes more prominent by a surge in rapid growth and activity. As the Graafian follicle grows, it secretes increasing amounts of estrogens. The remainder of the follicles regress.

- **Day 21 or 0**

With the increase in estrogens release by the Graafian follicle and a corresponding decrease in progesterone by the regressing corpus luteum, estrus or heat will occur (cycle has now returned to Day 0). The high oestrogen level in the blood triggers a release of LH near the end of heat. Following this surge in blood levels of LH, the mature follicle ruptures to release the egg and the cellular tissue left behind becomes luteinized in response to the stimulation of a hormonal complex to form a new corpus luteum (cycle has now returned to Days 1 and 2). Progesterone again becomes the dominant hormone.

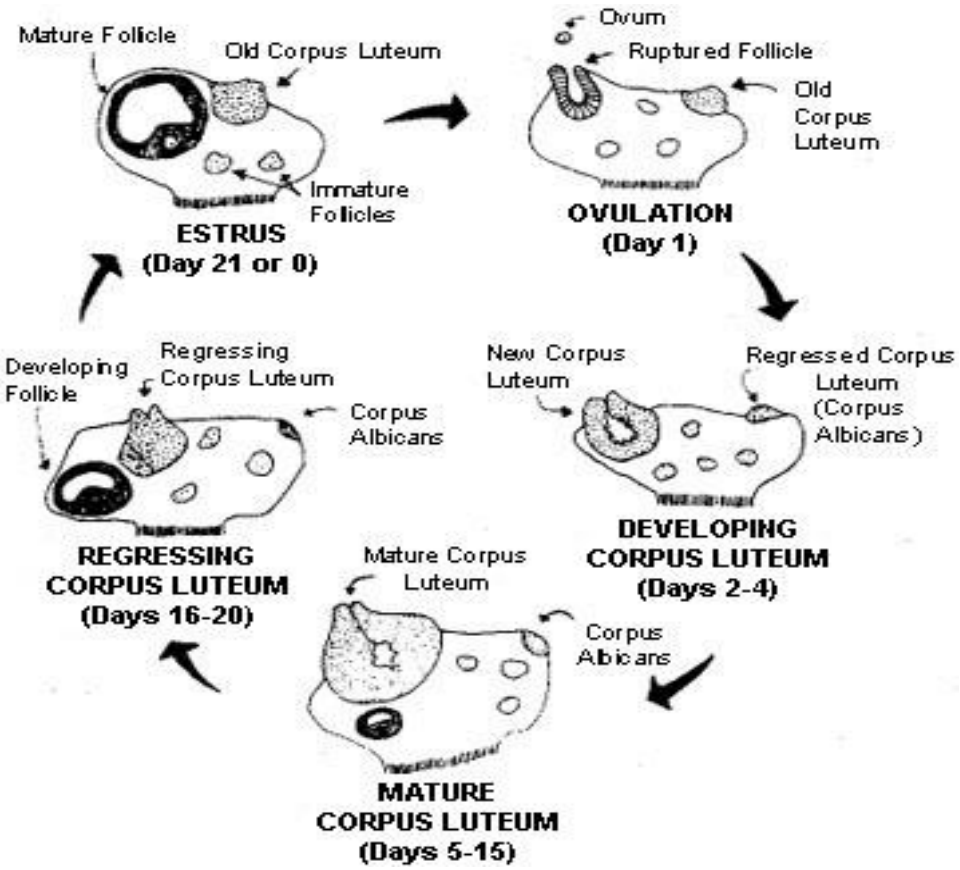


Figure 25 : Estrus cycle of female animal

- Content/Topic 2.Mating planning

A. Reproductive categories of females

- **Immature:** Is the young female cattle not fully developed
- **Pubescent:** Female cattle reaching sexual maturation.
- **Mature pregnant:** fully developed and physiologically holding an embryo(s) or fetus its own uterus.
- **Mature lactating:** fully developed and physiologically developing (or not) an embryo(s) or fetus its own uterus but solely in a phase of lactation period.
- **Mature non-pregnant:** fully developed and physiologically with no developing embryo(s) or foetus its own uterus
- **Resting female**: those ones are waiting for a proper time of insemination. This condition can depend on physiological condition, feeding and farmer request.

B. Mating planning and purpose

To plan any mating condition in a ruminant farm is based on multiple factors mainly:

- Feed availability

- Market
- Farm managerial capacity

- Content/Topic 3: Mating preparation

A. Heat induction

- **Flushing**

It is feeding practice carried out in female animals. Towards the oestrus period, female animals are fed on extra nutritious feeds before they are served, to ensure that during ovulation, many eggs are released. As a result, when fertilization takes place, many offspring are produced.

- **Male presence:**

The male presence in a herd of flock is very important to heat stimulation but feeding and managerial cost is added when this system is optionally chosen.

- **Oestrus synchronization**

A management technique that makes use of hormones to control or reschedule the estrous cycle. This is useful to group females for parturition (calving interval), shorten breeding and reduce estrus detection.

B. **Heat detection**

- **Signs of heat include:**
  - ✓ Standing to be mounted (standing heat)
  - ✓ Mounting other animals
  - ✓ Restlessness and nervousness
  - ✓ Clear mucous vaginal discharge
  - ✓ Reduction of feed intake
  - ✓ Licking and smelling other animals
  - ✓ Frequent urination

C. Heat observation timing

The farmers must visit their farms and observe any morphological or physiological change at the vulva, secretion with any strange behavior. This visit should be done every morning and evening for every day in all mature herd and flock.

- Content/Topic 3.Mating and post mating follow up

A. Suitable moment for mating

The mating moment will only be effective if the farmer or his stockman can recognize when the cow is on heat and ready to be served. Observation is the key to heat detection. Watch animal quietly at least three times a day for about 20 minutes each time. The best times to watch the cows are:

- Early morning
- Early afternoon
- As late at night as possible

When ovulation is about to occurs, a female animal goes on heat. This serves to alert the male animal of the same species to mate with this female animal. Heat refers to the time when female farm animals are ready for mating. If a female animal mates with a male animal during this period, fertilization may occurs.

B. Mating methods

- **Natural**

Male animals have the natural ability to detect female animals on heat. Once detected, the male animal mounts the female and deposits the sperms in the vagina. Natural mating takes places during the act of copulation by the penis.

- **Artificial**

This is a mating by artificial means. Semen is collected from a male animal and introduced into vagina of a female animal on heat using insemination equipment.

In cattle, semen is collected from a bull using artificial vagina (AV), screened to check whether it is safe, diluted and stored in plastic straws in liquid nitrogen or solid carbon dioxide. The semen can stay live for a period of 9 years. On the day of insemination, an inseminator gun (catheter tube) is used to introduce the semen into the vagina.

C. Post mating follow-up

C.1. Post mating process

Once mating is carried out successfully, and hopefully ovulation has taken place, the two gametes (sperm and ovum) combine to form one single cell of the new individual, called the *zygote*. This fusion of gametes is referred to as *fertilization*. Shortly after ovulation, the corpus luteum forms on the ovary. It releases the hormone progesterone. This hormone causes four things to happen:

- ✓ The fertilized egg (embryo) is implanted in the uterus.
- ✓ Others eggs are stopped from forming.
- ✓ The pregnant condition is maintained.
- ✓ The mammary glands begin to develop.

The mammary glands produce the milk to feed the young when they are borne.

If the egg is not fertilized, the corpus luteum does not grow. It atrophies, or wastes away. This allows other follicle to grow and another oestrus period to occur.

C.2..Fecundation or fertilization

It is the union of the sperm and the egg cell. During copulation, the male animal deposits sperm in the reproductive tract of the female. The sperm move through the reproductive tract of the female until they reach the infundibulum. If an egg cell is present, a sperm cell may penetrate it. Only one sperm fertilizes an egg cell. Many millions of sperm cells are present in the reproductive tract as a result of mating. This help to make sure that at least one sperm will fertilize the egg cell.

Sperm cells cannot live very long in the female reproductive tract. In cattle, for example, sperm cells live only about 24 to 30 hours after mating occurs. The egg cell lives about 12 hours after it is released if it is not fertilized. For fertilization to occur, the animal must be bred to have the live sperm cells and the eggs cell present at the same time. If fertilization does not occur, the egg and sperm cells are absorbed by the body. The estrus cycle will repeat itself until the animal does become pregnant.

C.3. Infertility

Causes of infertility

- Poor feeding affecting physiological function;
- Immature and infertile spermatozoa;
- Infections in the reproductive systems or reproductive diseases;
- Poor insemination techniques;
- Free martin: when twin calves of different sexes are born, the male is fertile while the female is infertile. Its reproductive system is deformed and it cannot conceive. This is a free martin.
- Abnormal embryo that fails to implant (dead foetus)
- Deposition of fats which block the fallopian tubes

D.Gestation

The gestation period is the time during which the animal is pregnant. During pregnancy the fetus develops in the uterus. The fetus is surrounded by a watery fluid enclosed in membranes. Blood vessels in the umbilical cord supply nutrients and oxygen and carry off waste products.

D.1. Development of fetal membranes (chorio-amniotic membranes)

Glossary, the placenta consists of layers of soft membranes that form two fluid-filled sacs (amnion and allantois) around the developing fetus.

D.2.Amnion (inner layer):

This is the layer immediately around the fetus. It forms a sac around the fetus called amniotic sac.

D.3. Allantois: is another layer surrounding the amniotic sac which forms the fluid-filled called allantoic sac.

D.4. <u>Chorion</u> (outer layer): the outside of the allantoic sac is covered by the Chorion, which attaches to the uterine lining. The Chorion is linked to the fetus by the umbilical cord. The umbilical card is link between the fetus and the nutrient and waste exchange structures of the placenta.

D.5.<u>Umbilical cord</u>

As its name implies, it is a cord like structure that contains blood vessels (the umbilical arteries and umbilical vein) and a drainage tube from the fetus urinary bladder.

The **2 umbilical arteries** carry unoxygenated waste-filled blood from the fetus to the placenta.

The **single umbilical vein** carries nutrient and oxygen-rich blood back from the placenta to the fetus.

D.6. <u>Placenta and types of placentation</u>

- **The placenta**: is life-support system for the developing fetus. During gestation (pregnancy), the fetus leads a parasitic existence as it grows and develops. That is, it receives all the nutrients and other substances it needs to grow and develop from its mother. It also depends on her to dispose of the waste products it produces. The placenta is a multi-layered, fluid-filled membranous sac that develops around the embryo and is connected to it by the umbilical cord**.**

In some areas the outer most layer of the placenta attaches to the lining of the uterus. It is these areas of attachment that the actual exchange of nutrients and wastes takes place between the fetus circulation and the maternal circulation. The fetal and maternal blood vessels are separate but in close proximity to each other in this area. Normally, no direct mixing of fetal and maternal blood occurs. The nutrients and wastes are exchanged across the very thin layers that separate the two sets of blood vessels.

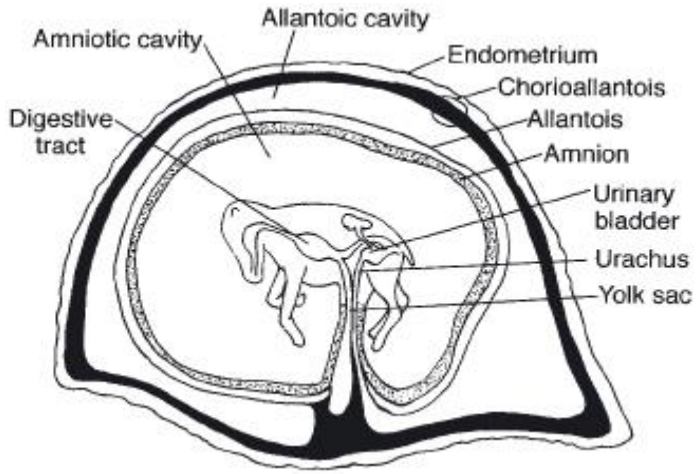


Figure 26 : Structure of a placenta

- **The types of placentation**

The area where the chorion attaches to the lining of the uterus is where the fetal and maternal blood vessels intrauterine with each other. The exchange of nutrients and wastes takes place here, between

the fetal and maternal blood streams. The type of attachment (placentation) varies among species but can be categorized into one of four general types:

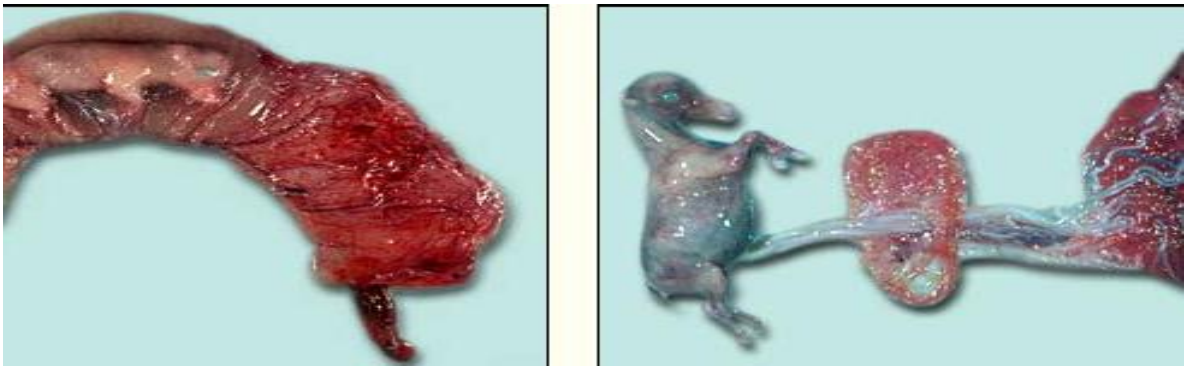


Figure 27 : Diffuse placentation (horse and pig)



Figure 28 : Cotyledonary placentation (Ruminants)



Figure 29 : Zonary placentation (dogs and cats)

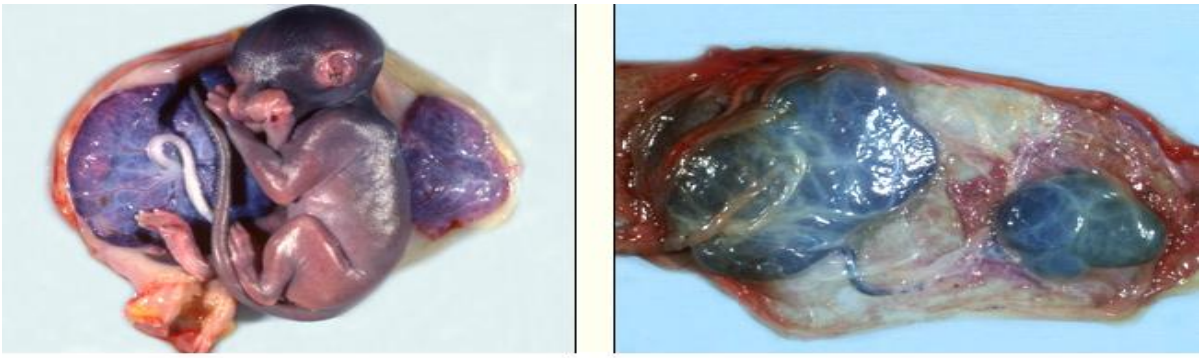


Figure 30 : Discoid placentation (primates, rodents and rabbits)

D.7.Development of udder

An udder is an organ formed of the mammary glands of female quadruped mammals, particularly ruminants such as cattle, goats, sheep and deer. The udder is a single mass hanging beneath the animal, consisting of pairs of mammary glands. In cattle there are normally two pairs, in sheep, goats and deer there is one pair, and in some animals such as pigs there are many pairs. In animals with udders, the mammary glands develop on the milk line near the groin

The mammary glands stay small and undeveloped until puberty (the time of sexual maturity). Up until that time, the proper mix of hormones has not occurred to stimulate their growth and development. Once the estrus cycles begin at puberty, however, the mammary glands respond to the new hormones flowing through the body by enlarging and gearing up to produce milk.

A complex balance of hormones stimulates the mammary glands to develop. Most of the anterior pituitary hormones are involved in the process either directly or indirectly. Prolactin and growth hormones directly encourage mammary development. FSH and LH stimulate the ovaries to produce estrogen and progesterone during each heat cycle.

The estrogens and progesterone encourage the alveoli and duct systems of the mammary glands to develop. Thyroid-stimulating hormone and adrenocorticotropic hormone influence the process indirectly through their target organs. The levels of these various hormones must be balanced precisely for complete mammary gland development to take place.

Abnormally high levels of any hormones, such as might occur when thyroid hormone or corticosteroid drugs are administered to a young animal, can actually inhibit normal mammary glands development.

D.8. Abortion

It is premature expulsion from the uterus of the products of conception, either the embryo or a non-viable fetus.

Mortality: It represents the number of new born dead from calving/ farrowing date to weaning date.

They are divided into 3 categories:

- Death before giving birth (abortion)
- Death during giving birth (still birth)
- Death during weaning period

D.9. Observation of heat return

Observation for service returns tends to be concentrated around the normal oestrous cycle length of 18-24 days. The absence of a return to oestrus at this time or around 42 days after service may indicate that the cow is pregnant. However, this method has inaccuracies in that:

- it is dependent upon efficient and accurate heat detection;
- it assumes that non-pregnant cows return to heat at regular intervals;
- It assumes that cows with a cessation of oestrous cycles are pregnant. Up to 7% of pregnant cows can show signs of heat, usually between the fourth and eighth month of pregnancy. These cows (false negatives) could abort following repeat insemination or may be unnecessarily culled.

LO 4.3 – Assist in parturition

- Content/Topic 1: Normal parturition and its preparation

A. Parturition preparation

Birth in livestock is a natural process and normally does not need any human interference. But sometimes there can be birth problems where the dam needs assistance from the farmer/pastoralist

A.1.Signs of parturition

To facilitate delivery of the fetus, muscles and ligaments of the birth canal relax shortly before parturition.

- ✓ The vulva swells, and a mucus discharge may be present.
- ✓ Muscles on both sides of the tail head may relax and appear lowered or depressed.
- ✓ Mammary glands enlarge and may secrete a milky material for a few days prior to parturition.

As the time of parturition becomes imminent, animals may become restless, seek seclusion, and increase the frequency of attempts to urinate.

A.2. Prepare parturition place, dams and materials

Assistance is required when a cow appears to be having problems giving birth. If the calf is in the wrong position, it is possible for a person to examine the cow and gently rearrange the calf so that is in the

correct position and can be delivered. If the calf appears to actually be stuck, it may take some more effort on the part of the person, but it is possible to assist and deliver a healthy, live calf.

Before assisting a cow, the cow's vulva and the surrounding area should be cleaned, as well as the hand and arm of the person who will be assisting the cow. Any other equipment that may be going inside the animal should be disinfected and properly stored between uses.

B. Normal parturition

B.1. Parturition process

Parturition (***labor***), the act of giving birth to young, marks the termination of pregnancy. Parturition may be divided into three stages.

The ***first stage*** consists of uterine contractions that gradually force the fetus and fetal membrane to the cervix. The duration of this stage is a matter of hours in most species (e.g., 2 to 6 in the cow and ewe, 1 to 4 in the mare, and 2 to 12 in the sow).

In the ***second stage,*** actual delivery of the fetus occurs. Passage of parts of the fetus through the cervix into the vagina along with rupture of one or both water bags reflexively initiates actual straining or contraction of the abdominal muscles. The combination of uterine contraction and abdominal contraction forces the fetus through the birth canal.

The ***third stage*** of parturition consists of delivery of the placenta, which normally follows the fetus almost immediately

B.2.Different presentations and positions

- **Normal presentation**

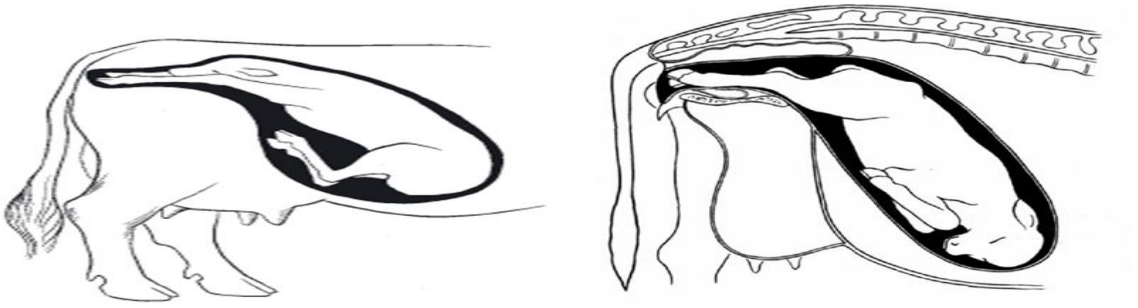


Figure 31 : Normal presentation of fetus

The calf is normally presented front feet first with the head extended and the nose between the front feet. The dorsum of the calf is in contact with the sacrum of the dam. This position, called cranial

(anterior) presentation, takes advantage of the natural curvature of the birth canal of the dam and the curvature of the fetus. A caudal (posterior) presentation with the hind feet first, hocks up, occurs frequently enough in cattle to be considered normal.

- **Abnormal presentations**

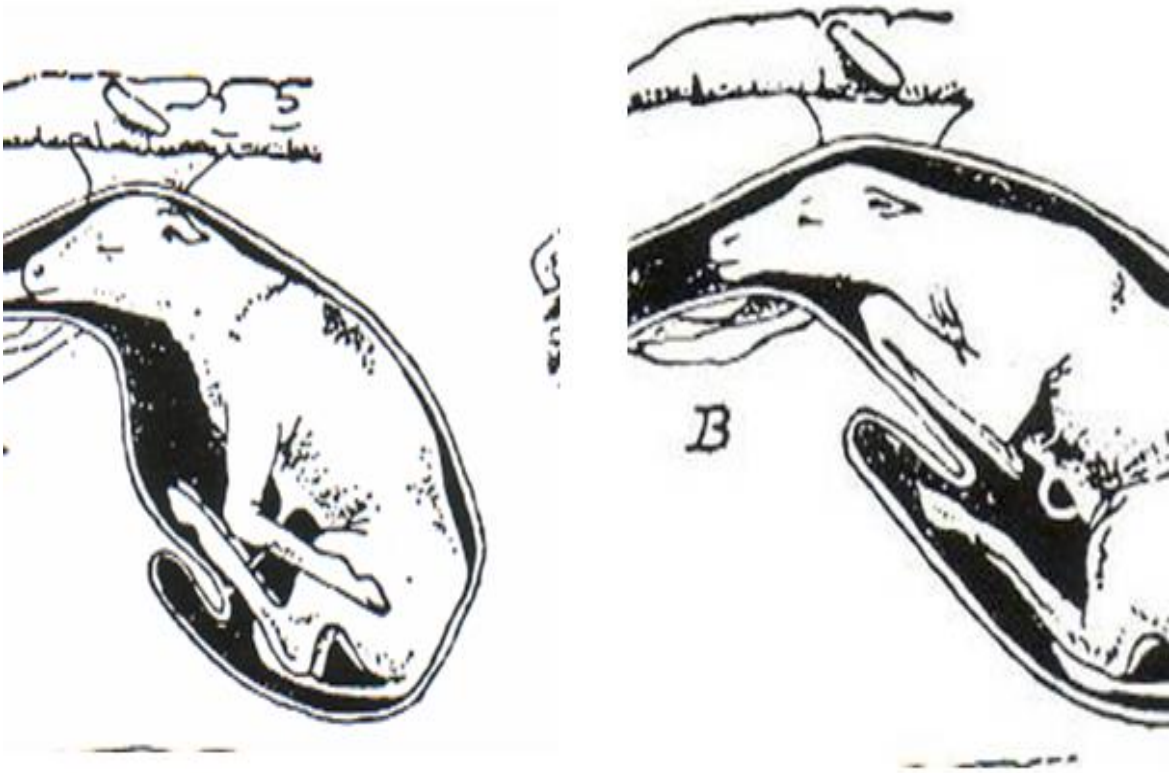


Figure 32 : Leg back presentation

Anterior presentation **Posterior presentation**

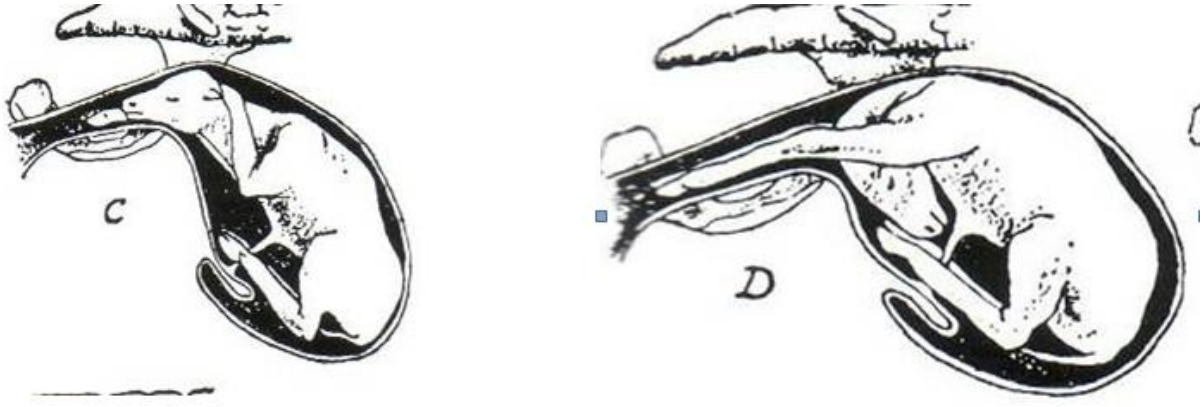


Figure 33 : Leg over Head presentation **Poll first presentation**

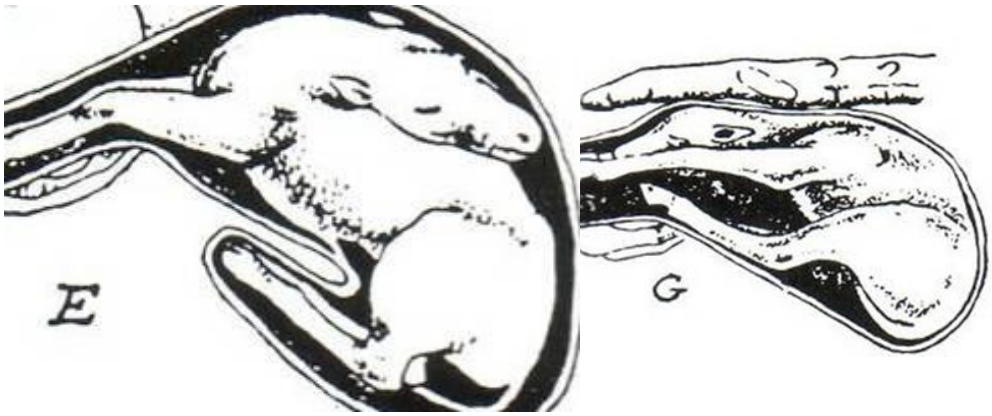


Figure 34 : Calf upside down **Four legs at once**

True breech

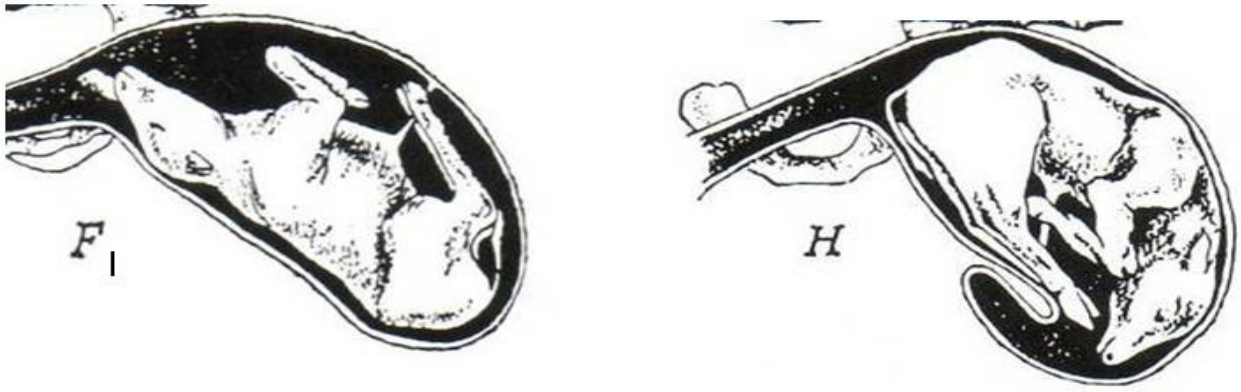


Figure 35 : Leg overhead presentation Poll first presentation

B.3. Eutocia and dystocia

- **Eutocia** is a parturition in which an animal give birth normally without any complication. There is no human intervention (normal birth).
- **Dystocia** is difficult birth; in some cases, birthing is not possible without assistance. In general, from the onset of labor, cows should calve within 8 hours, ewes should lamb within 2 hours.

In large animals (cow, mare, and ewe), improper fetal presentation is a common cause of dystocia, and typically with abnormal positioning of the limbs or head.

Excessive size of the fetus relative to the size of the birth canal of the dam may also produce dystocia. This is a common cause of dystocia in first-calf heifers and in relatively small cows mated with much larger bulls.

- Content/Topic 1.normal parturition assistance and postpartum care

A. Normal parturition assistance

Correction of such a presentation may be necessary for delivery of the fetus. Correction usually entails repelling the fetus into the uterus away from the pelvic inlet so that the fetus can be manipulated and the position of its limbs and head changed. This is performed by rotation, propulsion, aversion and traction movements to uterus and fetus.

If you help the cow with the delivery of the calf, you should pull at the two legs. Always pull to the side of the legs and udder of the cow and never towards the tail side. If you pull, then only do so with a maximum of 2 people and pull only at moments when the cow is pushing herself.

B. Post parturition cares for new born

B.1. Breathing stimulation

As soon as a baby animal is born, make sure that it is breathing.

- If the baby is having difficulty breathing, hang it upside down. Rub the chest to make any fluid in the lungs come out of the nose;
- Lift the new-born animal up by the back legs for a minute or so to let mucus and fluid drain out from the lungs. You can hold the back legs of a small animal and swing it round to make mucus come out of the nose;
- You can also c lean mucous away from the mouth and nostril by hand.
- Pull the new-born animal to where the mother can reach it easily to lick it dry and put the new-born so that it sits up.
- Put a piece of dry grass up the baby animal's nose. This makes it cough then it starts breathing.
- Take the weight to determine the birth weight

B.2. Umbilical cord cutting and disinfection

The umbilical cord usually breaks on its own and is not a problem. If a long cord is still attached to the new-born animal tie a sterile string round it and cut it to about 3 cm long.

Keeps the navel of a new-born animal clean to stop infection getting in. It is a good idea to put antiseptic or antibiotic powder on the navel to prevent infection. A good way is to soak the navel in antiseptic (iodine or Dettol).

B.3. Proper shelter and bedding

The young ones must be transferred to the calf pens that were prepared for them. Dry straw needs to be replaced after a few days and the place cleaned. The calf pen should have adequate space, well ventilated and well lit.

B.4. Colostrum feeding

For the first 3-4 days after an animal give birth it produces special milk called colostrum. It gives energy to baby animals. And colostrum has antibodies in that help the baby animal to fight off infection. It is better to help the calf to stand and to suckle colostrum.

A new-born animal can only use antibodies from colostrum within six hours after it is born. After the animal is about three weeks old it starts to make own antibodies. It is very important for a new-born animal to get enough colostrum to drink from mother in the first few hours of its life.

In addition, make sure the baby animal sucks its mother's teat as soon as possible. When the mother feels a baby sucking, her brain releases a hormone called oxytocin into her blood that makes milk flow from udder. It also makes the uterus contract and pushes the placenta out.

C. Post parturition care for dam

The dam may need some special attention soon after parturition such as:

C.1.Check delivering:

For all animals, the afterbirth must be expelled within 24 hours and the animal should not consume it. By allowing the dam to exercise (walking around) or provision of warm water to the dam after calving, expulsion of the afterbirth is accelerated If retained, the dam may die or become infertile due to rotting.

C.2.Check haemorrhage and tear:

Post-partum cares for the dam also consist of checking tears and haemorrhages caused by forced traction of the foetus.

C.3.Check for twins

C.4.Dam cleaning:

Remove the fetal membrane from the calving area or pen floor; clean the pen and the rearing area of the dam to reduce risk of infection by flies

C.5. Check for mastitis and differentiate with mammary oedema/congestion

C.6. Administration of stimulants

LO 4.4 – Manage parturition complications

- Content/Topic 1. Parturition complications of ruminants

- **Treat uterus inertia**

Uterine inertia that is lack of normal physiologic uterine contraction during or after parturition, is a common condition encountered in bovine. However, it is comparatively less reported in canine. Primary inertia is due to a hormonal dysfunction. Secondary uterine inertia due to exhaustion of uterine muscle has been reported. The animal is given oxytocin in IV injection.

- **Episiotomy**

Episiotomy is a surgical incision into the perineum and vagina to prevent traumatic tearing during delivery. If the head is very large and / or the vulva too small and tight, an episiotomy may be performed.

If the vulva is tight it may be stretched with the wedged forearms of the operator before the onset of the assisted delivery. It is important that the episiotomy incision is towards the 11 o'clock or 1 o'clock position to avoid incising or tearing into the rectal sphincter.



Figure 36 : Episiotomy techniques

- **Haemorrhage and tear management**

C.1. Haemorrhage

Cows giving birth in the delivery process because of improper or Midwifery uterus and ruptured blood vessel damage resulting in massive blood loss occurs. Although the incidence of clinically is not high, but the cure rate is low because of its high mortality and to losses caused by cattle households. The main clinical cows' postpartum haemorrhage occurred mostly primiparous beef cows households seek immediate benefits as early as with the phenomenon common to calving when the body is not fully reached maturity, the narrow birth canal, causing obstructed labor, postpartum haemorrhage occurred. Clinical investigation found that improper selection of bulls cold finishing relatively high incidence of dystocia. Cow prevention measures to control postpartum haemorrhage a good beginning of cows with age and weight. Cows with early age of not less than 16 months, and important to the adult body weight of 70% (or 350 kilograms) or more before breeding. Rational feeding and management, strengthening

exercise into the dry period, should be appropriately reduced energy diet, increased protein feed and minerals, it is necessary to ensure normal fetal growth and development.

C.2. Tears

Depending on the severity of the tear, perineal stitching may be required to promote normal tissue healing and function.

- **Placenta delivering**

A placenta is considered to be retained pathologically if an abnormally long time elapses between birth of the young and delivery of the placenta. The placenta of the cow and ewe should be delivered within 24 hours. Sometimes the placenta and its membranes hang from the vulva.

- **Treatment:**

If the placenta does not come out:

- ✓ Restrain the animal;
- ✓ Wash your hands and arms with soap or disinfectant;
- ✓ Put your arm into vagina and grip the placenta;
- ✓ Pull very gently. If the placenta comes out easily pull it out. If it is difficult to pull it out leave it there.
- ✓ Put some antibiotic through the cervix into the uterus
- ✓ If the animal has a fever or looks sick give an antibiotic by injection.
- ✓ Encourage new-born animals to suck the mother as soon as possible after they are born. This helps make the uterus contract and squeeze the placenta out.

- **Uterine prolapse reduction**

E.1. Definition

Uterine prolapse is a common spontaneous condition in cattle, sheep, goats and other animals occurring immediately after parturition where the uterus comes out through the vulva. Among the cause of uterine prolapse include:

- A large calf in anterior presentation that may have been hip locked for some time. When there was too much effort to make it deliver, an incidence is getting higher.
- In older cows, in a case of hypocalcaemia because of less concentration of uterine muscle.




Figure 37 : Uterine prolapse

E.2. <u>Restraining technique for uterine prolapse reduction</u>

- **Management**

  Be protected from further trauma and contamination by wrapping a wet towel or sheet around it. Sacro-coccygeal epidural injection for controlling the straining (2 % Lidocaine:5ml

- **In standing position:**

✓ Raise the prolapse uterine to the level of vulva by assistant's hands or something which can support it like a board or sheet.

✓ If possible, an anterior body is positioned lower than posterior body to make it return easily.



Figure 38 : Standing position

- **Recumbent position**

Lay the animal down on its chest and pull the back legs out. This makes it much easier to put the uterus back. Get someone to sit on the animal's back and hold the tail up.



Figure 39 : Recumbency position

E.3. <u>Uterine prolapse reduction techniques</u>

- Removal of placenta
- Treatment the wound if there are (Suturing the site of rupture, Haemorrhage)
- Put your one of fist on the top of everted uterus (Pay attention to your fingers. There is a risk of rupture. Better to wear a cotton gloves).
- Take this fist into the vulva and keep it there.
- One hand: Push your fist on the top of uterine into the vagina.
- Other hand: Push the uterus surrounding a vulva. Assistant can help do it too.
- Suturing the vulva for controlling the prolapse.
- Inject the Oxytocin (40 i.u, I.M.): to make an involution of uterus

E.4. <u>Uterine prolapse complications</u>

- The prolapse possibly happens again when the replacement was not completed. To be replaced it exactly, better to use a material like a big beer bottle (1 L) for pushing the uterus in the vagina. Of course, don't remain the bottle inside after pushing.
- Put the antibiotic oblet into the uterus for avoiding the infections. Sometimes a general antibiotic therapy is also needed (IM, IV).
- **<u>Post-partum metritis treatment</u>**
- **Metritis**

A clear or blood-stained red/brown discharge often comes from the vagina after a healthy animal has given birth. It does not smell foul. But a white /yellow discharge or a bad smell is a sign of infection in the uterus. This is called metritis and animal sometimes get it soon after they have given birth.

Infection gets into the uterus through the vulva and vagina, especially when an animal gives birth in dirty place. Animals often get metritis when the placenta does not come out.

The treatment of metritis is done immediately when the animal shows the above sign(white /yellow discharge or a bad smell) and fever. Give a general anti-biotherapy by injection or put antibiotic tables into the uterus by hand but this is not the best way to treat metritis. Even severe infection can be treated.

Prevention of metritis

- ✓ Make sure the place where an animal gives birth in clean and dry. Do not always use the same place without cleaning it up.
- ✓ Wash your hands and arms carefully with soap or disinfectant before putting them into an animal to help with a birth. You can cause infection if your hands and arms are not clean.

Animals often get metritis after a difficult birth because the vagina or cervix has been damaged.

- **Pyometra**
  - ✓ **Etiology** *Trueperella pyogenes*, formerly known as *Arcanobacterium pyogenes, Actinomyces pyogenes,* or *Corynebacterium pyogenes*
  - ✓ **Clinical findings**. Secretion from infected quarters is initially watery with clots and later purulent. Initially severe systemic signs including fever, inappetence, tachycardia, depression, and mortality rate up to 50%.
  - ✓ **Treatment** Responds poorly to treatment with parenteral procaine penicillin G or oxytetracycline and intra mammary penicillin. Affected quarter is almost always lost for milk production.
- **Milk fiver (hypocalcemia)**
  - ✓ **Causes**

Milk fever (**parturient paresis or hypocalcemia**) is generally associated with older, high producing dairy cattle. However, incidences of milk fever may also occur with beef cattle. Milk fever occurs **shortly after calving and the onset of milk production**. Milk fever occurs when the lactating cow is not capable of absorbing enough calcium from the diet or has not started mobilizing bone calcium to meet the increased calcium demand of lactation. Calcium losses from lactation coupled with inadequate supply results in a drop in blood calcium level. Since calcium is needed for muscle contraction, cows suffering from milk fever often lose their ability to stand.

- ✓ **Clinical Signs**

There are three progressive stages of parturient paresis.

During stage one; cows are able to stand but show signs of hypersensitivity and excitability. Cows may appear restless and bellowing. If calcium therapy is not instituted, cows will progress to stage two.

In stage two, cows are unable to stand but can maintain sternal recumbency. Depression, anorexia, dry muzzle, subnormal body temperature, and cold extremities are seen. Cows often tuck their heads into their flanks or, if the head is extended, an S-shaped curve to the neck may be noted.

In stage three, cows lose consciousness progressively to the point of coma. They are unable to maintain sternal recumbency, unresponsive to stimuli, and can suffer severe bloat. Cardiac output worsens, heart rate can approach 120 beats /min, and pulse may be undetectable. Cows in stage three may survive only a few hours.



Figure 40 : cow with milk fever

- ✓ **Treatment**

The most common treatment is slowly applying an intravenous injection of a calcium gluconate solution. Single dose bottles are typical and are available at local veterinary clinics and supply stores. Calcium may also be provided orally as calcium propionate in a gel form. Retreatment is necessary in some cases.



Figure 41 : Intra venous injection of Calcium borogluconate

- ✓ **Prevention**

Numerous steps can be taken to prevent milk fever. The first is to evaluate the calcium and phosphorus levels of the diet. Excessive dietary calcium during late pregnancy could leave the cow unprepared to absorb or mobilize (resorb from bone) enough calcium to meet elevated requirements when lactation starts.

Learning Outcome 4.5: collect milk

- Topic 1. Milk collection

A. Preparation of milk collection materials

- **Introduction**

The milking shed should be scrubbed clean before actual milking starts and allowed to dry or swept clean in case no scrubbing is required. In case of machine milking, the teat cups and milk storage tank should be washed clean. Also ensure that the whole milking machine is in good working condition. Any material that can taint milk should be removed from the shed.

Hygiene at all stages of milk collection and processing is very important for the quality and shelf life of dairy products. The farmer could provide containers or the group may provide and clean standard milk churns to improve hygiene. Important points for good hygiene are:

- ✓ use clean containers and equipment;
- ✓ use containers that are easy to clean with a wide opening;
- ✓ keep the milk covered and in the shade;
- ✓ transport the milk as quickly as possible after milking;
- ✓ cool as quickly and whenever you can (4°C or below);
- ✓ Try to avoid any delays in milk collection.

If some group members have refrigerated storage facilities, it may be necessary to provide separate collection for this pre-cooled milk.

- **Cleaning and Sanitation**

There is a difference between cleaning and disinfection. Cleaning removes materials such as dirt and any residues of milk, disinfection kills most harmful bacteria. Clean the containers as follows: Rinse with cold

water first, then scrub with a brush and warm water containing detergent and rinse again with cold water. Sterilize with boiling water (or use disinfecting solutions like hypochlorite), dry the cans on a drying rack (preferably in the sun).



Figure 42 : Cleaning and Sanitation of milking materials

B. Milk collection techniques

There are two methods used to remove milk from the udder of the cow and these are hand and machine milking

B.1.Hand milking

The milker squats and ties the hind legs with milker's rope, washes the udder with warm water and dries it up with a clean towel. He then applies a salve on the teats to avoid cracking.

The thumb finger is placed along the teat and the index finger closes the top of the teat. Then pressure is exerted on the teat by squeezing the teat rhythmically. Milk trapped in the teat cistern is drawn downwards into the container. Avoid pulling the teats during milking as this may lead to milk hold-up.

B.2. Machine Milking

A milking machine is a common equipment on large dairy farms where hand milking may be impossible .a milking machine is composed of the vacuum supply unit, the pulsator, the vacuum controller, the teat cup, the teat cup linear and milk receiving unit.

Vacuum supply creates vacuum within the entire system and this is the principle on which the machine works. When the teats cups are put on the teats, the vacuum pump creates a vacuum inside the rubber teat cup liners as well as between the rubber liners and the metal in shells. As a result, the vacuum created holds the teat cup in place, the teat canal opens up and milk follows out.

In order to avoid injury to the animal, the pulsator ratio should be set according to the manufacturer's instructions. The pulsation ratio is the time the inhalation is in milking phase compared to the resting phase. The vacuum controller is a valve in the vacuum supply unit, which performs the following during milking.

Machine milking has the advantages of clean milk production, saving labour and it is quick. However, costs of instalment are high, faulty machines can injury the animals, there are higher chances of mastitis spread through teat cup and power failure can affect milking.

C. Udder health care

Animal should be allowed to assemble within the milking area in good time .This allows them to settle down.

The hind legs are tied with help of milker's rope and the udder washed with warm water mixed with disinfectant. The udder is then wiped dry with a clean disposal towel. The hind quarter is brushed or groomed to remove loose hair or dust.

Learning Outcome 4.6: manage weaning

- Topic 1.Ruminant weaning

A. Weaning process

A.1. Calf

Weaning is a period when a young animal stops depending on its mother. Calves are usually weaned between 8-10 weeks of age. With good management and proper feeding they may be weaned between 3-8 weeks of age. In other situations, the two stay together for some time before the separation. In preparation for that stage, the young one is slowly introduced to solid food as well as searching for food. This enables the dam to prepare for the next gestation period.

From the second week onward a calf should be able to eat small amounts of good quality feed such as young grass. This is necessary for the development of the rumen. Fresh, clean water should also be available.

A.2. kid

Weaning methods for goat kids suggest that kids can be weaned earlier than the traditional weaning age of 3 months. Kids can be successfully weaned at 9 kg of body weight, 8 weeks of age or at the time when at least 30 g/day of solid feed are consumed. Weaning shock is reduced when any of the above criteria are achieved. Restricted milk feeding encouraged solid feed consumption by goat kids

A.3. Lamb

Weaning should take place by 12 weeks from the start of lambing, sooner if the season has been poor. Weaning at this time will help with the ewe's recovery and allow her to get back into shape before next year's mating. It is essential that weaner is provided with adequate nutrition to meet their growing needs. Feeding ewes while they have lambs at foot is a great way to 'imprint feed' lambs. The lambs will learn to feed more quickly and will take to grain/pellets easily at weaning.

Weaning weights will vary depending on the breed, frame and pre-weaning nutrition. It is important to aim for the heaviest weight possible at weaning. Even small increases in weaning weights can significantly influence the chance of survival. Aim for 40% of their expected mature live weight by weaning. If animals are less than 40% of their mature live weights consider managing the tail of the mob separately, providing them with improved nutrition.

Growth rate after weaning is as important as actual weaning weight for survival of Merino weaners. A light weight, under-grown weaner at weaning time can have its chances of survival bolstered by having a good growth rate. Weaners under 40% of mature weight at weaning should grow at least 30 grams (g)/day with 50g/day being the recommended growth rate.

If hand feeding is likely to be required for the weaners post weaning it is important to ‘imprint feed' while they are still on their mothers. This means hand feeding with the grain or feed that the weaners will face later in the season. Imprint feeding needs to be done at least three times prior to weaning for the lambs to understand what the feed is and be able to seek it out. If lick feeders or self-feeders are being used for weaning then these should be used during imprint feeding also.

On weaning day many things should already have been put in place such as deciding on and setting up the paddock that the lambs will be weaned onto (or the paddock that the ewes will be moved to), ordering the vaccine and imprint feeding of the weaners while still on their mums.

Learning Unit 5 –Feed ruminants

LO 5.1 – Cattle feeding

- Content/Topic 1. Dairy cattle feeding

Feed is the single largest cost associated with raising ruminants, typically accounting for 60% or more of total production costs. It goes without saying that nutrition exerts a very large influence on herd reproduction, milk production, calf, and lamb and kid growth.

1. Cattle feeding

Different cattle feeding production systems have separate advantages and disadvantages. Most cattle have a diet that is composed of at least some forage (grass, legumes, or silage). In fact, most beef cattle are raised on pasture from birth in the spring until autumn (7 to 9 months). Then for pasture-fed animals, grass is the forage that composes all or at least the great majority of their diet. Cattle fattened in feedlots are fed small amounts of hay supplemented with grain, soy and other ingredients in order to increase the energy density of the diet. The debate is whether cattle should be raised on diets primarily composed of pasture (grass) or a concentrated diet of grain, soy, corn and other supplements.

A. Dairy cattle feeding

Feeding systems in smallholder dairying are primarily based on grazing of native pastures of low productivity. The benefits of such land may range from a mere exercise ground during the major part of the year.

A. 1. Feeding calves

- **Colostrum feeding**

A new born calf must be fed on colostrum's in the first three days. It plays the following roles:

- ✓ It contains antibodies from the dam which provide immunity up to a time when the young animals makes its own. Antibody can only be absorbed in this period

- ✓ It is highly nutritious and liquid form which the young one can easily consume.
- ✓ It is a laxative which helps the alimentary canal to get rid of the first food thus avoiding constipation because the animal's diet at that stage lacks roughage.
- ✓ It is also highly digestible.

- **Artificial milk replacers**

The high quality milk replacers are made from dairy products rather than plant products. Milk replacers that have the following protein sources are preferred:

- ✓ Skim milk powder
- ✓ Buttermilk powder
- ✓ Dried whole whey
- ✓ Delactosed whey
- ✓ Casein
- ✓ Milk albumin

Plant protein sources are not as digestible as milk protein sources. The following protein sources in milk replacers are considered to be of poorer quality:

- ✓ Meat soluble
- ✓ Fish protein concentrate
- ✓ Soy flour
- ✓ Distillers dried soluble
- ✓ Brewer's dried yeast
- ✓ Oat flour
- ✓ Wheat flour

- **Feeding milk replacers**

After 3 days the calf may be feed whole milk or milk replacer. The quantity of 2.3 kg is fed to small breed calves and large breed calves are fed about 3.2 kg. Feed this amount for 3 weeks on an early weaning program and for 4 to 5 weeks on a liberal milk program.

- **Digestion in the young calf**

A new born ruminant's digestive tract functions primarily as monogastric digestive system. The rumen and reticulum at the birth are small and are essentially non-functional. The abomasum/true stomach is the largest of the four stomach compartments of the first few weeks of life. The development of rumen

and reticulum is affected by the types of diet. The calf kept on a liquid diet of milk or milk replacers may take over 3 mouths to fully develop their reticulum function. The reticular groove also called the esophageal groove is a trough in the wall of the reticulum that extends from the esophageal opening to the omasum. When the calf nurses or suckles, the muscles associated with the groove contract and form a tubular structure that conveys swallowed from the esophageal opening directly to the omasum, essentially by passing the rumen and reticulum. The suckling act seems to be necessary for this groove to function. With age and development of the rumen and reticulum, this groove formation reflex almost completely disappears.

- **Bucket milk feeding**

The procedure of this technique is:

- ✓ Starve the calf for two to four hours to step up appetite
- ✓ Obtain warm milk from the mother and dilute 25% of its volume by water
- ✓ Dilute milk at 35-37^{o}C
- ✓ Put the milk in a clean bucket
- ✓ Washing hands with an antiseptics
- ✓ Dip fingers into the fresh milk
- ✓ Lower the calf's head into the bucket to suck the fingers.
- ✓ Gently lower the calf's head as it sucks the fingers to drink the milk
- ✓ Carefully and slowly withdraw the fingers as the calf continues to drink the milk.
- ✓ Repeat the procedure every other day till the calf automatically comes and drinks on its own
- ✓ Feed calves two times in a day at regular intervals.

- **Free suckling**

In dairy management, particular cows are selected and used to suckle several calves they did not produce. In order to succeed, they should be fed while suckling to limit chances of rejecting foreign calves. This practice saves labor and reduces incidence of digestive disorders experienced with bucket feeding. The dam from which all the calves suckle is referred to as foster mother. Limitations include easy spread of diseases such as Tuberculosis if the mother is infected. It is difficult to serve the calves according to their needs.

- **Introduction of solid feed and forage feeding**

In ruminants the young ones have an under developed rumen, therefore have to depend on only milk for the first two weeks. A ration made up of forage fed free choice and limited grain may be fed. As from 7 days of age early weaner pellets are introduced alongside the milk. Water is also provided all the time ad libitum. At about 2 weeks of age, young, quality pastures are selectively cut and provided to the calves. At ten weeks calves are taken to paddocks to start direct grazing.

- **Weaning calves**

Weaning is a period when a young animal stops depending on its mother. Calves are usually weaned between 8-10 weeks of age. With good management and proper feeding they may be weaned between 3-8 weeks of age. In other situations, the two stay together for some time before the separation. In preparation for that stage, the young one is slowly introduced to solid food as well as searching for food. This enables the dam to prepare for the next gestation period.

From the second week onward a calf should be able to eat small amounts of good quality feed such as young grass. This is necessary for the development of the rumen. Fresh, clean water should also be available.

A.2. Feeding heifers

Good quality forage is the basis for feeding heifers during this period. Some grain may be need for proper growth. A grain of 0.72-0.8kg per day is desirable. Heifers on mature or heavy grazed pasture will need additional feed. Be sure the ration meets the mineral and vitamin needs of the heifer.

A.3. Feeding pregnant cow

The cow in pregnant period must fed properly because feeding during the last 2 months of gestation is especially important and the condition of the heifer at calving will strongly influence the amount of milk produced during the first lactation. The heifer should be growing more rapidly during the last 2 or 3 months of gestation.

Feeding grains on 6 weeks before calving at the rate of 1% of body weight. The balanced diet is important. Limitation of the salt in the diet during the last mounts of pregnant must be considered because the excess o salt can cause udder edema.

A.4. Feeding milking cows

In order to improve the quantity and quality of milk production and satisfy the requirements of a dairy cattle**,** a balanced diet that contains the following elements is required:

- **Roughages:** a good forage from 60-80 % of the dry matter that contains grasses and leguminous are used for dairy cattle rations are hay, silage and pasture should come from roughages.
- **Concentrates:** The ration must be supplemented with concentrates such as **grains** (corn, wheat, barley…), **proteins (**soy bean meal, sun flour meal, cottonseed meal…).
- **By-products and other processed** (alfalfa meal, cottonseed, molasses, potatoes, wheat brain…)
- **Minerals** (calcium, phosphorus, magnesium, potassium, sodium, zinc…),
- **Vitamins** (vitamin A and B are important but other vitamins may be needed in dairy rations.) then lactating dairy cow require more water.

A.5. <u>Feeding dry cow</u>

The nutrients needs of dry cows are generally not as high as during lactation. Over feeding will result in cows getting too fat during the dry period. Limit the amount of corn silage fed because of its high energy content. The following conditions must be respected.

- ✓ Maintain a total dry matter intake during this period at about 2%of body weight
- ✓ Roughage intake at about 1% of body weight
- ✓ The amount of grain depends on the quality and type of forage fed
- ✓ Supplementation with Vitamin A, D, minerals such Ca and P reduce problems with retained placenta and milk fever.

A.6. <u>Feeding bulls</u>

Yearling bulls should be in condition score 6 (1 = thin and emaciated; 9 = obese) before the start of the breeding season. This is usually not a problem as these bulls would be coming off of a growing/development ration. Yearlings should after removal from the cow herd after the breeding season; yearlings should be kept separate from the older bulls if possible at least through their second winter. Yearlings need to be fed or grazed on a good quality forage or pasture. Be left with the cow herd for 60 days or less. Beyond that time their condition can fall off to such a degree that it could have long-range effects upon their growth.

For spring/summer breeding programs, this could be meadow regrowth or brome grass pasture. Their supplemental feeding regime can be equated to the program for bred-yearling heifers. These bulls are growing rapidly, in addition to replacing the condition they lost during the breeding pasture. Extra care and feed of yearling bulls after the breeding season should increase their longevity. These bulls should also have a Breeding Soundness Evaluation well before the start of the breeding season.

- **Two-year-old Bulls feeding**

Get two-year-old bulls in condition or their working clothes well before the start of the breeding season. Start at least 100 days before the start of the breeding season to get these bulls in condition score 6. This may mean some grain or distillers may need to be fed to get them in condition. Starting early enough means that you will not need a lot of grain or distillers to get this accomplished.

Two-year-old bulls should have more of their mature size by breeding season as compared to yearling bulls. A 1,700 pound 2-year-old that is slightly under-conditioned will probably only need to gain 1 pound per day at this stage in his life. To do this, active bulls may need 40 pounds of feed or more on a dry matter basis, of which 5 to 7 pounds should be grain.

If body condition is well below the target, the amount of grain will need to be increased to near 0.5 to 1 pound or more per 100 pounds of body weight. Again, make any increases in grain intake gradually so that digestive disorders are unlikely. The diet will need to be about 12% crude proteins. Depending on the forage available this again may a require protein supplement. Monitor the body condition of the bulls closely and make grain feeding adjustments to reach the body condition score of 6 before the next breeding season begins. After this age of bull finishes the breeding season, good quality grass pasture should be adequate. Watch body condition and if they struggle to pick up condition by fall, they may need some supplement during the fall and winter. These bulls should also have a Breeding Soundness Evaluation well before the start of the breeding season.

B. Beef cattle feeding

Beef cattle feeding are possible on small and part-time farms, but the cost of feeding drops significantly as the size of the operation increases. While it is a high-risk business, less land is required for a cattle feeding operation than for a cow-calf enterprise.

B.1. Calves

Starting calves on feed takes time and effort because of the stress young calves are susceptible to at this point in their lives. The reduction of stress will result in calves consuming more feed, thus remaining healthier. To successfully start calves on feed, dry matter intake must be maximized while minimizing health problems. The following is a 5-step applied method for starting calves on a silage-based ration.

Step 1

Ensure that all facilities are adequate, including windbreaks or other methods of shelter, a processing protocol has been worked out with your veterinarian and a feeding regime developed with your nutritionist.

Step 2

Depending on the circumstances, calves may have been on a truck for extended periods of time. Even if calves have just been weaned and have not travelled far, the first nutritional goal is to fill them up on long, soft, palatable hay. Their rumens are probably empty and need to be stimulated in order for proper function. Use high quality hay at this point, crude protein about 15% to 17% and acid detergent fiber 30% to 34%. Higher fiber indicates increased maturity and therefore lower quality. Ideally, the hay should be half grass and half alfalfa. The alfalfa adds protein and the grass is palatable. If the weather is warm, do not put straw in the pen because the calves will fill up on straw rather than hay. If it is cold and/or wet and the calves are tired, bedding may be necessary. Do not put the hay in round-bale feeders as this teaches the calves to stay away from the bunks – the opposite of what is desired. Feed hay alone for 2 to 3 days.

Step 3

Once calves are consuming the hay and are settled, silage can be introduced. Calves may take a few days to adapt or accept a silage-based diet. The acid and palatability characteristics differ considerably from hay, but over a few days intake will increase. Dry, chopped hay can be utilized to dilute the silage until the calves develop a taste for the fermented product. Once the calves get onto silage, hay can be reduced but small amounts will increase the protein value of the ration and increase palatability. The amount to use is more related to economics. The various available feedstuffs should be priced on a per unit of energy and protein basis and with maximum and minimum fiber and concentrate levels established. The forage portion of a starter ration should include approximately 50:50 silage and hay. As an example, feedstuff proportions could be (dry matter basis): 30% silage, 30% grass/alfalfa hay, 37% concentrate and 3% supplement (an ionophore, vitamins and minerals). This would result in a dry matter content of approximately 60% for the ration.

Step 4

Select a suitable grain for starting calves. In the western U.S., corn or barley are readily available, although oats and wheat can also be used. Barley and wheat digest quite rapidly and therefore predispose the calves to digestive conditions such as acidosis. Oats are generally too expensive when cost per unit of energy and proteins are considered. Corn is generally the most cost-effective grain and nutritionally works quite well. If dry matter intake is depressed significantly during the first 3 to 4 weeks after arrival it may be necessary to feed 35 to 40% concentrate on a dry matter basis in a starter ration. Once suitable intake is achieved then a lower level of concentrate can be included. This may take a couple of weeks. All calves are not created equal and purchased calves may have a diverse history. If possible find out as much as you can about the calves. Do not mix calves from different loads unless you

know they are very similar in background (previous feeding regime etc.). Ionophores reduce digestive upsets such as bloat and acidosis. Ionophores won't eliminate the problem, but they will help keep it under control and so are recommended.

Step 5

Once calves are eating the starter rations well, decrease the concentrate and go to a very simple ration composed of silage, hay, grain, and supplement. An example of this would be 35% silage, 35% alfalfa/grass hay, 27% concentrate and 3% supplement. These values could be increased or decreased depending on desired average daily gain (ADG), weight, frame score, breeding, and feed costs. Increased concentrate levels will increase ADG but as an example may cause a small framed calf to gain at too great a rate, which may decrease eventual slaughter weight. It is advisable to sort calves after they are on their ration a couple of weeks after arrival. Sorting should be based on breed, gender, weight, frame size, and desired ADG

- 1-7 days 0.5 – 1.5
- 8-14 days 1.5 to 2.5
- 15-28 days 2.5 to 3.

B.2. Growing

Grower rations are mainly forage-based (silage, whole crop, straw and combinations of these). These can be supplemented at least once a day with dry or moist feeds to add energy, protein, minerals and Vitamins. Rations can be formulated with a wide range of home-grown and bought-in feeds. The most likely scenario for a winter ration would be grass silage plus a blend. It is important that silage is palatable and consistent quality, it also helps if it contains reasonable levels of protein. Generally, only whole crop legume silages can be fed without protein supplementation. The formulation and quantity of supplement depends on silage analysis and intake. Adding straw slows down the rate of passage of silage and promotes cud chewing.

B.3. Finishing

This phase of beef production consists of full feeding of grain with limited amounts of roughage until market weight and finish are reached. Older cattle may reach finish on pasture alone (or with only a few pounds of grain/day) or after 60–90 days in the feedlot on high-grain rations to improve market grade and to remove any yellow tinges from their body fat (due to stored carotene from pasture forage). Weanling calves commonly are shipped directly to the feedlot and fed finishing rations for 100–150 days; yearlings require ~150 days, and older steers 100–125 days. Grain consumption of cattle on full-feed is1 kg/45 kg body wt. Roughage consumption usually is limited to about one-fourth to one-third of the total concentrate consumption after cattle are on full-feed. Cattle consume ~3% of their body

weight/day when self-fed mixed rations. For calves, <1 kg) of a 33% protein supplement is required daily for best gains and market grades when no legume roughage is fed.

The grain (concentrate) allowance for finishing cattle should be increased gradually over 2–3 week from the time they are started on a finishing program to get them on full feed. Feeding too much grain to finishing cattle too rapidly can lead to lactic acidosis or founder .Self-fed, total mixed rations should contain >50% roughage as cattle are started on feed.

Corn or sorghum silages are very palatable, and cattle of lower grade may be finished principally on silage supplemented with protein and minerals. Alfalfa or grass silage is relatively high in protein, carotene, and minerals but is lacking in available energy. Alfalfa hay is excellent roughage but may cause bloat in calves if fed as the only feed. Grains for finishing cattle have about the same relative value as indicated by their total digestible nutrient content. Plant-source proteins are equal in value and can be replaced in part by feeding supplements containing urea. For optimal performance, under-graded intake protein, also known as “bypass protein,” should be provided. Supplements should be fortified with minerals, vitamins, and desired feed additives. A small amount of molasses 0.5 kg/head/day) may improve rations that contain low-quality roughages, such as corn cobs, weathered hays, or cottonseed hulls.

B.4. Steers feeding

Maintain them on their dam until normal weaning at 6 to 9 months of age. Under normal environments, the plane of nutrition from dam’s milk and forage should be adequate for normal growth rates. Management options such as early weaning or creep feeding can be considered when the steer plane of nutrition is less than desired. In Post-weaning, We suggest moderate rates of gain instead of high rates of gain. Once the desired average daily gain is selected, add the maintenance and gain levels for each nutrient to determine the total nutrients required. There are many possible rations that could be used to develop them at the desired animal performance.

Table 6 : Approximatively feeding chart

Steer Weight	% of body weight eaten per day	approximate feed amounts
500	3%	12 lbs grain 3 lbs hay
800	3%	20 lbs grain 4 lbs hay
1100	2.5%	24 lbs grain 4 lbs hay

B.5. Farming system

There are two basic types of production: intensive (**zero grazing**) and extensive. Intensive production is high input (capital, management, facilities) and requires high output for sustainability. For dairy goats and sheep, this type of production is characterized by minimal grazing/ pasture use, with most nutrient needs provided by harvested forages and concentrates.

Extensive production is a lower-input production requiring lower output for sustainability. Naturally occurring feedstuff is used and supplemented as needed with concentrates and harvested forages. An extensive goat or sheep dairy will have few buildings for the animals, allowing them to graze and forage when not being milked.

From an environmental standpoint, an intensive goat/sheep dairy with the animals housed in buildings will fit the classification of an animal feeding operation (AFO). Under some circumstances, it can be a concentrated animal feeding operation.

In intensive production, manure and other waste materials can build up as dry or liquid products and must be removed from the buildings, handled, and stored. Ultimately, the material must be put to use.

Manure management in an extensive operation is usually taken care of by forage/pasture management. Little manure is allowed to accumulate, as it is spread through foraging and grazing. Only when the animals are in the milking parlor does manure become a potential issue.

Nutrient management for an extensive operation is an integral part of pasture management, since the animals spread manure as they graze/browse. Intensive production, even if only an AFO, should have a plan for making use of the manure and other wastes.

LO 5.2 – Small ruminants feeding

- Content/Topic 1: Goat and Sheep feeding

A. Flushing (Ewe and rams(1 month before mating))

- Feeding the ewe so she is gaining weight about 2 weeks before breeding is called flushing. Flushing may increase lambing percentage by increasing the number of eggs that the ewe ovulates. Flushing works best on thin ewes that are already in good body condition usually do not respond well to flushing

- Flushing has more effect early in the breeding season. Flushing may also be beneficial late in the breeding season. Mature ewes respond better to flushing than yearlings. You can flush ewes by feeding them 0.5 to 1 lb. of grain per day or by moving them to a better quality pasture. If flushing is continued through the breeding season, it may enhance embryo survival during early pregnancy

B. <u>Flushing (Doe and bucks1 month before mating)</u>

Flushing refers to the practice of providing extra nutrition to does approximately two weeks prior to breeding and for a variable portion of the breeding period, for example one to two weeks, to increase the number of ovulations and have a greater proportion of twins and triplets.

C. <u>Steaming up ewe during pregnancy</u>

- **Early-to-mid gestation**

Early to mid-gestation is a critical period in the ewe's production cycle because placental development occurs from day 30 to day 90 of gestation. Placental size or weight affects nutrient transfer between the ewe and her foetuses. Underdeveloped placentas result in lower birth weights regardless of late gestation nutrition. While the ewe's nutritional requirements during this period are not significantly above maintenance requirements, 21 days of severe underfeeding or 80 days of moderate underfeeding can affect placental development.

- **Late gestation**

Good nutrition during late gestation will help to ensure a successful lambing season. Knowing how much to feed ewes during late gestation can be difficult because it depends upon the number of fetuses the ewe is carrying. Underfeeding will result in the birth of small lambs. Small lambs are less resistant to cold stress and will have slower pre-weaning growth. Most of the ewe's mammary development occurs during late gestation. Underfeeding will reduce the yield and quality of milk, including colostrum. Overfeeding can result in oversized foetuses. Big lambs increase lambing problems and have a higher mortality rate

The nutrients that are important during late gestation are energy, protein, calcium, selenium, and vitamin E. The amount of energy required depends upon the number of foetuses the ewe is carrying. Cold stress increases nutritional requirements, especially if ewes are kept outside. Winter lambing, ewes usually cannot consume enough forage to meet their energy needs. More energy is required two weeks before lambing versus six weeks before lambing. Ewes carrying singles do not need to receive grain as early as those carrying multiple births.

D. Feeding Ewe during lactation

- Lactation places the greatest nutritional demand on ewes. How much you feed a ewe will depend upon how many lambs she is nursing, her size and condition, her age, and the time of the year the lambs are born. Ideally, ewes should be separated into production groups and fed according to the number of lambs they are nursing. A general rule of thumb for concentrate feeding of lactating ewes is 1 pound of grain for each lamb nursing the ewe. On pasture, ewes rearing triplets should be given access to more forage. Supplemental feeding may be advisable.
- Protein and energy are both critical nutrients for milk production. If either nutrient is fed below the requirement, milk yields and lamb gain will be reduced. After the first 60 days of lactation, you should reduce the amount of feed you are feeding because all it will accomplish is making the ewes fat.
- Most ewes will lose weight during lactation. Weight loss during lactation affects protein requirements. The more weight ewes lose, the higher their protein requirement will be.

E. Growing kids feeding

The lighter breeds should reach 90 pounds in a similar timeframe the average for the whole plant. The kid grazing on improved pasture, browsing in woodlots or consuming alfalfa hay is able to select plant parts which have a higher nutritional value than laboratory analyses of the forage samples might show.. If a doe is weaned at 8 weeks, weighing 20 lbs and is to kid at 12 months at 110 lbs, then she must gain 90 lbs in 10 months or approximately 1/3 lb daily. Therefore, the nutritional program must aim for a growth rate of approximately 150 gm daily with consideration for both the nutritional requirements of the growing doe and the growing fetus over the 5-month gestation period. If does are freshening at 15 to 20 months, then the proper size is more easily attained with less grain feeding. Fresh water and exercise are also important in the post weaning period.

F. Farming system

F.1. Grazing (Extensive system)

With regard to the time aspect, sheep must have at least 8 hours a day for grazing. The animals should be given water to drink during the midday rest. Free grazing involves the intensive use natural resources: the sheep are kept under permanent surveillance by man, who controls both the time and the place used for grazing, but the areas available for grazing are usually far in excess of the animals' strict requirements.

In this system, the value of a shepherd will be fully appreciated. A good shepherd will methodically move and re-group his sheep to ensure that the section of pasture he has allocated to them is properly used. Other grazing systems require fencing, which always entails a considerable financial outlay.

F.2. Zero-grazing (intensive system)

Very intensive systems are of two categories: intensive use of cultivated forages or stall feeding. Although goats prefer to browse in comparison to grazing, they are nevertheless quite capable of making efficient use of cultivated pastures for meat or milk production and stocking rates of the order of 16–60 goats/ha are feasible depending on the type of grass used, level of fertiliser application and the presence or absence of legumes.

Mainly because of the limited work that has been done in the Asian and Pacific region in this context, and in order to compare meat production from goats versus cattle, studies were recently completed to investigate their response and grazing behaviour to cultivated Setaria setivalva pasture fertilized with 150 kg of N, 40 kg P and 40 kg of K/ha/year applied in three equal amounts. The average yield of dry matter was about 5–6 t/ha. Four stocking rates were used: 20, 40, 60 and 80 goats/ha in a randomised block design, replicated thrice, involving Katjang crossbred kids with an initial liveweight of about 10–12 kg. At the end of four months, the highest stocking rate rendered the paddock bare and this treatment had to be withdrawn. The effect on daily live weight gain was dramatic. Noticeable effects were found about three months after the experiment started, and the highest stocking rate only gave a daily live weight gain of 9.2g/day. The results suggest that the optimum stocking rate for Setaria pastures is about 40 goats/ha.

The second alternative system, stall feeding, requires high labour and capital investment. It is a system that favours situations where there is no land or more particularly, the availability of abundant supplies of crop residues and agro-industrial by-products. Probably because of the higher capital investment, it has not been adequately used as a system. In Fiji, it has been reported that goats fed sugarcane tops, stovers, straws, coconut cake, rice bran and molasses reached live weights of 23–25 kg in about 22 weeks with a daily live weight gain of 154 g, compared to 83 g in the extensive system.

In considering the systems together, their relevance and potential contribution particularly in the context of intensity of land use and demographic pressures in Asia, the conclusion that emerges is that the village, intensive and integrated systems are the most appropriate. Goats and sheep already exist in village systems in most mixed crop-animal small farms. Intensive stall-feeding is justified by the

presence of various types of crop residues and agro-industrial by-products. The integrated systems, especially with tree crops, remain unexplored. These three systems thus merit special focus and development.

F.3.Semi-intensive

In this system there is usually limited grazing and stall-feeding depending on the availability of time, labour and also feeds. It is essentially a part-time operation like the village system. The duration of grazing is variable and is about 4–6 hours per day, usually in the late morning or evening. The goats are then housed and given some forages or crop residues. Very seldom are concentrates offered

The semi-intensive system refers to situations where there is a combination of limited grazing and stall feeding. It is a compromise between very extensive and intensive systems. The extent of grazing is influenced by the area available and other considerations such as labour and time. The use of labour is a part-time operation and may be undertaken by unpaid family labour or by shepherds. The former often involves children and farmers' wives. In the latter case, it is not uncommon for the shepherd to herd the animals belonging to several farmers for grazing. The flock sizes are generally small and not more than 1–8 animals.

F.4. **Feeding mineral supplements**



Figure 43 : Mineral lick block

Rivière suggests a formulation, the preparation of which demands resources that are not available to the individual farmer:

- ✓ Dicalcium phosphate: 60%
- ✓ Sodium chloride: 20%
- ✓ Sodium sulphate: 10%
- ✓ Magnesium sulphate: 9%

- ✓ Zinc sulphate: 0.5%
- ✓ Copper sulphate: 0.09%
- ✓ Manganese sulphate: 0.40%
- ✓ Cobalt sulphate:0.01% Mineral lick supplied

Water



Figure 44 : water supplies

Small ruminants should have ad libitum access to clean, fresh water at all times. A mature animal will consume between ¾ to 1 ½ gallons of water per day. Water requirements and intake increase greatly during late gestation and during lactation. Water requirements increase substantially when environmental temperatures rise above 70^{o}F and decline with very cold environmental temperatures. An animal's nutrient requirements will increase if it has to consume cold water during cold weather. Rain, dew, and snowfall may dramatically decrease free water intake. Inadequate water intake can cause various health problems. In addition water and feed intake are positively correlated

F.4.<u>Tethering</u>

Tethering is defined as the securing of an animal to an anchor point to confine it to a desired area. It is used to prevent animals straying in the owner's absence or to allow animals (e.g. sheep and goats) to graze unfenced pasture. Tethering should not be confused with short-term tying up or with hobbling.

Tethering of animals may expose them to increased risk of stress, injury or death. In particular, tethered animals may be:

- Unable to evade predators
- Unable to obtain shelter from climatic extremes
- Unable to obtain sufficient exercise

- Isolated from their companions
- Exposed to environmental hazards, such as road traffic, and the tether itself.

For these reasons, other confinement methods appropriate for the species should be sought. Tethering of animals requires a high standard of animal husbandry and exceptional care, including regular inspections.

Some species and individuals may not be suitable for tethering. Animals should never be tethered in conditions where they are vulnerable to extreme weather.

These guidelines have been developed to assist people to tether animals correctly when circumstances make it a necessary method of confining and protecting animals. They specify the requirements for tethering dogs, sheep, goats, cattle, donkeys and horses.

G. Advantages of farming system

Table 7 : Advantages of extensive and intensive farming system

Extensive	**Intensive**
Dependent on the climate (environmental factor)	Independent of the climate factors
Scarce resources	Constant forage production
Intermittent feed cycles	Continuous feed cycles
Parasitic problems	Good sanitary condition
Use of marginal land and non-agricultural resources	Use of technology
Low animal density	High animal density
Autochthonous breeds	Improved breeds
Low productions	High productions
Great ability of adaptation	Increased sensitivity to diseases
Lower fecundity and fertility	Increased fecundity and fertility
Traditional system	Industrial system

LO 5.3 – Manage nutritionals deficiencies in ruminants

- Content/Topic 1: Management of carbohydrates, Fats, lipids and protein deficiency

A. Carbohydrate deficiency

- Deficiency of carbohydrate (energy) is the most common nutrient deficiency which limits the performance of grazing animals. Feed may be inadequate due to overgrazing, drought, poor quality or digestibility or expense. Sometime forage may contain an excess of water, limiting energy intake.

A.1. <u>Carbohydrate deficiencies result in</u>:

- Retarded growth in young animals and a delay in the onset of puberty.
- A shortened lactation in milking animals and decline in milk production.
- In mature animals, a marked loss of bodyweight, especially during late pregnancy and early lactation.
- Prolonged periods of anoestrus, lasting several months, which have marked effect on the reproductive performance of a breeding herd.
- Calves and lambs may be born weak and undersized.

B. <u>Protein Deficiency</u>

Protein deficiencies usually accompany carbohydrates deficiencies. They are not usually as severe and take the form of:

- Reduced appetite in young animals.
- Lowered feed intake.
- Lack of muscle development.
- A prolonged time to reach maturity.
- In mature animals there is loss of weight and decreased milk production.
- **Prevention - Control – Treatment**

Treatment and prevention of malnutrition is beyond the reach of most farmers. Diseases that worsen the effects of malnutrition can be alleviated by appropriate treatment e.g. deworming. Severely malnourished animals usually do not survive even when food again become available, so if a drought is expected or feed sources otherwise too few, it is wisest to sell/slaughter the weaker animals before the condition goes down too much.

Ruminants utilize non protein nitrogen in the form of urea and biuret feed supplements, which can supply from one-third to one-half of all the protein needs of ruminant animals.

c. **<u>Fat/Lipid Deficiencies</u>**

- Content/Topic 1: Management of mineral deficiency

A. Signs of Mineral deficiencies:

- Wasting diseases.
- Loss of hair, depigmented hair and skin disorders.
- Non-infectious abortion.
- Diarrhea.
- Loss of appetite or depraved appetite.
- Bone abnormalities.
- Tetany.
- Low fertility.

B. **Management of mineral deficiency**

- **Correct feed mixing ration**
- **Iron injection: Iron and Manganese**

Iron deficiency rarely occurs in adult livestock and supplementation with Iron and Manganese is much less important than for other trace minerals. Most tropical soils are acid, resulting in animal plant feeds having levels generally in excess of requirements. In addition, soil consumption will provide substantial quantities of these minerals to grazing livestock diets, particularly Iron

- **Calcium injection**: Calcium and Phosphorus

In cattle the most common mineral deficiency is lack of Phosphorus. In most livestock grazing areas of tropical countries, soils and plants are low in Phosphorus. These elements have a vital function in almost all tissues in the body and must be available to livestock in the proper quantities and ratio. 99% of the Calcium and 80% of the Phosphorus in the entire body are found in the bones and teeth. An inadequate intake of Calcium may cause:

- ✓ Weakened bones
- ✓ Slow growth.
- ✓ Low milk production.

- **Use of mineral blocks**



Figure 45 : Mineral lick block

Fat/Lipid Deficiencies „

Ruminant – Generally not a fatty acid deficiency because of ruminant microbes

- Content/Topic 3. Management of vitamins deficiency

A. Multi vitamins injection



Figure 46 : Multi vitamins

Multivite is indicated for the prevention and treatment of vitamin deficiencies in animals particularly during periods of illness, convalescence and general unthriftiness.

- **Contra Indications**: None
- **Application Rate**

- ✓ **Cattle Application**: For intramuscular or subcutaneous injection
- **Dose rates/directions for use**:
- ✓ Cattle: 20-30 ml, Calves: 5-10 ml
- ✓ The injection may be repeated at intervals of 10-14 days.
- ✓ **Sheep & Goats Application**: For intramuscular or subcutaneous injection.
- **Dose rates/directions for use**: Sheep: 5-10 ml Lambs: 2-5mlGoats: 5-10 ml

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