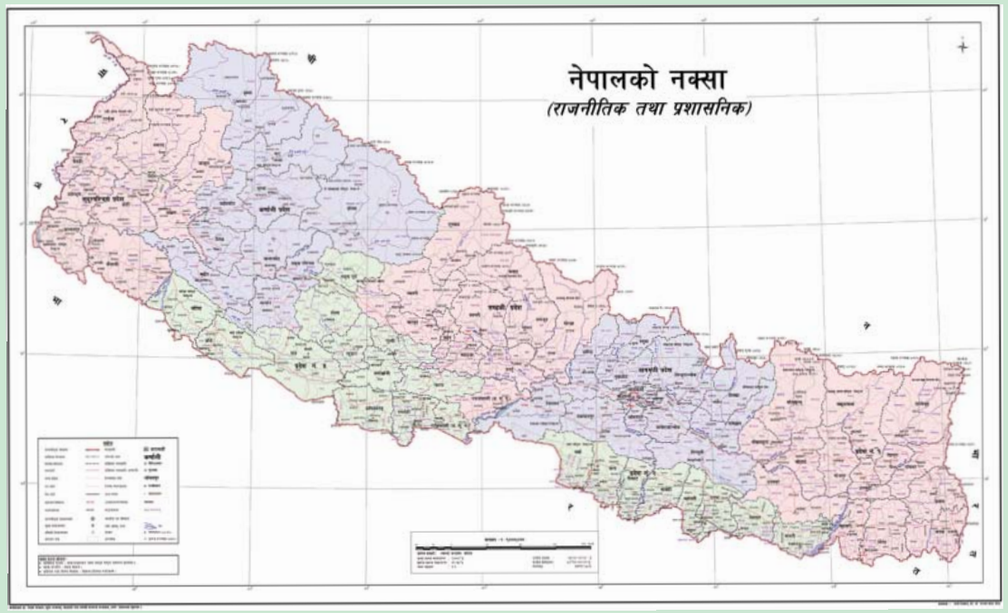

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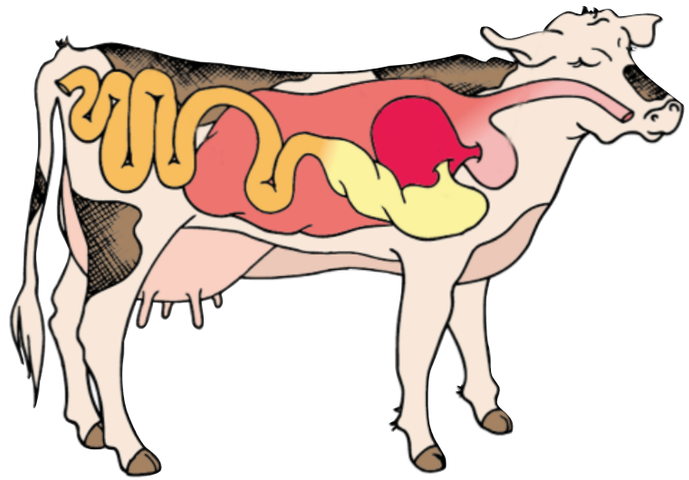
Animal Science

Large Ruminants Production and Management



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Feedback Copy

Technical and Vocational Stream

Learning Resource Materials

Large Ruminants Production and Management

(Grade 9)

Secondary Level

Animal Science

Government of Nepal
Ministry of Education, Science and Technology
Curriculum Development Centre
Sanothimi, Bhaktapur

Publisher: Government of Nepal

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Preface

The curriculum and curricular materials have been developed and revised on a regular basis with the aim of making education objective-oriented, practical, relevant and job oriented. It is necessary to instill the feelings of nationalism, national integrity and democratic spirit in students and equip them with morality, discipline and self-reliance, creativity and thoughtfulness. It is essential to develop in them the linguistic and mathematical skills, knowledge of science, information and communication technology, environment, health and population and life skills. it is also necessary to bring in them the feeling of preserving and promoting arts and aesthetics, humanistic norms, values and ideals. It has become the need of the present time to make them aware of respect for ethnicity, gender, disabilities, languages, religions, cultures, regional diversity, human rights and social values so as to make them capable of playing the role of responsible citizens with applied technical and vocational knowledge and skills. This Learning Resource Material for Animal Science has been developed in line with the Secondary Level Animal Science Curriculum with an aim to facilitate the students in their study and learning on the subject by incorporating the recommendations and feedback obtained from various schools, workshops and seminars, interaction programs attended by teachers, students and parents.

In bringing out the learning resource material in this form, the contribution of the Director General of CDC Dr. Lekhnath Poudel, Prof. Dr. D.K. Singh, Dr. Shambhu Sah, Dr. Yam Bahadur Gurung, Dr Kiran Pokharel Dr. Ganesh Gautam, Dr. Shishir Bhandari, Dr. Hari Prasad Panta, Dr. Anita Devkota, Dr. Laba Kumar Jha, Dr. Garima Thapa is highly acknowledged. The book is written by Dr. Raj Kumar Yadav and the subject matter of the book was edited by Badrinath Timsina and Khilanath Dhamala. CDC extends sincere thanks to all those who have contributed in developing this book in this form.

This book is a supplimentary learning resource material for students and teachrs. In addition they have to make use of other relevnt materials to ensure all the learning outcomes set in the curriculum. The teachers, students and all other stakeholders are expected to make constructive comments and suggestions to make it a more useful learning resource material.

2076 BS

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Curriculum Development Centre

Contents

Unit: 1

Introduction

A. Objectives

- To be enable to know introductory part of livestock production.
- To describe about zoological classifications of livestock.

B. Content elaborations

1.1 Introduction to Animal Husbandry and Livestock Farming System in Nepal

Animal Production and Management is a branch of the Veterinary science that deals with housing, breeding, feeding and health care of different domesticated livestock. In other words it deals with production and protection of different classes of domesticated livestock aiming for maximum economic returns. Major domesticated animals to be considered are: Cattle and buffaloes, horse, sheep and goats, pigs, poultry and rabbits including pet animals and wild animals.

Comparatively Veterinary science is a very difficult subject as the animal does not speak and tells its grievances and sufferings however, it sometimes expresses some signals regarding its illness. The Veterinary graduate has to ask the owner regarding the signs and symptoms of suffering animal and examine clinically to identify the suffering and disease of the animal. He has to use all his technical knowledge for proper diagnosis and provide appropriate measures.

Introduction to Livestock Industry in Nepal

Livestock is an integral part of the agricultural production system in Nepal providing almost all the draft power for cultivation and dung as farmyard manure to enrich the soil fertility. In the hills and mountain mules, asses, yaks and even sheep and goats are important means of transportation whereas in the Terai bullocks and buffalo bulls are mainly used in pulling cart for transportation of human and other agricultural commodity. Some horses and ponies are also used for transportation. Livestock is the only source of high value animal proteins in the form of milk, milk products, meat and eggs and generates cash income in rural

households. Sale of live animals for slaughter, surplus livestock products and/or draft power accounts over 20 percent of the household cash income. The main reasons for livestock keeping could be ranked as under:

- Manure production
- Draft power production for ploughing and transportation
- Substituting protein rich food for household consumption, and
- Obtaining cash income from selling surplus live animals and their products

Livestock farming is closely inter-related with various components such as crop production, forest, pasture, market and households. The increasing human and livestock population in the country have relentlessly destroyed the forest and pasture for survival and brought most of the marginal land under cultivation which consequently resulted in environmental deterioration, thereby increasing area of degraded forest, denuded hills, soil erosion, shortage of fodder and fuel wood supply. Livestock productivity is low which is attributed to maintaining indigenous low producing animals, prevailing traditional animal husbandry methods and rising demand of draft power and pack animals, poor nutrition resulting from excessive livestock pressure on available fodder resources and wide range of endemic animal diseases. Livestock feeding depends on seasonally available forage grass, fodder and crop by-products, which are usually inadequate. There is an overall feed deficit as overgrazed areas are increasing in size and livestock owners spending more time in traveling while collecting grasses, fodder and fuel wood.

Definition of common terms

Details	Cattle	Buffalo	Sheep	Goat	Pig	Horse
Species	Bovine	Bovine/ Bubaline	Ovine	Caprine	Swine/ Sus	Equine
Group	Herd	Herd	Flock	Flock/ Band	Drove/ Stock	Pack
Adult Male	Bull	Buffalo bull	Ram/ Tup	Buck	Boar	Stallion
Adult Female	Cow	Buffalo cow/She buffalo	Ewe	Doe	Sow	Mare
Young	Bull calf	Buffalo	Ram	Bucking/	Boarling	Colt

Male		bull calf	lamb/ Tup lamb	Male kid		
Young Female	Heifer Calf	Buffalo heifer calf	Ewe lamb/ Gimmer lamb	Goatling	Gilt	Filly
New born	Calf	Buffalo calf	Lamb	Kid	Piglet/ Pigling	Foal
Castrated Male	Bullock/ Steer	Buffalo bullock	Wether/ Wedder	Castrated	Hog/stag/barrow	Gelding/ Geld
Castrated Female	Spayed	Spayed	Spayed	Spayed	Spayed	Spayed
Act of Parturition	Calving	Calving	Lambing	Kidding	Farrowing	Foaling
Act of Mating	Serving	Serving	Tapping	Serving	Coupling	Covering
Gestation Period	282 days	310 days	151 days	151 days	114 days	336 days

Common Animal Husbandry Terms

1. **Nymphomaniac or chronic- buller**

   A cow affarently always in heat.

2. **Cryptorchid**

   A male animal in which one or both the testicles fail to descend into the scrotal sac.

3. **Free Martin**

   When twin calves of different sexes are born, the bull calf is usually sexually normal, but often the heifer calf is sterile. Such female calves are known as Free martin.

4. **Crone**

   An old broken mouthed ewe which has been retained in a breeding flock beyond the normal time because of her excellent breeding performance.

5. **Culling**

   Removal of unwanted animals from the herd for economic purpose.

5. Shearing

The process of removing wool in sheep.

6. Gimmer

A female sheep between first and second shearing.

7. Seggy

A ram castrated after service.

8. Open animal

Female animals that have not been bred.

9. Card/ Crit/ Runt

The smallest piglet usually last to be born in farrowing.

10. Parturation

Act of giving birth

11. Fecundity

The ability or capacity of a female to produce functional ova.

12. Prolificacy

Capacity of female to produce more number of offspring.

12. Jenny

A female donkey

13. Jack

An uncastrated male donkey

14. Castration

The process of making animal sterile

15. Flushing

Practice of providing extra nutritious diet 3-4 week prior parturition.

16. Caponization

The process of castration of male bird.

1.2 Zoological Classification of common domestic animals, and Difference between Ruminant and Non Ruminants Animal

Taxonomic Hierarchy

Bos	Genus	-	oxen, true cattle
Bovinae	Sub-family	-	Bovines, including cows, yaks and buffalo
Bovidae	Family	-	gazelles, African antelope, buffalo, mountain goats, and domesticated species such as cattle, sheep, and goats
Artiodactyla	Order	-	even-toed ungulates eg. pigs, camels, deer and cattle
Eutheria	Infra-class	-	Placental mammals
Theria	Sub-class	-	Mammals that give birth to live young
Mammalia	Class	-	Egg-laying mammals, live bearing mammals
Vertebrata	Sub-phylum	-	amphibians, birds, cartilaginous fishes, rays, sharks, mammals, reptiles, cyclostomes, jawless fishes, bony fishes
Chordata	Phylum	-	animals with a dorsal hollow nerve chord, dorsal supporting rod (notochord), and gill pouches or slits.
Animalia	Kingdom	-	mammals, fish, insects, birds, humans

Unit: 2

Basic Anatomy and Physiology of Animal

A. Objectives

- To practice the drawing the external body part of cow .
- To able to practice in drawing the digestive organ of ruminants.

B. Content elaboration

2.1 The external parts of a cow

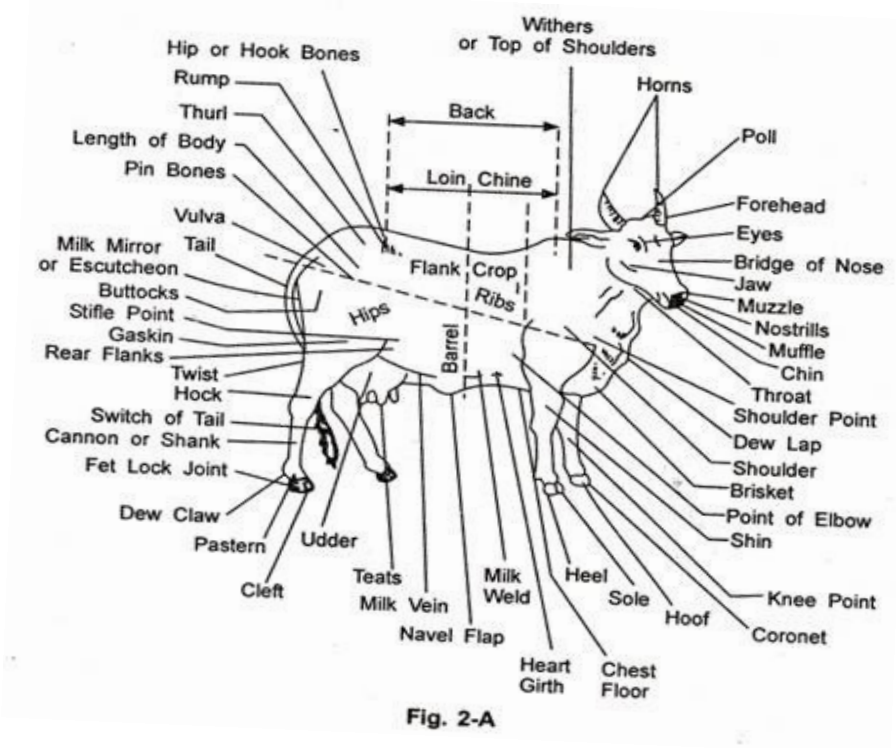

Fig. 2-A

Figure 2.1: External Body Part of Cow

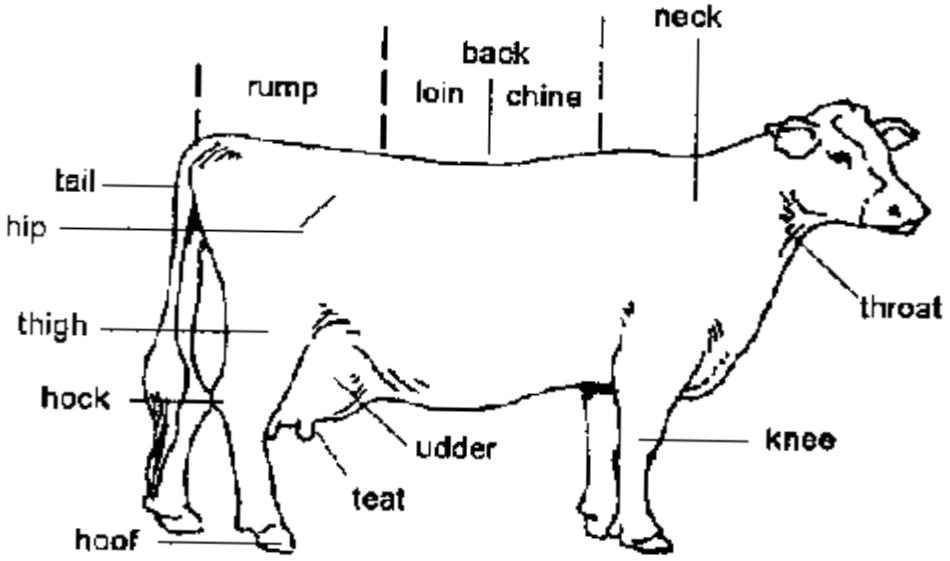

Figure 2.2: External Body Part of Cow

2.2 The digestive organs of ruminants

Ruminant livestock include cattle, sheep, and goats. Ruminants are hoofed mammals that have a unique digestive system that allows them to better use energy from fibrous plant material than other herbivores. Unlike monogastrics such as swine and poultry, ruminants have a digestive system designed to ferment feedstuffs and provide precursors for energy. By better understanding how the digestive system of the ruminant works, livestock producers can better understand how to care and feed ruminant animals.

Ruminant Digestive Anatomy and Function

The ruminant digestive system uniquely qualifies ruminant animals such as cattle to efficiently use high roughage feedstuffs, including forages. Anatomy of the ruminant digestive system includes the mouth, tongue, salivary glands (producing saliva for buffering rumen pH), esophagus, four-compartment stomach (rumen, reticulum, omasum, and abomasum), pancreas, gall bladder, small intestine (duodenum, jejunum, and ileum), and large intestine (cecum, colon, and rectum).

A ruminant uses its mouth (oral cavity) and tongue to harvest forages during grazing or to consume harvested feedstuffs. Cattle harvest forages during grazing by

wrapping their tongues around the plants and then pulling to tear the forage for consumption. On average, cattle take from 25,000 to more than 40,000 prehensile bites to harvest forage while grazing each day. They typically spend more than one-third of their time grazing, one-third of their time ruminating (cud chewing), and slightly less than one-third of their time idling where they are, neither grazing nor ruminating.

The roof of the ruminant mouth is a hard/soft palate without incisors. The lower jaw incisors work against this hard dental pad. The incisors of grass/roughage selectors are wide with a shovel-shaped crown, while those of concentrate selectors are narrower and chisel-shaped. Premolars and molars match between upper and lower jaws. These teeth crush and grind plant material during initial chewing and rumination.

Saliva aids in chewing and swallowing, contains enzymes for breakdown of fat (salivary lipase) and starch (salivary amylase), and is involved in nitrogen recycling to the rumen. Saliva's most important function is to buffer pH levels in the reticulum and rumen. A mature cow produces up to 50 quarts of saliva per day, but this varies, depending on the amount of time spent chewing feed, because that stimulates saliva production.

Forage and feed mixes with saliva containing sodium, potassium, phosphate, bicarbonate, and urea when consumed, to form a bolus. That bolus then moves from the mouth to the reticulum through a tube-like passage called the esophagus. Muscle contractions and pressure differences carry these substances down the esophagus to the reticulum.

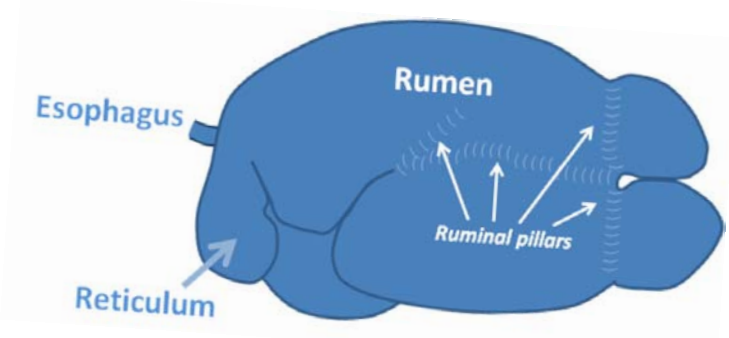

Figure 2.3: Left-sided view of ruminant digestive tract.

Ruminants eat rapidly, swallowing much of their feedstuffs without chewing it sufficiently (< 1.5 inches). The esophagus functions bidirectionally in ruminants, allowing them to regurgitate their cud for further chewing, if necessary. The process of rumination or "chewing the cud" is where forage and other feedstuffs are forced back to the mouth for further chewing and mixing with saliva. This cud is then swallowed again and passed into the reticulum. Then the solid portion slowly moves into the rumen for fermentation, while most of the liquid portion rapidly moves from the reticulorumen into the omasum and then abomasum. The solid portion left behind in the rumen typically remains for up to 48 hours and forms a dense mat in the rumen, where microbes can use the fibrous feedstuffs to make precursors for energy.

True ruminants, such as cattle, sheep, goats, deer, and antelope, have one stomach with four compartments: the rumen, reticulum, omasum, and abomasums. The ruminant stomach occupies almost 75 percent of the abdominal cavity, filling nearly all of the left side and extending significantly into the right side. The relative size of the four compartments is as follows: the rumen and reticulum comprise 84 percent of the volume of the total stomach, the omasum 12 percent, and the abomasum 4 percent. The rumen is the largest stomach compartment, holding up to 40 gallons in a mature cow.

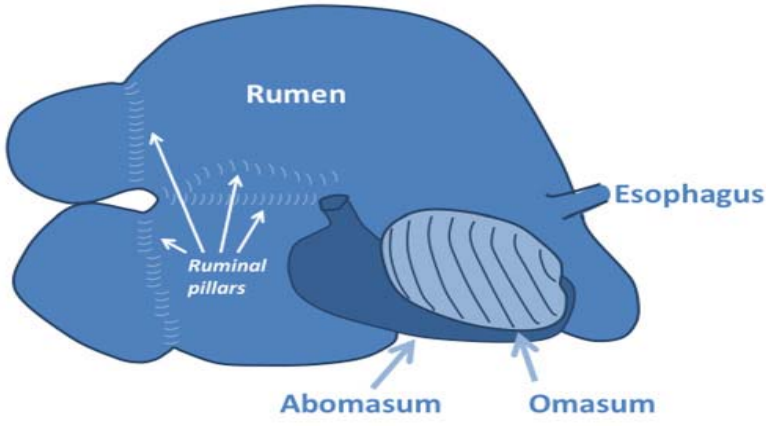

Figure2.4: Right-sided view of ruminant digestive tract.

The reticulum holds approximately 5 gallons in the mature cow. Typically, the

rumen and reticulum are considered one organ because they have similar functions and are separated only by a small muscular fold of tissue. They are collectively referred to as the reticulorumen. The omasum and abomasum hold up to 15 and 7 gallons, respectively, in the mature cow.

The reticulorumen is home to a population of microorganisms (microbes or "rumen bugs") that include bacteria, protozoa, and fungi. These microbes ferment and break down plant cell walls into their carbohydrate fractions and produce volatile fatty acids (VFAs), such as acetate (used for fat synthesis), priopionate (used for glucose synthesis), and butyrate from these carbohydrates. The animal later uses these VFAs for energy.

New born- (Rumen + Reticulum)*2= Abomasum

8th week- (Rumen + Reticulum) = Abomasum

12^{th} week- (Rumen + Reticulum)1/2 = Abomasum

The reticulum is called the "honeycomb" because of the honeycomb appearance of its lining. It sits underneath and toward the front of the rumen, lying against the diaphragm. Ingesta flow freely between the reticulum and rumen. The main function of the reticulum is to collect smaller digesta particles and move them into the omasum, while the larger particles remain in the rumen for further digestion.

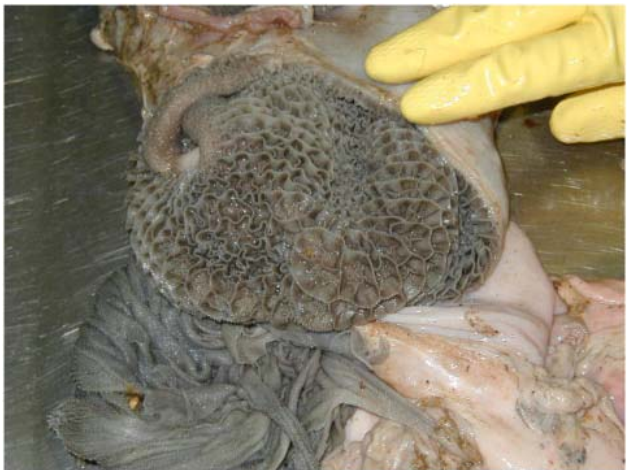

Figure 2.5: "Honeycomb" interior lining of the reticulum in an 8-week-old calf.

The reticulum also traps and collects heavy/dense objects the animal consumes. When a ruminant consumes a nail, wire, or other sharp heavy object, it is very likely

the object will be caught in the reticulum. During normal digestive tract contractions, this object can penetrate the reticulum wall and make its way to the heart, where it can lead to hardware disease. The reticulum is sometimes referred to as the "hardware stomach." Hardware disease is discussed in detail in Mississippi State University Extension Publication 2519 Beef Cattle Nutritional Disorders.

Figure 2.6: Interior lining of the rumen, revealing papilloe in an 8-week-old calft. (http://extension.msstate.edu/publications/publications/understanding-the-ruminant-animal-digestive-system)

The rumen is sometimes called the "paunch." It is lined with papillae for nutrient absorption and divided by muscular pillars into the dorsal, ventral, caudodorsal, and caudoventral sacs. The rumen acts as a fermentation vat by hosting microbial fermentation. About 50 to 65 percent of starch and soluble sugar consumed is digested in the rumen. Rumen microorganisms (primarily bacteria) digest cellulose from plant cell walls, digest complex starch, synthesize protein from nonprotein nitrogen, and synthesize B vitamins and vitamin K. Rumen pH typically ranges from 6.5 to 6.8. The rumen environment is anaerobic (without oxygen). Gases produced in the rumen include carbon dioxide, methane, and hydrogen sulfide. The gas fraction rises to the top of the rumen above the liquid fraction.

Figure2.7 Interior lining of the omasum, revealing the "many piles" tissue folds in an 8-week-calf. (http://extension.msstate.edu/publications/publications/understanding-the-ruminant-animal-digestive-system)

The omasum is spherical and connected to the reticulum by a short tunnel. It is called the “many piles” or the “butcher’s bible” in reference to the many folds or leaves that resemble pages of a book. These folds increase the surface area, which increases the area that absorbs nutrients from feed and water. Water absorption occurs in the omasum. Cattle have a highly developed, large omasum.

The abomasum is the “true stomach” of a ruminant. It is the compartment that is most similar to a stomach in a nonruminant. The abomasum produces hydrochloric acid and digestive enzymes, such as pepsin (breaks down proteins), and receives digestive enzymes secreted from the pancreas, such as pancreatic lipase (breaks down fats). These secretions help prepare proteins for absorption in the intestines. The pH in the abomasum generally ranges from 3.5 to 4.0. The chief cells in the abomasum secrete mucous to protect the abomasal wall from acid damage.

The small and large intestines follow the abomasum as further sites of nutrient absorption. The small intestine is a tube up to 150 feet long with a 20-gallon capacity in a mature cow. Digesta entering the small intestine mix with secretions from the pancreas and liver, which elevate the pH from 2.5 to between 7 and 8. This higher pH is needed for enzymes in the small intestine to work properly. Bile from the gall bladder is secreted into the first section of the small intestine, the duodenum,

to aid in digestion. Active nutrient absorption occurs throughout the small intestine, including rumen bypass protein absorption. The intestinal wall contains numerous "finger-like" projections called villi that increase intestinal surface area to aid in nutrient absorption. Muscular contractions aid in mixing digesta and moving it to the next section.

The large intestine absorbs water from material passing through it and then excretes the remaining material as feces from the rectum. The cecum is a large blind pouch at the beginning of the large intestine, approximately 3 feet long with a 2-gallon capacity in the mature cow. The cecum serves little function in a ruminant, unlike its role in horses. The colon is the site of most of the water absorption in the large intestine

2.3 Animal blood; functions of blood and components of blood

Functions of Blood

On the basis of the above description, the general functions of blood are:

(1) Transport of Food Materials.
(2) Transport of Respiratory Gases.
(3) Transport of Hormones.
(4) Transport of Excretory Matter.
(5) Transport of Heat.
(6) Defence against Infection.
(7) Temperature Regulation.
(8) Water Balance.
(9) Maintenance of pH.
(10) Helps in Healing.
(11) Maintenance of Physiological Cooperation.

Unit: 3

Mechanisms of large ruminant reproduction

A. Objectives

- To enable to know sexual cycle and hormone regulation.
- To enable to get knowledge about male and female reproductive system..

B. Content elaboration

3.1 The Male Reproductive System

Testes

The *testes* are the primary organs of reproduction in males, just as ovaries are primary organs of reproduction in females. Testes are considered primary because they produce male gametes (spermatozoa) and male sex hormones (androgens). Testes differ from ovaries in that al potential gametes are not present at birth. Germ cells, located in the seminiferous tubules, undergo continual cell divisions, forming new spermatozoa throughout the normal reproductive life of the male.

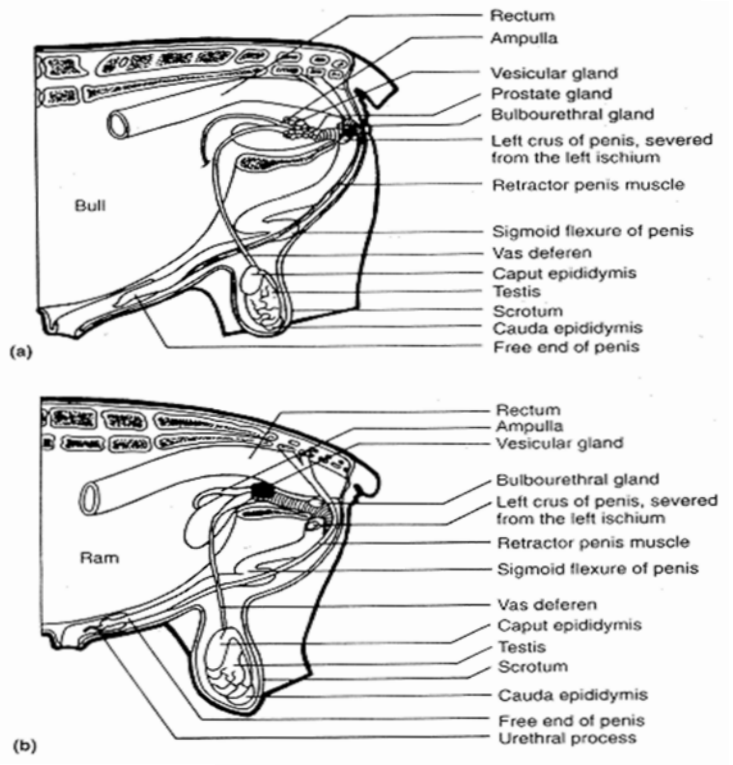

Figure 3.1 Diagram of the reproductive system of the (a) bull; (b) ram

Scrotum and Spermatic Cord

The *scrotum* is two-lobed sac which enclosed the testes.It is located in the inguinal region between the rear legs of most species. The scrotum has the same embryonic origin as the labia majora in the female.It is composed of an outer layer of think skin with numerous large sweat and sebaceous glands.This outer is lined is with a layer of smooth muscle fibers,the *tunica dartos,* which is interspersed with connective tissue. The tunica dartos divides the scrotum into two pouches, and is attached to the tunica vagimals at the bottom of each pouch.

The role of the scrotum and spermatic cord in temperature control of the testes .Two smooth muscles are involved.The *tunica darttos,*the smooth the spermatic cord,are sensitive to temperature.During cold weather,contraction of these muscles causes the scrotum to pucker and the spermatic cords to shorten,drawing the testes closer to the body.During hot weather,these muscles relax,peritting the scrotum to stetch and the spermatic cord to lengthen.Thus,the testes swing down away from the body These muscles do not rsepond to changes in temperature until near the age of puberty.They must be sensitized by testosterone to respond to changing ambient temperature.

Epididymis

The *Epididymis*,the first external duct leading from the testis,.The total length of this convoluted duct is about 34 meters in the bull and longer in the ram,boar,and stallion.The lumen of the cauda is wider than the lumen of the corpus.The structure of the epididymis and other external ducts (vas deferens and urethra is similar to that of the tubular portion of the female tract.The tunica serosa (outer layer)is followed by a smooth muscle layer (middle)and an epithelial layer(innermost).

- The epididymis serves to transport spermatozoa
- function of the epididumis is concentration of spermatozoa
- Epididymis is storage of spermatozoa
- Epididymis is that of maturation of spermatozoa

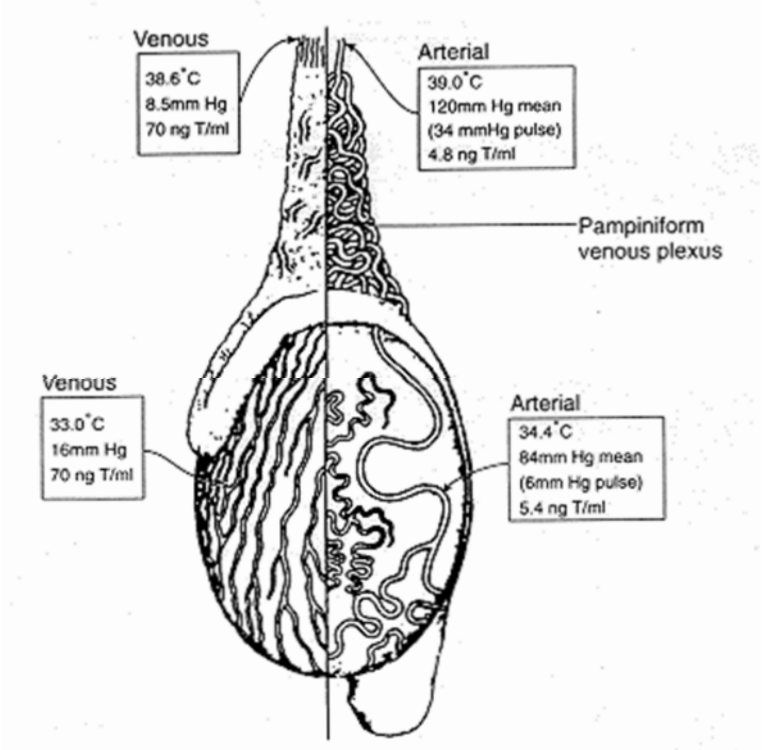

Figure 3.2 Cooling of the testis by heat exchange through the circulatory system

Vas Deferens and Urethra

The *vas deferens* are a pair of ducts with one leading from the distal end of the cauda of each epididymis. Initially supported by folds of the peritoneum,it passes along the spermatic cord,through the inguinal cannal to the pelvic region,

The urethra is a single duct which extends from the junction of the ampullae tothe end of the penis.It serves as an excretory duct for both urine and semen.During ejacualtion in bull and ram there is a complete mixing of spermatozoa concentrate from the vas deferens and epididymis with fluids from the accessory and boars,mixing is not as complete,with the ejaculate containing sperm-free and sperm-rich segments.

Accessory Glands

The *accessory glands*(Figure 3-6) are located along the pelvic portion of the urethra,with ducts which empty their secretions into the urethra.They include the *vesicular glands,*the *prostate gland* and the *bulbourethral glands.*They

contribute greatly to the fluid volume of semen.In addition,their secretions are solution of bufers,nutrients,and other substances needed to assure optium motility and fertility of semen.

Vesicular Glands

The vesicular glands (sometimes called seminal vasicles) are a pair of lobular glands that are easily that identiied because of their knobby appearance.They have been described as having the appearance of a "cluster of grapes." ,they contribute well over half of the total fluid volume of semen,and appear to make a substantial contribution in other species.Several organic compounds found in secretion of the vesicular glands are unique in that they are not found in substantial quantities elsewhere in the body.

Prostate Gland

The prostate is a single gland located around and along the urethra just posterior to the excretory ducts of the vesicular glands.A prostate body is visible in excised tracts and can be palpated in bulls and stallions.In rams,all of the prostate is embedded in urethra muscles as is part of this glandular tissue in bulls and boars.It makes a small contribution to the fluid volume of semen in mosr species stuided.however,some repory that the contribution of the prostate gland is at least as substatial as thet of the vesicular glands in boars.The prostate of the boar is larger than that of the bull.The secretions of the prostate are high in inorganic ions with sodium, chlorine, calcium, and magnesium all in solution.

Bulbourethral Glands

The bulbourethral (Cowpers)glands are a pair of glands located along the urethra near the point where it exits from the pelvis.They are about the size and shape of wanuts in bulls,but are much larger in boars.In bulls,they are embeded in the bulbospongiosum muscle.They contribute very little to the fluid volume of semen.In bulls,their secretions flush urineresidue from the urethra before ejaculation.These secretions are seen as dribblings from the prepuce just before copulation.In boars,their secretions account for that portion of boar semesn which coagulates.This strained from boar semen before it is used for artificial

insemination.During natural service,the white lumps formed by coagulation may prevent semen from flowing bak through the cervix into the vagina of sows.

Penis

The *penixl* is the organ of copulation in males(Figure 3-1).It forms dorsally around the urethra from the point where the urethra leaves the pelvis,with the external urethral orifice at the free end of the penis.Bulls,boars,and rams have a *sigmoid flexure,*an S-shaped bend in the penis which permits it to be retracted completely into the body.These three species and the stallion have *retractor penis muscles,*a pair of smooth muscles which will relax to permit extension of the penis and contract to draw the penis back into the body.These retractor penis muscles aries from the vertebrae in the coccygeal region and are fused to the ventral penis just anterior to the sigmoid flexure.The *glans penis*(Figure 3-7),which is the free end of the penis,is wwell supplied with sensory nerves and is homologous to the clitorisin the female(Chapter 2) In most species the penis is fibroelastic, containing small amounts of erectile tissue.The penis of stallions contains more erectile tissue is found in bulls,boars,bucks,rams.

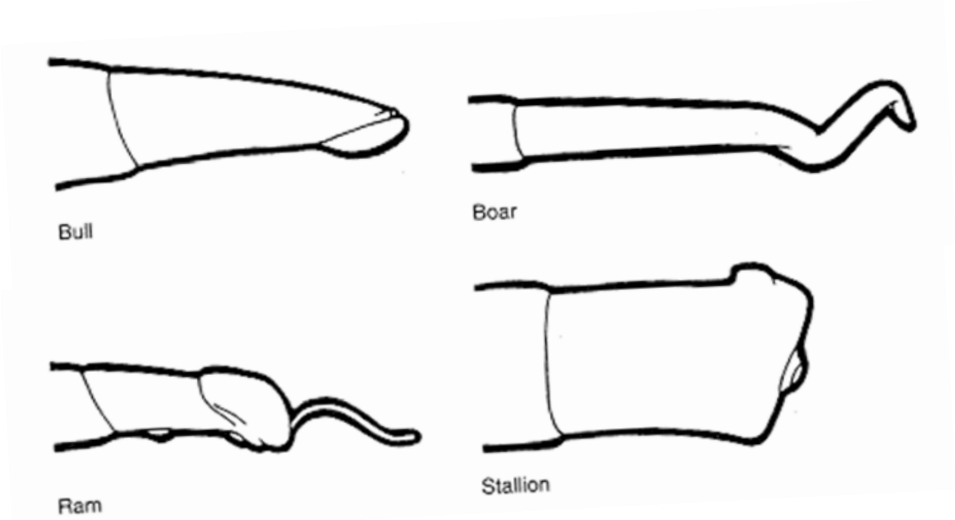

Figure 3.3Comparative diagram showing the shape of the glans penis of the bull, boar, ram. and stallion.

the final ejection of semen during ejaculation .Both the bulbospongiosum muscle and ischiocavernous muscle are striated,skeletal muscles,rather than the smooth muscle associated with most of the male and female tracts.

Prepuce

The *prepuce* (sheath)is an invagination of skin which completely enclosed the free end of the penis.It has the same embryonic origin as the labia minora in the female.It can be divided into a prepenile portion,which is the outer fold,and the penile portion,or inner folds.The orifice of the prepuce is surrounded by long and tough preputial hairs.

3.2 The Female Reproductive System

The female reproductive system,as illustrates for the cow in Figure 2-1,consists of two ovarians and the female duct system.The duct system includes the oviducts,uterus,cervix,vagina,and vulva.The origin of the ovaries is the secondary sex cords of the genital ridge.The genital ridges are first seen in the embryo as a slight thickening near the kidneys.The duct system originates from the *mullerian ducts,*a pair ducts which appear during early embryonic development. An overview of the organs of reproduction for the female and the major functions of these organs is shown in Table 2-1.

Ovaries

In the female animal, the embryonic indifferent gonad develops into the ovary without being subjected to the influence of the testicular-determining factor (TDF) or that of the müllerian-inhibiting factor. The ovaries have two major functions: To produce the female gametes (oöcytes, eggs) and to produce the sex hormones (estrogens).

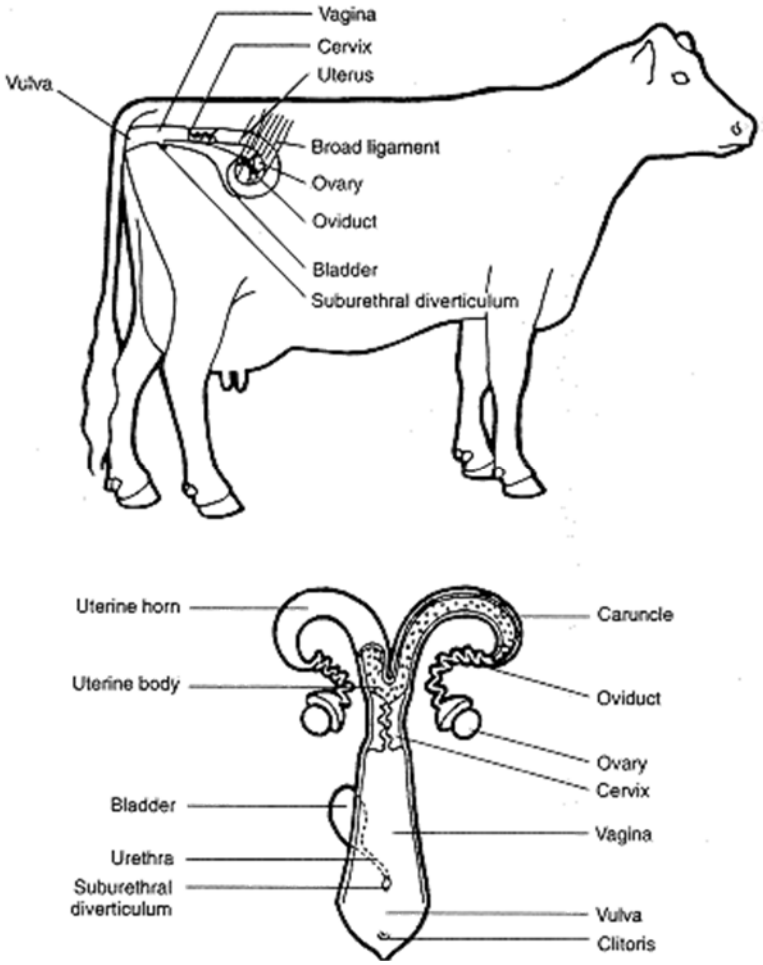

Figure 3.4 Reproductive system and associated parts of the urinary system of the cow as it appears in the natural state (top) and excised (bootom)

Oviducts

The oviduct derived from the parts of the müllerian ducts. And its functions is: Receives the ovum. The oviduct is very active at the time of ovulation. The opening of the infundibulum comes into contact with the surface of the ovary. An ovum that is released through a ruptured follicle is usually picked up by the fimbriae and directed into the duct

Uterus

This organ derived from part of the müllerian duct. It receives the sperms through the cervix and serves as the site for the development of the fetus.

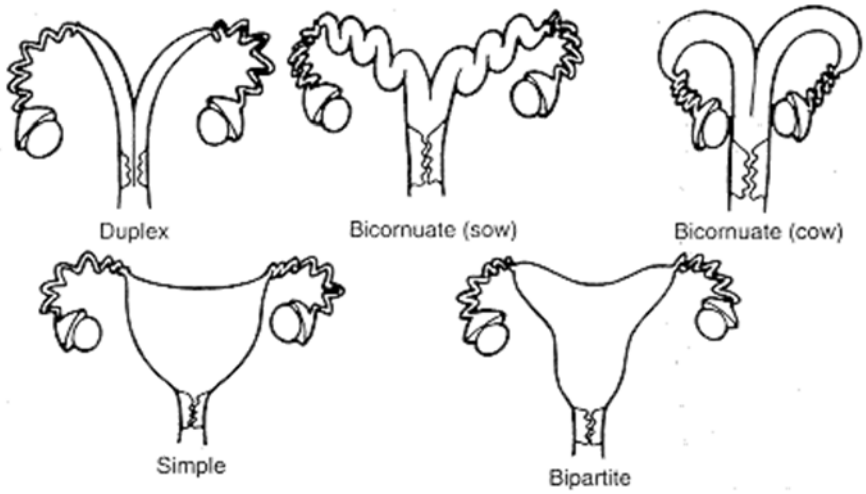

Figure 3.5 Basic types of uteri found in mammals.

The Endometrium

Functions Preparation for the implantation of the embryo

Cervix

The cervix is the channel through which sperms travel from the vagina into the uterine cavity. Through this channel also travels the newborn. On the other hand, pathogens can also enter the uterus via this route. The cervix is the neck of the uterus and is thick-walled, muscular structure. The mucosa may be thrown into prominent primary, secondary and tertiary folds.

Vagina

This is a fibromuscular tube with three layers: the mucosa, the muscularis and the adventitia

External Genitalia

Vulva

Two labia, covered by skin with sebaceous glands and fine hair. The dermis and hypodermis have a vascular plexus that becomes congested during estrus, especially in sows and bitches. In the hypodermis are skeletal muscle fibers of the constrictor vulvae.

Clitoris

Consists of a paired, joined erectile corpora cavernosa clitoridis, a rudimentary glans clitoris, and a preputium clitoridis. The clitoris is richly supplied with sensory and autonomic nerve endings.

3.3 Period of the Estrous Cycle

The period of the estrous are *estrous, metestrus, diestrus,* and *proestrus*. These periods occur in a cyclic and sequential manner, except for periods of *anestrus* (absence of cycling) in seasonal breeders such as the ewe,doe,and mare,as well as anestrus during pregnancy and the early postpartum period for all spercied.

Stages of the Estrous Cycle

- Proestrus
  - follicle enlarges
  - estrogen increases
  - vasularity of the female reproductive tract increases
  - endometrial glands begin to grow
  - estrogen levels peak
- Estrus
  - allows male to mount/ period of heat
  - estrogen decreases
  - LH surge occurs
  - ovulation 24-48 hr after surge of LH
  - uterine motility high with contractions moving toward oviduct
  - sperm transport is optimal
  - cervical mucus volume increases
- Metestrus
  - estrogen low
  - corpus hemorrhagicum present
  - ovulation in cow
  - uterus- Return to normal state

- contractions subside
- endometrial glands continue to grow and become coiled
- in cattle bleeding occurs

- FSH increases, triggering growth of follicles
- Diestrus
  - progesterone high
  - Longest phase of estrous cycle.
  - If pregnant- progesterone produce
  - If no pregnant- no progesterone
  - FSH low but increases at some point to cause growth of pre-ovulatory follicle
  - Uterus
    - secrets fluid but the volume of fluid decreases over time
    - contraction stop
    - corpus luteum regresses at the end of this period if female is not pregnant

Length of Phases of Estrus cycle in Different Animals Species:

Animal	Proestrus (days)	Estrus (days)	Metestrus (days)	Diestrus (days)	Total Estrus Cycle (days)
Cow	3	12-24 hours	3-5	13	18-24 (Av. 21 days)
Mare	3	4-8	3-5	6-10	19-23 (Av. 21 days)
Sow	3	2-4	3-4	9-13	18-24 (Av. 21 days)
Ewe	2	1-2	3-5	7-10	14-19 (Av. 17 days)
Bitch	9	4-13			1-4 cycles per year

Behavioral sign in estrus(Detection of Heat)

During estrus, animal shows some behavioral sign which are as follows;

a. Accepting mounting by other animal (standing heat), primary sign of heat/estrus.

b. Bellowing

c. Restlessness, however standing still when approached by other animal

d. Frequent urination

e. Vaginal mucus discharge(transparent and string like)

f. Pink vulva (due to hyperemia)

g. Reduce feed and water intake

h. Isolated from the herd and goes in search of male

i. Decreased milk yield in lactating animals

j. Slight rise in body temperature etc.

3.4 General Hormones affecting male and female reproductive system

Hormones	Source	Functions	
LUTEINISING HORMONE RELEASING HORMONE (LHRH)	Hypothalamus	● Pulsatile secretion of LHRH stimulates gonadotrophs in anterior pituitary ● Triggers release of luteinising hormone (LH) and follicle stimulating	
LUTEINISING HORMONE (LH)	Anterior pituitary (adenohy pophysis)	● Stimulates production of androstenedione and testosterone by theca interna ● Follicular granulosa cells utilise androgens in synthesis of oestrogen ● LH surge triggers ovulation	
FOLLICLE STIMULATING HORMONE (FSH)	Anterior pituitary (adenohypophysis)	● Stimulates development of follicular granulosa cells ● Upregulates granulosa cell LH receptor expression	
OESTROGEN	Preovulatory (Graafian) follicle	● Negative and positive feedback control of hypothalamic-pituitary function ● Stimulates: ● proliferation and cornification of vaginal epithelium ● increased vascular permeability ● neutrophil infiltration of vaginal epithelium and uterine	

		endometrium ● proliferation of endometrial stromal fibroblasts and epithelial cells ● hypertrophy of uterine myometrium	
PROGESTERONE	Postovulatory follicle (corpus luteum)	● Negative and positive feedback control of hypothalamic-pituitary function ● Stimulates: - mucification of vaginal epithelium - activation and differentiation of endometrial stromal fibroblasts - endometrial gland secretion - hypertrophy of uterine myometrium	
PROLACTIN	Anterior pituitary (adenohypophysis)	● Has both luteotrophic and luteolytic functions in the rat ● Vaginocervical stimulation triggers prolactin secretion by lactotrophs	
INHIBIN	Preovulatory (Graafian) follicle	● Negative feedback control of pituitary FSH secretion	

Unit: 4

Animal Breeding and Artificial Insemination

A. Objectives

- To be able to know Artificial insemination, its advantages and limitations, Insemination techniques
- To be able to get knowledge about Selection of animal and traits of selection, Systems of breeding

B. Content elaboration

4.1 Selection Methods

A. Performance Testing

A performance test is a measure of the phenotypic value of the individual candidate for selection. Accuracy of this estimate depends on the heritability of the trait, i.e., on the degree to which the genetic modified by the environmental influences. If heritability is 1.00 the performance test is an exact measure of the genetic value.

B. Pedigree selection

It is based on the fact that relative possess many of the same genes, thus an estimate of the breeding value of one animal provides some information about the breeding value of his relatives. It may be used to select animals for performance or progeny testing in a multiple stage selection scheme

C. Progeny Testing

It is a special form of pedigree evaluation where the parents are chosen on the basis of phenotype performance of their progeny. High accuracy when many progeny are obtained.

Criteria for choosing breeding animals

a. Choose healthy individuals free from serious genetic effects
b. Check the reproductive organs
c. Choose mature animals if good ones are available
    - Top progeny tested parents are best

- Parents of demonstrated top performance
- Progeny of outstanding proven parents
- Off springs with poor parents but above average grandparents and other relatives are usually no good prospects.

c. Choose unproven young animals from good parents in preference to below herd average candidates , since those below herd average have been proven to be poor risks as breeding animals

d. Good proven sires are often available to artificial insemination

4.2 Systems of breeding

It have been broadly divided into two

1. Inbreeding
2. Out breeding

Inbreeding

It is the mating of more closely related individuals than the average of the population. Inbreeding further divided into following groups

Close breeding: Mating of full sister to full brother. These type of mating should be used only when both parents are outstanding individuals, e.g. Sire to daughters, son to dam.

Advantages

- Progeny are more uniform than out bred progeny
- Undesirable recessive genes may be discovered and eliminated by further testing in this line

Disadvantages

- Progeny becomes more susceptible to disease
- Breeding problems and reproductive failure usually increases

Line Breeding

It means mating wider degree of relationship than those for close breeding. It promotes uniformity in the character. Half brother and sister or mating of animals more distantly related, e.g. Cousin mating.

Advantages

- Increased uniformity
- Dangers involved in close breeding can be reduced

Disadvantage

- If breeder will select animal for pedigree giving no consideration to real individual merit may results in a few generation which receive no benefits from selection.

Out Breeding

It is the breeding of unrelated animals and this involves the following types of breeding:

Out crossing: it is the practice of mating of unrelated pure bred animals

Cross breeding is the mating of animals of different breeds. Methods of cross breeding are criss- crossing, triple crossing, and back crossing.

Species hybridization

Species and chromosomes		Number	Reproductive Ability
E.g. Sire	×	Dam	
Ass (donkey)		Domestic horse	Sterile
Domestic goat		Barbary sheep	Full term fetuses, but no live hybrid
Domestic horse		Ass (donkey)	M sterile, female fertile (exceptional case)

Grading up

It is the practice of breeding sires of a given bred to no-descript and their offspring for generation after generation.

Percent replaced of offspring

Generation	Percent replaced of offspring
1st	50
2nd	75
3rd	87.5

4th	93.75
5th	96.87
6th	98.44
7th	99.22

From this table, we can see that the offspring come closer to a 100% improved breed as we go on grading.

Advantages

- It helps to prove the potentialities of the sire and adds to its market value.
- It is a good start for new breeders who can slowly change over to pure breed systems.

4.3 Artificial Insemination (AI) its advantages and limitations

Artificial insemination (AI) is the deposition of semen in the cervix by the artificial means. It is a useful technique devised for the genetic improvement of farm animals. Artificial insemination is widely used for breeding cattle, buffaloes, sheep, goats, horses, dogs and a variety of laboratory animals.

Advantages of artificial insemination

The greatest advantage of artificial insemination is the opportunity to spread superior germ plasm by the wide use of carefully tested and selected sires. On average, a bull can sire 50,000 progeny per year through artificial insemination compared to 40 - 50 progeny through natural mating.

Artificial insemination plays an important role in the control of various diseases, particularly the venereal diseases disseminated by natural mating. It helps to maintain complete and accurate breeding records, leading to better herd management and the identification of infertility problems. Artificial insemination is more economical than natural mating. The mating of animals of different sizes becomes possible without any accidental injury. Artificial insemination extends the usefulness of sires of high genetic merit which for physical reasons are unable to copulate normally.

Limitations of artificial insemination

There are few disadvantages of artificial insemination even if it is properly

performed. The major limitations are due to lack of trained personnel to provide proper service. Poor breeding efficiency may occur in herds when owners do not watch their animals closely for estrus and the inseminator does not breed them at the proper time. The inseminator may be, if not careful, a means of spreading infections from one herd to another. Herd owners should avoid intensive use of a limited number of sires, which may increase inbreeding in the herd. Increased inbreeding is usually associated with low fertility and decrease in vigor and overall productivity.

4.5 Insemination Techniques

Semen and its collection

One of the most important steps in an artificial insemination program is the collection of semen and its proper handling. The following methods are used for the collection of semen from bulls.

- Artificial vagina method
- Massage Method
- Electro-ejaculation method

The best procedure and practical method for collecting semen is with an artificial vagina. Various sizes and shapes of artificial vagina are used, but all consists of a heavy rubber cylinder with a rubber lining inside. This enables a clean, complete ejaculate to be collected in the glass tube fitted on the lower end of the artificial vagina.

In the massage method, the operator's hand is inserted about 10 inches into the rectum of the bull. The vesicular glands are picked up with the fingers by carefully feeling the rectal wall. They are then massaged gently causing a slightly turbid fluid to appear which cleanses the path for semen. Then the operator massaages the ampulla of the vas deferens until the sperm containing semen appears. The semen is collected in a test tube placed in front of the sheath.

Electro-ejaculation is the method used for males that refuse to serve the artificial vagina or when injuries makes this impossible. A rectal probe with either a ring or straight electrode is used to provide the necessary electrical stimulation.

After the semen is collected, it is evaluated for quality (live and dead sperm, motility etc) and diluted with suitable extenders (diluent). Then it is stored in liquid form in the refrigerator at 5 Degrees Celsius or in frozen form in liquid nitrogen at -196 Degrees Celsius.

Insemination procedure

Detection of heat (estrus) of the female is the first step. When a female is found to be in heat, the inseminating rod is passed through the spiral folds of the cow's cervix by the recto-vaginal technique. Part of the semen is deposited in the uterus, just inside the cervix, and the remainer in the cervix while the rod is withdrawn. Extra care must be exercised in the case of those animals that have been inseminated previously. If pregnancy is suspected in an animal, insemination should not be repeated.

Spermatozoa can survive in the genital tract of a cow or buffalo for a little over 24 hours. The egg has a short survival time, about 6 hours at the most. Optimum fertility is obtained when inseminations are performed 13-18 hours before ovulation. Reasonably good results are obtained even during the period 7-12 hours before ovulation. The cows should be checked twice daily with a teaser bull to detect estrus. As a rule of thumb, cows showing estrus in the morning should be bred the same day in the afternoon, and cows showing estrus in the afternoon should be inseminated the next morning.

Unit: 5

Common cattle & buffalo breeds & their characteristics

A. Objectives

- To be able to familiar with Indigenous and exotic breed of cattle and buffalo.

B. Content elaboration

5.1 Introduction

a. Breeds of cattle

The existing two main groups of bovidal are:

- *Bos indicus* (Indian and African cattle: indigenous cattle): eg. Zebu cattle
- *Bos Taurus* (European: exotic cattle): eg. Jersy, Holstein-Friesian, Ayresire and Brownswiss

Indigenous zebu cattle (*Bos indicus*) or humped cattle might have been produced either in south or south west Asia. The zebu is characterized by:

- Presence of prominent large hump
- A long face
- Upright horns
- Drooping ears
- A large dewlap and slender legs

Bos taurus found in Europe and North America is all non-humped cattle.

b. Indigenous cattle breeds

Some production and morphological parameters of indigenous breeds of cattle

Breeds	age at 1st calving (mths)	Calving interval (days)	Milk yield (lits/day)	Adult weight (kg)		Body length (cm)
				male	female	
Terai	53	410	1-1.5	250-300	150-200	107
Pahadi	50	530	1.0-1.5	200-250	120-160	102
Lulu	40-60	365-730	0.25-2.5	150	125	87
Acchami	42-60	250-480	0.5-1.5	100-120	150	90
Siri	48-55	365-547	4-6	300-350	200-300	116
Yak	48-72	547-730	0.9	225-400	220-360	84

Lulu

Lulu is a small sized *Bos taurus* cattle found in mountain districts- Manang, Mustang and Dhaulagiri. Colour varies from black to white. Ear is straight with an average length of 14 cm. The calving interval is more than 2 years and calf mortality is high.

Achhami

These are mostly found in Accham district of Seti zone. They are popular for high yield in compare to their body weight. Body condition varies from black and white. Ear is straight with an average length of 17cms.

Siri

Siri cattle are black and white in colour. Well developed udder and larger than pahadi cattle. They have flat forehead, small ears and sharp horns projecting forward and slightly upward. Body colour varies from black to white i.e black, brown, grey, white, spotted black and white.

Terai

It is hump type cattle. Multipurpose use: milk, manure and draft. Females are poor milk yielders and males are good animals for transport and ploughing the land. Coat color is White or red but mixed color is also available. It is located in Terai region of Nepal and suitable for tropical and subtropical region. The age at first calving is 53 months with calving interval of 1.12 years. Milk yield is 1.0-1.5 liters a day.

Pahadi

This is a zebu cattle raised in milk hills of country ranging from 1000-2000 masl. Although, the breed is low milk yielder (460+/- 97 liters per lactation), the cattle are resistant to most disease and external parasites except contagious ones. Body color varies from black to white i.e. black, brown, grey, white, spotted black and white. Males are good draft animals. The age at first calving is 50 months, calving interval is 1.45 years.

Yak/Nak/Chauri

The hairy animals are alpine cattle raised from 3000-5000 masl and are found in Nepal, Tibet, Mangolia, Russia and India. Male is called Yak, female-Nak and

Crossbred-Chauri, Jhopkyo, Dimjo and Urang. The optimum temperature for maintaining yak is 0^0C to 10^0C although yak can thrive far below freezing point. It looses abut 25% summer body weight in winter and early spring due to extreme cold weather and limited available feeds. These animals are popular for producing milk, milk products and meat in the mountains, and castrated males are used for transportation and draft power in the remote mountains. Chanwar has religious value while hair is used to produce ropes and blankets.

Body color varies from black to white. Ear is straight. Tail having swampy switch. Its temperament varies from docile to wild. Generally Nak is not milked for the first two months after calving in order to make its calf healthy. The milk production varies from 220 Kg to 720 Kg in the lactation period of 150-180 days. Total yak/nak population is estimated ot be around 8500 in the Himalayan belt of the country. Their calving interval is about 1.53 +/- 0.48 years.

In Nepal Yak, Nak and Chauri are found in the following districts

Taplejung, Sankhuwasabha, Tehrathum, Bhojpur and Solukhumbu of Eastern Development Region

Dolakha, Ramechhap, Sindhupalchowk, Rasuwa and Dhading of Central Development Region

Gorkha, Manang, Baglung and Mustang of Western Development Region

Rukum, Dolpa, Jumla, Mugu and Humla of Mid-Western Development Region

Bajura, Bajhang and Darchula of Far-Western Development Region.

B. Exotic Breeds of cattle

a. Hariyana:

- Hariyana is an Indian dual type of cattle characterized for both milk production and drought purpose.
- Bullocks are powerful animals and good for transport and rapid ploughing. Cows are fairly good milkers

Distinguishing Characters

- Small had with long, narrow faces from which emerge short and somewhat

horizontal horns which grow longer and curve upwards and inwards in bullocks.

- Long and compact barrel.
- Legs are sturdy and long with well-shaped hoofs.
- Thin and short tail.
- In cows udder is well developed with prominent teats.
- These are generally white or light grey in color**.**
- Average milk production is 5-6 liters per day.

b. Sahiwal

- It is a milch breed of cattle. Average milk yield is about 2150 lits in 300 days of lactation period.
- Loose skin (hence named lola), short legs, stumpy horns, broad head.
- General colors are various shades of red, pale red and dark brown splashed with white.
- Horns are short and thick, do not exceed 3 inches.
- Massive hump (in male), voluminous dewlap and pendulous sheath.
- Long tail almost reaching to the ground, tapering to a good black switch.
- Navel flap is prominent in female.
- Males weight about 340 kg.

c. Jersey (*Bos Taurus*)

- It is a dairy cattle originated in Island of Jersey in England.
- It is a good milk yielder having the highest fat percentage.

Distinguishing characters

- Straight top lines, sharp wither.
- Heads have a double dish.
- Coat color generally fawns with or without white markings.
- Can withstand tropical and humid climate more than Holstein-Friesian.
- Animals are inclined to be nervous and sensitive.
- Bulls are often vicious.

- These animals are capable of utilizing roughages efficiently.
- A male weighs about 675 Kg and females weight about 450 Kg.
- Average milk production is 4000 liters/lactation of 305 days with fat percentage of 5.5.

d. Holstein (*Bos Taurus*)

- It is exotic dairy cattle originated in Holland and is popular for high milk production.

Distinguishing characters

- It is black and white patched, hump less, comparatively big animal having long leg with large feeding capacity and udders.
- Head is long, narrow and straight with slightly rounded withers.
- A male weighs about 1000 Kg and females weigh about 675 Kg.
- Average milk productions is about 6150 liters/lactation of 305 days with 3.5 fat percentage.

e. Ayrshire (*Bos Taurus*)

- It is regarded as hardy breed of dairy cattle, originally found in Ayrshire, a county of Scotland.
- It is slightly bigger than Jersey and smaller than Holstein.

Distinguishing Characters

- Straight top lines. Good udders.
- Long horns which are turned upwards.
- They have shorter and thicker neck in comparison to other breeds.
- Animals are over active and difficult to manage.
- A male weighs about 850 kg and females Wight about 550 Kg.
- Average milk productions is 4840 liters per lactation of 305 days with 4.1% fat.

f. Brown Swiss (*Bos Taurus*)

- This is also an exotic breed of cattle introduced mainly to upgrade Nak and local cows of hills and mountain districts.
- This breed is mostly concentrated in Dolakha district as it is farmed at Jiri

livestock farm.

- It is a multipurpose breed and originated in Switzerland. Breed is used for transport, milk and beef in Switzerland.

Distinguishing Characters

- Large heads, which are usually dished and thick loose skin.
- Animals are not angular as those other dairy breeds. Quite docile and easily manageable. More heat tolerant than Jersey. A male weighs about 900 Kg and female weighs about 625 Kg.
- An average milk production is 5250 liters/lactation of 305 days with 4.1 fat percentages.

C. Indigenous buffalo breeds

There are three indigenous breeds of buffalo in the country that have been identified and characterized so far. Among them gaddi is the largest and lime is the smallest. They are lime, parkote and gaddi. All identified indigenous buffaloes in the country are riverine with 25 pairs of chromosomes.

Some production and morphological parameters of indigenous breeds of buffalo

Parameters	Lime	Parkote	Gaddi
Age at 1st calving(yrs)	5	5	5
Calving interval(month)	20	20	
Milk yield(l/day)	2-3	2-3	2-4
Adult weight(kg)	300-325	325-350	375-450
Body weight(cm)	125cm		141cm
Wither height(cm)	118	124	131

Lime

- Found in low mid hills and are average milk yielders
- Grey in colour. The skin colour shades from whitish brown to grey.
- Eye brows are brown

- Has a typical character with a chevron of grey or white hairs below the jaw and around the brisket
- Has a whitish colour as the leg markings below the knee
- Small sickle shaped horns curved towards the neck.

Gaddi

- Black colour with white round patches on forehead.
- Long face and flat head
- Horns- long half curved
- Found in the far western hills

Parkote

- Scattered from low to high hills, found predominantly in the mid hills
- Long face and flat head
- Horns are sword shaped directed towards the back of the body
- Temperament is semiwild

D. Exotic Breeds of Buffalo

a. Murrah

- **Origin:** Punjab, Haryana and Union territory of Delhi (India)
- Noted for milk production. Average lactation yield is 1400-1800 liters with a fat percentage of 7.0 in a lactation period of 9-10 months.

Distinguishing Characters

- Small and clean head. Forehead slightly prominent.
- Short horns, flat and turning backwards, upwards and curling inwards in a spiral form.
- Body massive, long and deep. Prominent well developed udder and good sized teats.
- Long tail with white switch reaching to the fetlock.
- Adult weight is about 400-450 kg.
- Popular coat color is jet black with white markings on tail, face and extremities.

b. Jaffarabadi

- **Origin:** Located in the purest form in the Gir forest of Kathiawar especially towards Jaffarabadi in India. Heavy milkers.

Distinguishing Characters

- Heavy head, bulging and prominent forehead.
- Broad, flat horns droppings on each side of the neck and turning up at the points with a loose curve.
- Body is wedge shaped.
- Udder is large and well developed.
- Usually black in color, with white patches on face and legs.

c. Nili Ravi

- **Origin:** Montgomeri district of West Pakistan and Ferozepore district of Punjab

Distinguishing Characters

- Heavy body. Males are commonly used for heavy draft and females are heavy milkers.
- The average milk is 1600 liters in a lactation period of 250 days.
- The usual color is black with white markings on forehead, face, muzzle, legs and switch.
- Tail is long, almost touching the ground.

Unit: 6
Routine dairy farm operations

A. Objectives

- To be familiar with handling, transporting, casting of cattle and buffalo.

B. Content elaboration

6.1 Handling, transporting restraining and casting of cattle and buffaloes

Following care must be taken in handling and approaching animals for avoiding excitment, fear and accidents

- Never approach the animal suddenly and abruptly. Let the animal know your presence that is being approached.
- Approach the animal from left side
- Pat the animal gently
- Never go too near the head
- Use words familiar to the animals
- Animal must be thrown on the ground on its right side of body because rumen is present on left side, which otherwise upset the digestion of food
- The ground where the animal is thrown must be free of hard objects like stones and pulverized and made soft
- Nervous or highly exictable animals of vicious nature may be administred tranquilizers to calm them.

I. Throwing/Casting

Casting can be done with an inch rope preferably of cotton which is softer and more pliable than hemp. The rope should be 40-50 ft long, depending on the size of the animal.

a. Rope squeeze method/ Reuff's method

A loop is made around the animal's neck or horns using a bow-line knot. The free end of the rope is thrown over the back to the opposite side. The end thrown over the back to the opposite side. The end is picked up and brought around the body

and under the standing part of the rope near the bowline to fowl a half hitch just behind the shoulder. Another half hitch is made by tossing the end of the rope over the animal's back infront of the udder or prepuce. By pulling steadily on the free end of the rope, the animal falls to the ground, usually on the opposite side from the way the head is turned. The animal should always be casted (heavily pregnant animal should never be cast) on a large well strawed yard or grassed areas. Have plenty of help at hand.

b. Burley's Method

A 12-15 m long rope is doubled and its centre is placed over the withers of the animal. The ends of the rope are carried between the forelimbs and crossed at sternum. One end is carried up each side of the animal's body and the ends are again crossed over the back. The ends are now passed between the medical surface of the rear legs. The ends of the rope are pulled to cast the animal. The tail is pulled inside the leg at is held at the flank region. The head is held firmly and the hind and forelegs are tied separately to avoid any pressure on the thorax and injury to the leg.

II. Restraining

a. Tail restraint

Both hands are kept close to the base of the tail, and the tail is raised upwards without causing any injury. The operator should stand to one side to avoid kicking by the cow.

b. Nose lead

It is applied at the nose of the animal and then the nose is pulled and tied to the pole, if needed.

c. Manual restraint of head

The nasal septum is firmly grapsed with the thumb and forefinger with one hand and horn or ear with the other.

d. Ear twitch

A loop is formed around the horns and the rope is carned around the ear and the end of the rope is passed under the standing part to form a half hitch. The end of the rope is then pulled to apply restraint.

e. Milking restrant

A rope about 1m in length is tied to the hind limbs above the hock by crossing its ends.

6.2 Weighing and identification of farm animals

Measurement of live weight of animals becomes essential to check growth of young stock, to breed heifers at optimum time, to compute rations, to cull dairy calves, to calculate drug dosages and to estimate quantity of meat at slaughter.

Live weight of small animals such as sheep, goat, pigs and poultry birds can be known by weighing them in a weighing balance however; measuring weight of large animals such as cattle and buffalo is not possible through the balance. In some developed country weight of large animals is measured through a platform balance but more often their weight is calculated through the following formula:

1. Live weight in pound = $\frac{\text{Length in inches x (Girth in inches)}^2}{300}$

   Length in inches = Distance between point of shoulder and point of pin bone

   Girth in inches = Circumference of chest just behind elbow.

2. Aggarwal's Modified Shaeffer's Formula

   Live weight in seers = $\frac{\text{Girth in inches x Length in inches}}{9 \text{ or } 8.5 \text{ or } 8}$

   When girth is less than 65 inches – divide by 9.0

   When girth is between 65 – 80 inches – divide by 8.5

   When girth is over 80 inches – divide by 8.0

   Note: A seer is equal to 0.93 Kg

3. Mullick's Formula for Buffalo

   $X = 25.156 (Y) – 960.232$

   Where X = Body weight in pound

   Y = Girth in inches

6.3 Dentition and Determination of Age of Animals

In animal teeth serves as organs of prehension, mastication, weapons of offence and defense.

There are three types of teeth in mammals:

Incisors – Central, laterals and corners pairs of incisor teeth are located in the front of the mouth, are broad and sharp used for cutting grass. They are present only in the lower jaw of cattle, buffalo, sheep, and goat. The incisors are prehensive organs in the ruminants. In these ruminant animals incisor are absent in the upper jaw and instead hard dental pad is present.

Canine – Canine teeth are sharp, pointed small teeth located behind the incisors and are used for gripping and ripping. In the ruminants these are present only in the lower jaw and moved forward to function as incisors. In carnivorous and omnivorous animals canines are located behind the incisors and are used mainly for fighting purposes.

Premolar and Molar (Chick Teeth) – These are largest, strongest, broad, flat teeth with grinding surface located in sides of the jaws and used for grinding. These are 24 in number (six on each side of the jaw- right upper, lower and left upper, lower). The anterior 3 of these 6 teeth are premolars and the posterior 3 are molar.

Dental Formulae are as follows

Dental Formulae in Different Animals

Animals/ Teeth	Cattle/Buffalo	Sheep/Goats	Pigs	Dog	Horse
Deciduous/ Temporary (Milk Teeth)	2(DI0/4 C0/0 DP3/3) = 20	2(DI0/4 DC0/0 DP3/3) = 20	2(DI3/3 DC1/1 DP4/4) = 32	2(DI3/3 DC1/1 DP4/4) = 32	2(DI3/3 DC0/0 DP3/3) = 24
Permanent	2(I0/4 C0/0 P3/3 M3/3) = 32	2(I0/4 C0/0 P3/3 M3/3) = 32	2(I3/3 C1/1 P4/4 M3/3) = 44	2(I3/3 C1/1 P4/3 M2/3) = 40	2(I3/3 C1/1 P3or 4/3 M3/3) = 40 or 42

Cattle/Buffalo: In cattle and buffalo four pairs of incisors (milk teeth) are present in the front of the lower jaw at birth.

At 1 year 6 months the central pair of temporary incisors will be dropped.

At 1 year 10 months the central pair of permanent incisors will be appeared.

At 2 year 6 months second pair of permanent incisors will be appeared.

At 3 years third pair of permanent incisors will be appeared.

At 3 years 6 months fourth pair of permanent incisors will be appeared. Then it is known as full mouth

At 2 to 2 ½ years the first chick tooth (P1) is erupted

At 1 ½ to 2 ½ years the second chick tooth (P2) is erupted

At 2 ½ to 3 years the third chick tooth (P3) is erupted

At 5 to 6 months the fourth chick tooth (M1) is erupted

At 1 to 1 ½ years the fifth chick tooth (M2) is erupted

At 2 to 2 ½ years the sixth chick tooth (M3) is erupted

5 Years: Teeth are slightly worn along the cutting edges and they occupy more or less crowded position.

6 Years: (Surface wear reaches half way across the crown). A portion of root s exposed. About half the length of the crown has worn.

10 Years: Greater part of the crown has worn.

12 -14 Years: Only the stump of the teeth remains. These are widely separated from each other.

16 Years: Stumps of the teeth becomes close together.

Modified Eruption Chart (Cattle)

S.N	Time of ERUPTION	INCISORS
1.	Birth to one month	All 8 temporaries
2.	2 Years	1st pair permanent
3.	2 years 6 months	2nd pair permanent
4.	3 years	3rd pair permanent
5.	3 years 6 months-4 years	4th pair permanent

S.N	Time of Eruption	Incisors	Molars
1.	Birth to one month	All 8 temporaries	All 12 temporaries
2.	6 months	…	4th permanent

3.	1 year 6 months	…	5th permanent
4.	2 years	1st pair permanent	6th permanent
5.	2 years 6 months	2nd pair permanent	1st and 2nd permanent
6.	3 years	3rd pair permanent	3rd permanent
7.	3 years 6 months to 4 years	4th pair permanent	….

6.4 Grooming, dehorning/disbudding of cattle and buffaloes

Introduction

Horns are the pairs of hard, bonelike, permanent growths projecting from the heads of cattle. They grow from a unique area of skin cells at the base of the horn. At about two months of age, horns become attached to the frontal bone of the skull beneath the horn bud. As the horn grows and attaches to the skull, this frontal sinus joins into the adjacent portion of the horn. Dehorning or disbudding is the process of removing or stopping the growth of the horns of livestock often done for economic and safety reasons. It is labor-intensive, skilled operation with important animal welfare implications. The younger that cattle are dehorned, the better both for the calf and the operator. Young calves suffer less pain and stress, have less risk of infection and have better growth rates. They are also much easier to handle and restrain. The dehorning instrument used will depend on the age of the calf:

- Hot iron: under two months old
- Dehorning knife: 2-3 months old
- Scoop dehorners: 2-6 months old
- Cup dehorners: 2-6 months old

Animals over six months old

- Surgical wire: horn tipping only
- Tippers: horn tipping only
- Horn saw: horn tipping only

Advantages

- Horns may cause injuries to handlers or other cattle.
- Horned livestock take up more space.

- In some breeds and in some individuals, horns may grow towards the head, eventually causing injury.
- Horns may become broken, causing blood-loss and potential for infection.
- Horned livestock may become trapped in fences or vegetation.

Disadvantages

- Horned livestock are better able to defend themselves and their youngs from predators.
- Horns provide a secure point for roping or holding the animal's head.
- Horns are traditional in some breeds and breed standards may require their presence.
- In some areas horns are of cultural significance. Often being decorated or even trained into strange shapes.

Dehorning Methods

I. Cauterization

It is the process of killing the growth ring of the horn using heat. This process is done when the calf is very young, no more than three or four weeks old- that way the horns are not very big and have not had time to grow attached to the skull. Hot iron dehorners are available. The head of the iron is hollow circle and fits over the horn bud. Proper application of the hot iron will destroy the horn producing skin at the base of the horn

Technique

- Administer sedation, analgesia and local anaesthetic.
- Preheat the dehorning iron to a red colour.
- Hold the calf's ear out of the way to keep it from being burned
- Place the tip of the burner over the horn and apply slight pressure. When the burning hair begins to smoke, slowly rotate the dehorner by twisting your wrist.
- Continue the application of heat for 10-15 seconds. Do not leave the dehorner in place for much longer, especially in young calves. Heat can be transferred through the thin bones of the skull and damage the calf's brain.

- Dehorning is complete when there is a copper coloured ring all the way around the base of the horn.
- The horn bud or button will slough off in 4-6 weeks.

Fig6.1 An electric hot-iron dehorner will destroy the horn-producing skin at the base of the horn bud.

II. Dehorning spoons or tubes

Dehorning spoons or tubes provide a quick and efficient technique for removing horn buds in calves less than eight weeks of age. With this method, a sharpened metal tube cuts through and removes the horn-producing skin at the base of the horn bud. Use the proper size tube to remove the horn plus about 1/8 inch of skin around the entire horn bud.

Technique

1. Administer sedation, analgesia and local anaesthetic.
2. Select the correct size tube (4 sizes available) to fit over the horn bud, and cover about 1/8 inch of skin around the horn base.
3. Place the cutting edge straight down over the horn.
4. Apply pressure to the tube; push and twist the tube until the skin has been cut through.
5. Cut under the horn bud and remove it, using a scooping motion.
6. Apply an antiseptic to the wound. Some bleeding may occur.
7. Clean and disinfect the cutting edge of the tube between calves.

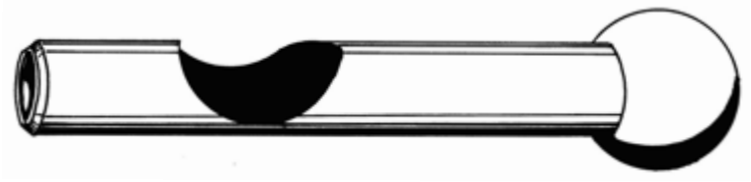

Figure 6.2 A dehorning spoon or tube is used to remove the horn bud plus the horn-producing skin at the base of the bud.

III. Chemical dehorning

Caustic chemicals will prevent the growth of horns when properly applied to the horn buds of new-born (less than one to three weeks of age) calves. The chemical destroys the horn-producing cells around the horn bud.

Technique

- Administer sedation, analgesia and local anaesthetic.
- Expose the horn bud (about the size of a 5-cent piece) by pushing the hair back.
- Apply the caustic to the horn button. Use a wooden applicator. Apply a thin layer.
- Re-position the hair over the paste and horn bud - i.e., cover the horn bud.
- Although the package insert may instruct operators to clip hair at the horn bud, experienced operators have shown that not clipping hair is preferable, because the hair keeps the caustic in place, reduces the risk of irritation to the cows udder and flanks and reduces irritation to other facial skin of the calf.
- Protect the calf and the cow from accidental caustic burns. One method is to place a patch of duct tape over each horn bud. The duct tape usually falls off in a few days. For dairy calves, keep in individual pens.
- In some countries, the technique is only permitted in calves less than eight days of age.

IV. Horn tipping

For mature cows that are not dehorned when they were young, it is a common practice to just cut off the pointes end if the horn. This practice is called horn tipping; it is less stressful on the cows because there is no blood loss and the horn is cut off where there is no longer any nerves endings. This practice does not eliminate the bruising damage done by the horns when cows fight, but it does eliminate the risk of puncture wounds and eye loss from pointed horns. If adult cattle are dehorned, it is usually done using local anesthetics (corneal nerve block).

After Care

Dehorning and disbudding are surgical procedures. Calves require observation and

aftercare following the surgery.

- Observe closely for bleeding for 30-60 minutes after dehorning.
- When bleeding is present, cauterize with a hot iron to stop the bleeding.
- Wounds usually heal well with no treatment.
- A fly repellant and a wound dressing are often recommended.
- For 10-14 days after dehorning, look for signs of infection and treat as needed.
- Get professional help for calves showing severe pain or infection.

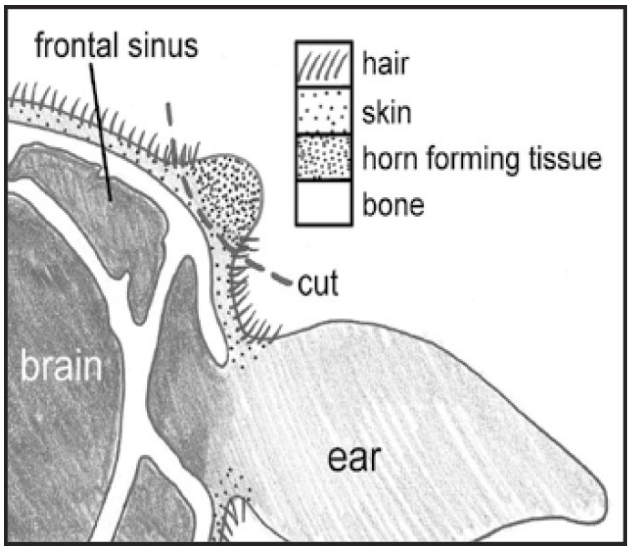

Figure6.3: Anatomy of growing horn

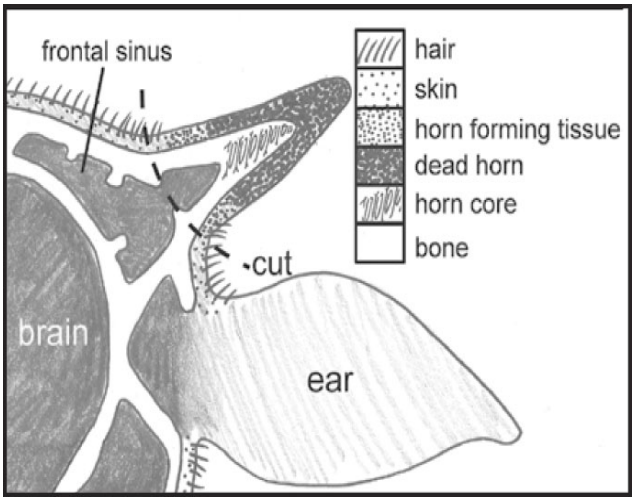

Figure6.4: anatomy of horn of older calf

6.6 Castration and ducking

Introduction

Castration essentially means depriving animals of its gonadal function either by removal or dysfunctioning of essential reproductive organs in male and females. Optimum time and age for castration of male:

Time: any part of the year

Age: a. bloodless castration: 4-6 mths

b. incision method: 8-9 mths

Methods of castration

A. Bloodless method(closed method of castration)

a. Burdizzo's castrator method

- In recumbent position, scrotum is palpated and cord is pushed firmly against the side of the scrotum.
- Burdizzo's castrator is adjusted in such a way, so as to crush the entire cord and only the necessary portion of scrotum. The castrator should not be extended across the median septum of the scrotum.
- Each side should be crushed twice at a distance of about 1cm so as to ensure proper crushing of the cord.
- The operated area should be painted with tincture iodine.
- Watch the animal for few days for any infection.

b. Rubber ring method

- Age: less than 3wks age
- Secure the calf and make it lie down on the side of clean floor.
- With the help of elastator place a tight rubber band over the spermatic cord little above the testes. The testes will get dissolved and absorbed, the rubber band slips and falls on the ground.

B. Incision method (open method)

a. Control and anaesthesia

The bull should be controlled in lateral recumbency, pulling upper hind limb

forward to the shoulder region so that the scroyum is well exposed or the animal can be controlled in standing position. Xylazine (0.05-0.2mg/kg IM) or chloral hydrate (90-100 mg/kg IV) or chloral mag (5g/50kg, 10%so;ution IV) or any other sedatives or tranquilizers along with local anaesthesia on scrotal incision line followed by infiltration of the spermatic cord, or general anaesthesia may be used.

Procedure

- The surgical area is prepared aseptically.
- An incision is made parallel to median raphae down the anterior surface of the scrotum and it is extended backwards to open the bottom of the scrotum.
- Hold and press on the scrotum to bring out the testes one by one.
- The testicle and the cord are freed from the loose areolar tissue with the help of fingers below the proposed point of removal.
- The cord then can be grapsed by one hand just below the testicle. The tunic over the testicle is incised and testicle is forced out through the incision in the tunics.
- Castration clamps over the cord are applied and avascular and vascular parts are first tied separately and then together at two places using chromic catgut size 1 or 2. The cord is divided in between these two ligatures and the castration clamps is released.
- The opposite testicle is removed in same manner.
- Free drainage from the scrotum should be established.

Unit: 7

Care and management of large ruminants

A. Objectives

- To be familiar with care and management of large ruminant.
- To management of housing system of ruminant.

B. Content elaboration

Introduction

It is said that management is the art and science of combining ideas, facilities, processes, materials and labour to produce and market a worthwhile product or services successfully. Success in dairying depends largely on the proper care and efficient management of the herd.

7.1 Site selection and housing for cattle and buffaloes

There are two types of housing:

a. Loose housing system (pen type barns)

The system consists of four units:

- Feeding area and feed storage @ 30"/cow
- The bedded area, pen space and bedding storage@60 sq.ft./cow
- Paved area @ 100 sq. ft./cow
- Milking plant or milking palor

b. Barn system

- *Single row system:* it is suitable if cattle number is below 10.
- *Double row system:* if cattle population is more than 10 and less than 50. In double row, the well known housing systems are:
  - Tail to tail /face out system
  - Face to face / tail out system

Sheds for young stocks

Calves should never be accommodated with adults in the cow shed. They should be kept separately until they are 6-8 weeks old and after that they may be grouped in

a maximum of 10 calves. The calf house must have provision for daylight ventilation and proper drainage. As far as possible the shed for the young calves should be quite close to the cowshed. It is useful to classify the calves below one year into three age groups, viz., calves below the age of 3 months, 3-6 months old calves and those over 6 months for a better allocation of the resting area. An overall covered space of:

- 20-25 sq.ft. per calf below the age of 3 months,
- 25-30sq.ft. per calf from the age of 3-6 months,
- 30-40 sq.ft. per calf from the age of 6-12 months and over, and
- 40-50 sq.ft. for every calf above one year, should be made available for sheltering such calves.

Objectives of proper housing

- To protect animals from extreme weather.
- To provide clean and comfortable shelter.
- Providing better accommodation at a cheaper cost.
- To protect animals from wild animals and theft.

Types of animals	**Floor space per animal (sq.ft.)**		**Manger length per animal (inches)**
	Covered area	**Open area**	
Cows	20-30	80-100	20-24
Buffaloes	25-35	80-100	24-30
Young stock	15-20	50-60	15-20
Pregnant stock	100-120	180-200	24-30
Bulls	120-140	200-251	24-30

Table: the floor and manger space requirement of dairy cows

Advantages of adequate housing

- Increased production of milk.
- Better utilization of labour.
- Production of higher quality milk and milk products.

- Better health of animals, proper disease control and minimum calf mortality.
- Better care and supervision and, productive and reproductive efficiency of animals.

7.2 Care of lactating female

It is very essential to care the parturient animal. As soon as cow shows complete relaxation of posterior border of the sacrosciatic ligament, she should be put in a clean, well bedded box and kept under frequent observation. If after 12 hours of restlessness there is no straining, a veterinary examination should be made to exclude primary uterine inertia, failure of the cervix to dilate and uterine torsion. If a cow comes into a normal second stage and there is no progress after an hour's straining, she should be examine to ascertain the cause of the obstructive birth.

Following parturition the dam should be allowed to lick and nurse her young. All undue excitement, noise, or unusual happenings should be eliminated or prevented. Rest and quite following parturition is imperative. The roughage fed to large animals should be of good quality. The grain ration should be rather laxative and light, such as bran, oats and a little linseed meal. In most animals the amount of grains should be increased gradually during the first three weeks after parturition. In the dairy cow it may be increased more rapidly to prevent acetonemia or ketosis.

In the sow the light grain feed should be continued for a week and then gradually increased. If it increased too rapidly the diarrhea may develop. In mare, it is practiced to administer one gallon of mineral oil to mares soon after foaling to help prevent constipation due to pain occasioned by the act of defecation the first few days after foaling. The cows should be watched carefully for several days after calving for symptoms of milk fever.

In most animals it takes about 10-14 days to return the dam to full feed. Moderate and light daily exercise is advisable in animals after parturition. Mares should be turned out for about one hour a day.

In domestic animals retention of fetal membranes occasionally occurs. The membranes are considered as being retained if they are not expelled within 8 to 12 hours in cow, 3 to 6 hours in the mare, and 8 to 12 hours in ewe. In multipara,

membranes usually cannot be observed hanging from the vulva and they frequently go unnoticed until they are expelled in 1 to 2 days or decompose and a mucopurulent discharge is noted in 4 to 10 days. Retained placenta should be treated in the cow within 1 to 3 days after parturition. Mares should be treated earlier within 12 to 24 hours to avoid septicemia, toxemia and possible parturient laminitis.

If the genital discharges persist beyond 14 to 20 days postpartum or if they are abnormal in amount or purulent in nature, the genital tract of animal should be examined and treated accordingly. Early treatment of uterine infections or pathology or repair of vulvar laceration after parturition is essential if the animal is to conceive promptly.

7.3 Care and management of young animals

There are two basic system of raising calf practiced in the country:

- *Keeping calf with its dam*: in this calf is allowed to suckle milk directly from its mother's udder a little before and after calving.
- *Weaning system:* the calf is kept away from its dam and fed artificially. There are two practices of removing calf from dam
  - i. Weaned immediately after birth
  - ii. Calf remains with dam for 2-3 days and removed to calf pen

1. Feeding young calves and rearing

Feed colostrums after birth within 1hr to get maximum antibodies especially in buffalo calves for developing immunity. Be sure to feed the calf enough of colosturm between 2-2.5 liters daily for the first 3 days following its birth.

a. Teaching the calf to drink milk

Two systems: hand feeding and pail feeding

b. Feeding whole milk

Amount: one tenth of the calf's body weight. Upto 7 days feed in 3 or 4 equal intervals and after 7 days twice daily.

Optimum gain/day: half kg

Minimum period of whole milk feeding:15 days

c. *Skim milk feeding*

Whole milk is replaced by skim milk at a gradual rate and the skim milk is discontinued at 24 weeks of age.

d. *Feeding calf starters*

Calf starter is a mixture consisting of ground farm grains, protein feeds and minerals, vitamins and antibiotics. One continues to feed whole milk to calves receiving starter until they are at least 1-10 weeks old. After a calf attains the age of 2 weeks the amount of whole milk given to it may be cut down

e. *Feeding grain mixture*

After 4 months of age calf can utilize grain mixture.

f. *Feeding silage*

Calves at their age ages between 3-6 months may be given small amounts of silage. Feed 1-2kg daily to calves aged upto 3-4 months and then increase these amounts by about 500 gms per day for each month of the calf's age.

g. *Feeding hay*

Hay can be offered to young calves after 2weeks of age on free choice basis.

h. *Pasturing calves*

Calves are permitted to graze after 6 months of age on a seoarate pasture for calves.

i. *Supplying minerals*

A simple mineral mixture consisting of 2 parts dicalcium phosphate and 1 part salt will usually give good results.

j. *Fresh water for calves*

Growing calves should have access to fresh clean water at all times, particularly when milk feeding is reduced or discontinued.

2. Removal of extra teats

Extra teat if any should be clipped off with a pair of sterilized scissors, and a disinfectant such as tincture iodine must be applied.

3. Marking calves

It can be done by several methods: tattooing, branding, notching, tagging etc.

4. Castration of bull calves and dehorning of calves

A. Care and management of heifers

1. Feeding heifers

The feed of heifer must contain 18%DCP and 60-70%TDN. The amount of concentrate feed would vary with size and age of heifer but in general young, breeding and pregnant heifers may be given 0.5, 1 and 1.5 kg concentrate respectively.

2. Training

It includes washing the udder with warm water and mopping to accustom her to feel hands in this region.

3. Exercise

It removes stiffness in their limbs, keeps them thrifty, growing and maintain normal appetite.

4. Culling

Removal of unwanted animals from the herd for economic purpose.

5. Deworming

7.5. Management of Pregnant Cows

Proper care and management of the herd is the key of success in dairy industry. Special attention of farmer is required for the watchful care of pregnant animals during the last quarter and at calving time so that animals should be in comfortable conditions. If the farm is run in commercial scale, it is essential to keep records of each female and take care of individual accordingly.

1. Calculate the approximate date of calving from the breeding record of the cow and move her to calving box 3-5 days in advance.
2. The calving box should be thoroughly washed and disinfected.
3. Buffaloes and cows if in milk should be dried at least 6-8 weeks before calving. For drying off the pregnant animals, concentrate should be reduced to zero and poor quality roughages be supplemented until dries off.
4. The animals in pregnancy should be well fed during the rest of the period of

6-8 weeks in order to bring in the good condition. Along with sufficient good quality fodders about 2-3 kg concentrate mixture should be given.

5. During the last 10-15 days before calving the animals should be fed on laxative diet of green fodder, hay or silage. In case dry roughages is supplied about 2-3 or crushed barely @ 2 kg/ head.

Unit: 8

Selection of animal

A. Objectives

- To be familiar with selection of animal and different scoring methods.

B. Content elaboration

8.1 Types, purpose, criteria and use of different scoring methods

It is a comparative evaluation of cattle in which animals are ranked based on their closeness to "ideal" dairy conformation. Desirable dairy conformation involves functional traits associated with high milk production over a long, trouble free productive life. In order to judge you most begin with the fundamentals. In addition, good judges of dairy cattle need a definite mental image of the ideal animal for the breed being judged. These images can be developed by observing cattle at shows, visiting outstanding herds, studying breed journals and observing personally owned dairy cattle closely. Before beginning to judge dairy cattle, judges should become familiar with the parts of the dairy cow.

Traits of judging dairy cattle:

a. Frame -15%

The skeletal parts of the cow, with the expectation of feet and legs are evaluated. Rump should be long and wide. The tail head should be slightly above and in between pin bones, and the tail is free from coarseness. The vulva is nearly vertical. Height at the withers and hips should be relatively proportionate. Front leg straight and wide apart and squarely placed. Head should be clean-cut, broad muzzle, large open nostrils and a strong jaw is desirable.

b. Dairy character-20%

The physical evidence of milking ability is evaluated. Consideration should be given to the stage of lactation.

c. Body capacity-10%

The volumetric measurement of the capacity of the cow is evaluated with age

taken into consideration. The barrel should be long, deep and wide.

c. Feet and legs-15%

Feet and rear legs are evaluated. Evidence of mobility is given major consideration. The feet is straight, well rounded closed toes.

d. Udder-40%

The udder traits are the most heavily weighted. Major consideration is given to the traits that contribute to high milk yield and a long productive life. Consideration should be given to the lactation number and age. Teats are squarely placed under each quarter.

Unit: 9

Maintenance of Animal Health

A. Objectives

- To be familiar with sign of ill health and cause of disease.
- To enable to learn about parasite of livestock.

B. Content elaboration

9.1 Sign of ill health and causes of diseases

Benefit of livestock production depends upon proper care and efficient management of all sick, young, dry and pregnant animals. Comfort of the animals has to be given due consideration. Proper housing, ventilation, adequate floor and trough space and feeding and regular health care should be available. Livestock building, floor, walls, mangers, drains, pens, paddocks, bedding and utensils should be kept clean and disinfected regularly for improving the hygienic and sanitary conditions. The animal habitations should be kept dry for keeping the animal healthy.

Livestock diseases cause farmers millions of rupees loss annually. In addition to death they cause loss of production and frequently a loss of body condition. Unthrifty animals require more food and take longer time for growth than healthy stock.

Health: It is a condition of an animal in which all its body structure are normal and functioning to their optimum capacity in relation to animals age, sex, work and purpose. Perfect health is a state of maximum physiological functioning of all the system of the body.

According to WHO (World Health Organization, 1948) health may be defined as a state of complete physical, mental and social well-being and not merely absence of disease or deformity.

Signs of Health

Cattle

- Look alert. The animal stands with easy appearance and walks freely

- The glossy coat. Skin is movable over the muscle
- Head should be held normally (No hide bound) not dropped down or to one side
- Horns and feet should neither be hot nor cold to touch
- No padding of feet and nervous switching of soil (unless flies are about)
- Nose and muzzle should be cool and moist
- Eyes are bright and clear
- All visible mucous membrane should be moist glistening and pink in color
- There should not be any excessive salivation, tears or any abnormal discharge through any natural opening
- Eructation: Gas is brought out from the rumen at frequent intervals
- Rumination usually takes places every six to eight hourly
- Feed weel. Does not leave any normal ration to the trough or manger
- During grazing cattle usually keep together
- Working cattle does not sweat as much as the horse
- During is comparatively soften. Urine is less
- When cattle lie down first sink on their knees, bring their hind legs under the body, touch the ground with the sternum and take a side. When rise they get on their hind legs first.

9.2 Types of diseases: on the basis of duration, causes and systems affected

Infectious diseases: Infectious diseases are those diseases caused by organisms, infective in nature, and which are capable of passing from affected to healthy one under favourable conditions.

e.g.: Anthrax, Tuberculosis, Pasteurellosis and Black quarter etc.

Contagious diseases: Contagious diseases are those diseases which spread from one animal to other by direct contact or indirect contact through other agencies.

e.g.: Malaria, Babesiosis, Brucellosis, Leismaniasis etc.

Bacterial Diseases: Bacterial Diseases are those diseases which are caused by bacteria such as streptococcus, Staphylococcus, E. Coli etc.

e.g.**:** Hemorrhagic Septicemia, Anthrax**,** Black Quarter, Mastitis, Tetanus, Brucellosis, Foot rot, Enterotoxaemia, Strangles, Glanders

Bacterial Diseases of Livestock

i. Hemorrhagic Septicemia,
ii. Anthrax**,**
iii. Black Quarter,
iv. Mastitis,
v. Tetanus,
vi. Brucellosis,
vii. Foot rot,
viii. Enterotoxaemia,
ix. Strangles,
x. Glanders
xi. Tuberculosis

Viral Diseases: Viral Diseases are those diseases which are caused by virus such as pox, picorna, lyssa etc.

e.g.**:** Rabies, Ranikhet, Foot and mouth disease (FMD), PPR, Rinderpest etc.

Viral Diseases of Livestock

i. Rabies
ii. Rinderpest
iii. Foot and mouth disease (FMD)
iv. Peste des petits ruminant (PPR) in goat
v. Swine fever
vi. Canine distemper
vii. Cow pox
viii. Goat pox
ix. Ephemeral fever
x. Blue tongue

9.3 Common ecto and endo parasites and their control

Control Measures for External Parasites

Measures to control parasites and other organisms which are carrier of diseases producing germs or spreading diseases.

1. Control of Ticks

Ticks and the diseases transmitted by them are not only prevalent in India but also throughout the world. According to one survey, it has been estimated that 80% of the world cattle are infested with ticks.

While planning for tick control, the possible difficulties that could be encountered should be kept in mind. The difficulties that could be posed during tick control are that:

- Ticks have high biotic potential.
- Ticks can survive starvation for long periods.
- They have limited natural enemies
- Two or three ticks have multiples host species for feeding and reproduction.
- Higher concentrations of insecticides are required for tick control, which may lead to toxicity in animals.
- Along with tick control over the animal, it is also necessary to control the ticks from the environment in which the animals are living, to make the plan successful.

2. Biological Management

a. Either remove the host from pasture or change the pasture.

b. Mostly the tick population moves in pasture land rather than cultivated land. By converting pasture land into cultivated land, the tick population can be controlled because the larvae and effects of the ticks are killed due to exposure of sunlight.

c. By adopting those species or breed of animal that are resistant to ticks. E.g. Zebu cattle (Bos indicus).

d. By using some natural enemies, such as *Huntrellus hookeri*, which according to reports, is a fly which lays its eggs, in the body cavity of the ticks, thereby ultimately destroying them.

3. Repellants

Some repellants like Diethylphthalate or Dibutyl-phthalate etc., when applied topically on skin causes some repelling effect against the ticks, so the ticks remain away from animals.

4. Irradiation techniques

By using some irradiating substances like Co60 the male tick may become sterile. So multiplication of ticks can be controlled.

5. Pheromone like chemicals

These chemicals are derived from female ticks. When these chemicals are applied locally the male ticks are attracted and concentrate at that area, which then can be easily destroyed by sunning acaricides or insecticides.

C. Practical Application

1. **Housing:** Animals house should be tick proof. There should not be any cracks and cervices in the wall and floor of the house. If possible there should be a 3 to 4 cm water trench around the building.

2. **Control of Rodents**

   Because ticks can grow on rodents, which can spread the same to the animals control of rodents can also control the spread of ticks.

3. **Use of acaricides**

   The most effective and most widely used technique to control tick is application of various acaricides. Some commonly available acaricides. Acaricides can be used groups.

a. Chlorinated hydrocarbons e. g. Lindane, Toxaphene i.e. BHC, DDT, etc.
b. Organophophorus compounds e.g. Melathion (Cythione), Sumithion, Asntol
c. Carbamate compounds e.g. Carbaryl (Sevin)
d. Pyrethroids e.g. Deltamethrin, Cypermethrin, Flumethrin etc.

Treatment strategy

Treatment of cattle by acaricides either by dipping or spraying must be done at certain specific intervals, depending on life cycle of the ticks to be controlled. The

treatment intervals, depending on life cycle of the ticks to be controlled. The treatment intervals may also vary as per the purpose to the treatment namely eradication, prevention of disease transmission, or for reducing the number of ticks below the level that causes damage.

Use of acaricides at 3 weeks interval for 2-6 times in a session is effective. As the tie ticks usually appear on animals at certain seasons of the year, it is not necessary to treat the animals for tick control throughout the year. Indeed, it may be more effective to treat the animals in tick season only.

Unit: 10

Dairy Farm Books and Records Keeping

A. Objectives

- To be able to keep dailly form records.

B. Content elaboration

Introduction

Several kinds of records may be kept in a dairy farm. Records of production should be kept by all dairy men. The important records which should be kept are:

a. milk record register
b. breeding record
c. health record
d. calf register
e. cattle history and pedigree sheet register
f. financial record

1. Service register of cows

Name of the dairy farm

Address

Breed

S.No.	No. of cows	Date of last calving	Date of service	Time of service	No. of bull	Expected date to calve	Date to be dried off	Date of calving	Weight of the calf	Sex of the calf	Time taken for the expulsion of	remarks

2. Calf register

Name of the farm: ……

Address: …….

For the month of: ……. 20 ……..

S.No.	Date of numbering	Ear tag no.	Sex of the calf	sire	dam	disposal		remarks
						How the calf was disposed	Date	

3. Milk record sheet

Name of the farm: ……

Address: …….

For the month of: ……. 20 ….....……..

Date	Time	No. of cow	No. of cow	No. of cow	No. of cow	No. of cow
	A.M					
	P.M					
	A.M					
	P.M					

4. Lactation record

Name of the farm: ……

Address: …….

For the month of: ……. 20 ….....……..

No. of animal	Months of the year						Yield in lit. during lactation period	Average fat%	No. in days in a lactation	Date and days dry off	Remarks
	Jan.	Feb.	…	…	Nov.	Dec.					

5. Stock register of cattle

Name of the farm: ……

Address: …….

For the month of: ……. 20 ….....……..

Serial no.	Tattoo no.	When purchased	Date of birth	Value	Approximate age when purchased	pedigree		How disposed off	Page of herd register	remarks
						Dam	Sire			

Financial Records

A. Journal

Journal is a record of day to day transactions. Before journalizing, it is necessary to determine the debit and credit items of the transaction. The rules of debit and credit under different types of accounts are:

a. Personal account
   Debit the receiver
   Credit the giver
b. Real account: it is the record of an asset.
   Debit what comes in
   Credit what goes out
c. Nominal account: it is a record of expense or loss and income or gain.
   Debit all expenses and losses
   Credit all incomes and gains

B. Ledger

Ledger is a book where different accounts are prepared to have a consolidated view of the similar transactions. A ledger is simply the grouping of the accounts that are used to prepare financial statements for a business.

D. Trial balance

Trial balance is that kind of statement which shows either the balance or total amount of debit items and credit items of all the ledgers and the bank and cash balance. It is the statement of debit and credit balance of the ledger account, which is prepared to check the arithmetical accuracy.

E. Balance sheet

Balance sheet may be defined as accounting statement of financial position of a business presented at specific point of time usually at the end of accounting period. It shows assets on one side and liabilities and capital on the other, the balancing of the statement being immediately apparent. Thus balance sheet discloses the information regarding assets, liabilities and capital.

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